Therapeutics and materia medica: a systematic treatise on the action and uses of medicinal agents, including their description and history (Volume 1).

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THERAPEUTICS

AND

MATERIA MEDICA.

Hoc sum contentus quod, etiamsi quomodo quidque fiat ignorem, quid fiat intelligo. . . . Quid scammoneæ radix ad purgandum, quid aristolochia ad morsus serpentum possit, video: quod satis est; cur possit nescio.

Cicero, *De Divinatione.*

THERAPEUTICS

AND

MATERIA MEDICA.

A SYSTEMATIC TREATISE

ON THE

ACTION AND USES OF MEDICINAL AGENTS,

INCLUDING THEIR

DESCRIPTION AND HISTORY.

BY

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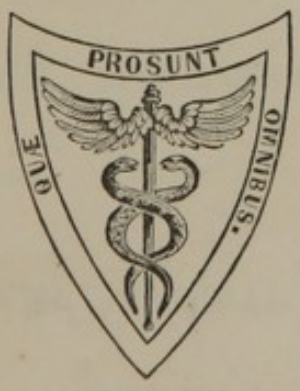
VOL. II.



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THERAPEUTICS

AND

MATERIA MEDICA.

NARCOTICS.—CONTINUED.

LACTUCARIUM.—LACTUCARIUM.

DESCRIPTION.—Lactucarium is the inspissated juice of *Lactuca virosa*, *L. altissima*, and also of *L. sativa*, or garden lettuce, a plant universally eaten with condiments, as a salad, while it is young and tender. Even in this state its tendency to produce drowsiness is familiar to every one, although it then contains no appreciable quantity of the milky juice in which the hypnotic virtues of the plant reside. This should be procured by making incisions in the stem of the plant while it is in flower, and allowing the exuded juice to dry. An extract prepared by evaporating a decoction of the whole plant is nearly worthless. The smell and taste of lactucarium are acrid and bitter. It is generally found in reddish brown masses, somewhat resembling opium. According to Buchner, the active principle is Lactucin, which is combined with resin. Lactuca virosa will yield three times as much lactucarium as Lactuca sativa. Aubergier describes the active principle as neutral, bitter, and crystallizable, insoluble in cold water, but soluble in alcohol.[1]

HISTORY.—The virtues of lettuce were well understood by the ancients. Celsus ranks it with the poppy as a soporific,[2] and it is mentioned more or less particularly by Galen, Dioscorides, and the writers of the Arabian school, who ascribe to it soporific and anaphrodisiac

[1] Bull. de Thérap., xxiii. 64.

[2] Book ii. chap. xxxii.

properties. Dioscorides even states that the juice of the wild lettuce (*lactuca virosa*) was regarded as so much like opium in its powers, as to be employed for adulterating this drug. Both Paulus Ægineta and Galen refer to lettuce as a cure for watchfulness, and the latter, in particular, found it a sovereign remedy for that wakefulness which beset him in his old age, and when his mind was over-excited by study. The reputed powers of lettuce in allaying amorous desires procured for it the name of ἀνανχιον, or eunuch-maker; the same idea is conveyed by the custom of including this plant amongst the herbs used at the festival in commemoration of the death of Adonis; for Venus was fabled to have deposited the dead body of her favorite upon a bed of lettuce.[1] Ray[2] attributes to the strong-scented lettuce decided aphrodisiac virtues, but admits that the garden lettuce, before it has run to seed, is sedative and refrigerant. Rutty[3] points out that the hypnotic qualities of the plant reside in its milky juice, says that it is useful in opacity of the cornea, and diseases of the skin, and prevents libidinous dreams. If modern observations have not directly confirmed the prevalent opinion of the ancient world upon the last point, they have at least rendered it probable, by showing the close analogy of the medicinal part of lettuce with opium, in everything but its stimulant qualities, upon which the aphrodisiac virtues of the latter entirely depend. Lettuce and its extract appeared to have nearly fallen into disuse, owing, probably to the more general employment of opium, particularly since the time of Paracelsus, and although the plant is mentioned by Bonetus and Sylvius as useful in uterine hemorrhage, and is briefly alluded to by Jones, Alston, Hill, and the other writers mentioned, no importance was attached to it as a medicinal agent, by the profession in general, when Dr. John Redman Coxe, of this city, made experiments with its juice, which confirmed the opinions of the ancients in regard to it, and led to its being adopted anew into the materia medica.[4] Dr. Coxe gave it the name of *lettuce opium*. His opinions in regard to it were subsequently confirmed, in the main, by Duncan, of Edinburgh, Bidault de Villiers, François, Aubérgier, and other continental observers.

Action and Uses.—Dr. Coxe reports lactucarium to possess stimulant qualities, causing acceleration of the pulse, and a general glow like that produced by a glass of wine. These effects, however, do not appear to have been noted in more than one or two cases, and may be

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[1] Anthon's Class. Dict., art. Adonis.

[2] Synopsis Method. Stirp. Brittan., Lond. 1724, p. 162.

[3] Materia Med. Nov. et Antiq., Rotterodami, 1775.

[4] Trans. of Am. Phil. Soc., vol. iv. p. 387.

explained by the medicine having been given in the form of tincture. Certain it is that such effects have not been observed to follow its administration in substance or in the form of syrup. François,[1] who made use of the concreted juice of the plant obtained by incision, pronounced it to be destitute of any narcotic or intoxicating property such as belongs to opium, but admitted that it indirectly disposes to sleep by soothing pain, and diminishing the activity of the circulation. Fischer, who appears to have examined the subject carefully, arrived at a similar conclusion[2] to the above, and also to that of M. Bertrand, of Clermont,[3] who states that even in large doses it does not produce the headache, tinnitus, flushing of the face, and increased force and frequency of the pulse which so generally follow the use of opium in full doses. Martin Solon,[4] who prescribed to several patients a syrup made by distilling an extract of the mature lettuce-stalks, found its effects similar to the preceding, and, in addition, noted that where this remedy failed of its purpose, opiates were equally ineffectual.

The general coincidence of the results obtained by the several experimenters who have been cited would appear to establish the possession of decidedly anodyne and sedative properties by lactucarium, but it must be admitted that some important counter-testimony exists which ought not, in fairness, to be concealed. This is furnished by Barbier, and M. Trousseau. The former refuses to lactucarium a place in the class of narcotic medicines, and classes it with extract of dandelion among the tonics. He affirms that in four or six grain doses it creates a sensation of warmth in the healthy stomach, and usually increases the appetite, but that in inflammatory states of the digestive canal, it augments the local suffering, and excites dryness of the fauces, and thirst. According to this author, it affects neither the circulation nor the respiration, but augments the flow of urine. In doses even of a scruple or half a drachm he alleges that it does not produce somnolence, or affect the intellect or senses, and he regards its supposed hypnotic and anodyne powers as altogether illusory. This inference Barbier drew from a number of experiments made comparatively with lactucarium, mild preparations of opium, and doses of inert fluids prescribed under the name of the former medicine.[5] M. Trousseau, without denying to the drug all of the properties ascribed to it, states that he was unable to perceive any manifestation of them except from doses of from half a drachm to a drachm, while the

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[1] Arch. Gén. (1825), viii. 258.
[2] Rust's Magazin, liii. 77.
[3] Annuaire de Thérap., 1843, p. 24.
[4] Bull. de Thérap., vol. ix. p. 320.
[5] Op. cit., vol. iii. p. 302.

original experimenters found them developed by doses no larger than those of opium.

Bouchardat concludes from his observations that the medicine is a very feeble soporific, but in doses of from four to six grains will procure a gentle sleep for very impressionable persons, at least for a short time, but that the susceptibility to its action is rapidly lost.[1] Marotte in like manner found that no appreciable effect was produced by less than four grains of lactucarium, and that this quantity had soon to be doubled, tripled, and even more.[2] To these statements it may be added that Bouchardat administered the preparation in half-ounce doses to dogs without any effect. It is not easy to reconcile these discrepancies in regard to matters of fact without supposing, what is indeed very probable, that the lactucarium employed by the different experimenters was obtained by different processes, was in some instances adulterated, and was in others impaired by long keeping. Due allowance must also be made for the enthusiasm of the physicians who reintroduced the preparation into use. Any one who will read the articles which have been published concerning it must be struck by a fact common to them all: they dwell at length upon the circumstance that after its administration there is an absence of headache, nausea, constipation, itching of the skin, &c., which so commonly result from the use of opium. But it is evident that these statements are perfectly consistent with the want of all active properties in the medicine.

Uses.—The *medicinal virtues* of lactucarium will readily be inferred from the preceding remarks. It is appropriate for combating nervous restlessness in all diseases, for relieving the watchfulness which so generally follows mental excitement, for allaying pain of a moderate degree, and as a substitute for opium in all cases where the milder effects of this medicine are desirable, and any peculiarities of the patient are opposed to its exhibition. Thus, it is preferable to other narcotics for infants. Dr. Duncan first recommended it as a valuable palliative of the cough in phthisis,[3] and, if it answers the purpose intended, it is preferable to opium, which is so apt to diminish the appetite and enfeeble the digestion, and thus diminish the power of the patient to resist the wasting influence of the disease.

It is difficult to determine in what *dose* lactucarium should be administered, since authors of equal repute direct it, some in doses of one or two grains, and others in ten-grain doses, to be frequently repeated,

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[1] Annuaire de Thérap., 1857, p. 12. [2] Bull. de Thérap., li. 512.

[3] Observations on the Distinguishing Symptoms, &c., of Pulmonary Consumption, 2d ed. (Edinb., 1816), p. 174. The name *Lactucarium* was imposed by Dr. Duncan.

and rapidly increased to half a drachm or more. The most judicious plan is, doubtless, to begin with the smallest quantity mentioned, and augment the dose daily, or administer it at shorter intervals, until a decidedly anodyne or hypnotic effect is produced. This caution is, indeed, only necessary to prevent the administration of doses so large as to disagree with the stomach, for there is no case on record of poisoning, or an approach thereto, by any amount of lactucarium that has hitherto been prescribed.

HYOSCYAMUS.—Henbane.

Description.—The officinal name of this medicine is derived from two Greek words, ὗς, a hog, and κυαμος, a bean, indicating that it is a kind of food of which hogs are fond. The vulgar appellation refers to its poisonous effect upon fowls. The leaves of *Hyoscyamus niger* are recognized by the U. S. Pharmacopœia. This is an annual or biennial (*Houlton*) plant of the natural family *Solanacea*, and is a native of Europe, but naturalized in the United States. When mature, it is from two to four feet in height; the leaves are large, long, deeply incised, like the stem hairy, and of a pale green color; at the upper part of the stem they are sessile, soft, cottony, and clammy, and exhale a rank, heavy, and sickening odor, which has been compared to that of the black currant. The flowers, which are gathered at the top of the stem in depending spikes, are sessile, and have a funnel-shaped corolla of a pale yellow color on the edges, and variegated with dark purple veins. They are succeeded by capsules containing numerous small kidney-shaped black seeds, reticulated on the surface.

The leaves and seeds are both officinal, and yield their virtues to alcohol and water. The root is a long, somewhat branching, tap-root, rough and brown without, but white within. Its juice, like that of other parts of the plant, exhales a rank smell, and possesses powerful narcotic properties. From its resemblance to certain edible tap-roots, and particularly that of the parsnip, it has frequently been eaten by mistake, and produced poisonous effects.

The active principle of henbane, *hyoscyamia*, is described by Schroff as an amorphous, semitransparent, viscid mass, of a sharp, biting, nauseously bitter taste. It is soluble in water, alcohol, and ether.

Extractum Hyoscyami.—Extract of Henbane.

This extract is prepared by evaporating the expressed juice of hyoscyamus leaves to a proper consistence.

Extractum Hyoscyami Alcoholicum.—Alcoholic Extract of Henbane.

This preparation is made by the percolation of diluted alcohol through powdered leaves of henbane, and the evaporation of the product.

Both of these extracts are of very uncertain strength, and often quite inert. The latter is, however, most apt to be of good quality. Their average dose is two or three grains; and in all cases it is advisable to increase the dose rapidly, but by degrees, until some characteristic narcotic phenomena are developed.

Tinctura Hyoscyami.—Tincture of Hyoscyamus.

The tincture is prepared by macerating four ounces of henbane leaves in two pints of diluted alcohol, for fourteen days, and filtering. It is laxative and narcotic, and may be given in the dose of a fluidrachm.

Medical History.—Hyoscyamus has been recognized as a medicinal agent from the earliest periods of medical history. Many of the ancient writers, indeed, draw distinctions between the several varieties of the plant from which the extract is procured, condemning two of them as unfit for medicinal purposes on account of their virulent qualities. One of these, the black, is that most generally employed at present, while in France this variety, and also the white, which the ancients alone admitted into medicine, are used as possessing identical properties. Although this agent was never, as some writers state, entirely disused, it nevertheless fell into comparative neglect during the eighteenth century, until it was introduced anew to the confidence of physicians by the publication of Störck in 1762, since which time it has continued to hold a rank among narcotic medicines.

Action. *On Animals.*—As its name implies, hyoscyamus may be eaten by swine with impunity; it is also said to be innocuous to cows and sheep, while deer, barnyard fowls, and fish are poisoned by it. According to Orfila's experiments, it acts upon dogs as upon the human species. Hyoscyamia is poisonous to rabbits, although twenty times the quantity of a strong alcoholic extract does not injure them.

On Man.—These are the same whether the preparation of henbane be introduced into the stomach or bowels, or applied to the denuded cutis. M. Ratier[1] and Mr. Judd[2] have described the effects upon themselves of full doses of this medicine. The former took, fasting, ten grains of a carefully prepared alcoholic extract. After the lapse of an hour he experienced headache, which became rapidly more severe, pastiness of the mouth, and a savor which he compares to that of a

[1] Arch. Générales de Méd., i. 307. [2] Lancet, i. 776.

mixture of sweet and bitter, and which masked completely the taste of sapid bodies. The tongue was covered with white fur, and the throat was hot and dry, the skin warm and halituous, and the pulse slightly accelerated. A short slumber followed, on awaking from which M. Ratier found his pupils so dilated as scarcely to leave a trace of the iris visible; he saw imperfectly, walked with a tottering gait, and experienced a numbness of the lower limbs. In four hours these symptoms had disappeared, except the dryness and bad taste in the mouth, which continued until the following day. In Mr. Judd's case the attention was chiefly attracted by a fluttering movement of the heart, and a corresponding rapidity and smallness of the pulse. The sense of touch was also very much impaired, the voluntary muscles were affected with spasmodic jerkings or were cramped, while the bladder could not be evacuated except by repeated efforts. According to Schroff, small doses of henbane uniformly diminish the frequency of the pulse at first, but its ordinary rate is soon resumed.[1]

In larger doses, hyoscyamus occasions such distinct and remarkable symptoms as to have been described by medical writers in every age. Hippocrates, in his treatise on the diseases of women, and Dioscorides, state that it is capable of exciting delirium, which the last-named writer very aptly compares to the delirium of drunkenness. Scribonius Largus calls the medicine *altercum*, because, as he remarks, it gives rise to garrulous delirium with altercation.[2] Wepfer[3] relates an extraordinary account of the effects produced by the roots of hyoscyamus niger on the inhabitants of a monastery, who had eaten them for supper by mistake. Soon after retiring many of the monks were seized with vertigo, dryness and heat of the fauces, contortions of the trunk, and disorder of the limbs. At matins one imagined that he had to read the service for the dying; another fancied he was cracking nuts, and pretended to throw the empty shells away. Among those who reached the chapel some could not read, others read what was not in the book, and to others the letters appeared to be running about the page. In another case, recorded in the *Ephemerides Cur. Naturæ*, two female servants, who had to prepare and apply repeatedly a fomentation of henbane leaves to their mistress, were seized with delirium and vomiting; they quarrelled, and at last came to blows. Still another instance of the sort is contained in the same work. Two apothecary's apprentices, who were drying henbane seeds upon a stove which grew too hot, became intoxicated by the poisonous fumes, made

[1] Bull. de Thérap., l. 43.

[2] See also Hoffmann, i. 200, 223.

[3] Cicut. Aquat. Hist. et Noxæ.

extravagant gestures, and at length fell to fighting. One of them, subsequently, was attacked with vomiting and purging; he laughed, danced, and sang;[1] and for some weeks afterwards complained of depression of spirits, debility, giddiness, and headache.

Such maniacal excitement is not, however, of ordinary occurrence after an overdose of hyoscyamus. More commonly there are fulness and heat of the head, flushing of the face, injection of the eyes, and cerebral excitement manifested by indistinct or clouded vision, and sometimes total blindness, giddiness, delirium, and hallucinations. Sometimes natural objects assume a grotesque appearance, or the field of vision is filled with luminous figures. There is little or no inclination to sound sleep, but a sort of somnolence with incoherent mutterings, like that which is so common in typhus fever. Sometimes the hearing is lost. The pupils are usually, but not always, dilated, the muscles of the throat and chest, and of the lower limbs, are affected with tetanic rigidity, or clonic spasms, and there is a more or less complete loss of power in the same parts, which is apt to continue after the attack. Aphonia is by no means uncommon. General sensibility is, in most cases, very much impaired, while at the same time there may be severe neuralgic pains in the course of the principal nervous trunks. The skin is apt to be bathed in perspiration which is sometimes cold, when a large dose of the drug has been taken; but smaller quantities, exhibited for several days in succession, more frequently render the skin dry and itching, or produce a papular eruption upon its surface. Sometimes the tongue is paralyzed and the pharynx spasmodically contracted. Dr. Craik, of Montreal, describes the eruption, in a case observed by him, as "a bright scarlet redness of the whole surface, exactly resembling that of scarlatina."[2] Vomiting and diarrhœa, with colicky pains, are of usual occurrence. Death may ensue upon the graver symptoms which have been enumerated, but, considering their formidable appearance, this termination is comparatively rare.

The dose which may be considered as poisonous is very uncertain. As Orfila long ago pointed out, the extract of henbane sometimes appears to be perfectly inert. But, on the other hand, very small doses of it occasionally produce symptoms of poisoning. Thus, in a case related by Dr. Keating, they were produced by a single dose of three grains, and that in a woman who, within the previous fortnight, had

[1] A case in which these symptoms occurred is reported by Shillizi, Arch. Gén., Mai, 1854, p. 604.

[2] Ranking's Abst. (Am. ed.), No. 28, p. 134.

taken very large quantities of opium. In another, mentioned by Dr. Ruschenberger, four grains occasioned them.[1]

Administered by the rectum, hyoscyamus may give rise to symptoms of poisoning. A female affected with organic uterine disease injected into the rectum a decoction of the plant. Instantaneously she was attacked with giddiness and confusion of sight, she talked at random, and presently fell, exhausted. Remedies were at once employed, but the effects of the poison were manifested for several months in great disorder of the nervous system.[2]

Schroff's experiments with hyoscyamia show that it produces dryness of the mouth and throat, lowers the pulse, dilates the pupils, and induces sleep. He states that in the dose of a five-thousandth part of a gramme (about gr. $\frac{1}{333}$) it reduced the pulse from 79 to 18; and he gives as the average medicinal dose one-sixtieth to one-twentieth of a grain.

This sketch of the effects produced by henbane and its alkaloid, presents a striking contrast to the symptoms which arise from opium and morphia. The latter seeming to exert their primary and principal action in regulating and then oppressing or extinguishing the functions of the brain, and in rendering torpid the whole muscular system, including that of the intestines, while the former stimulate the mental faculties and at the same time derange them, affect the muscles of animal life with spasms, and promote instead of counteracting the alvine evacuations. Judging, then, from its influence upon the healthy subject, it is not easy to discern upon what grounds hyoscyamus should be classed with opium as a narcotic; the actions of the two substances seem rather opposite than parallel. Some writers and experimenters have indeed refused to associate them under the same head, of whom may be mentioned Alibert, Barbier, Fouquier, and Ratier. The two last named refuse to henbane a narcotic or hypnotic property, and base this judgment on experiments upon the sick, rather than derive it from the physiological effects of the drug. As will appear in the sequel, this opinion differs from that of most medical authorities.

Remedial Employment.—The ancients made use of hyoscyamus internally to palliate cough, and with a view of controlling hemorrhages, particularly from the uterus, but they employed it much more extensively as a topical anodyne in earache, toothache, gout, and glandular inflammations.[4] Beyond this, and its recommendation for epilepsy and

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[1] Am. Journ. of Med. Sci., July, 1858, p. 96.

[2] Abeille Méd., x. 316.

[3] Br. and For. Med.-Chir. Rev., Jan. 1857, p. 260.

[4] Adams, Comment. on Paul. Æginet., vol. iii. p. 386.

dysentery, scarcely any extension was given to its employment until the time of Störck, who vaunted its virtues in convulsions, internal spasms, palpitation of the heart, mania, and melancholy, difficulty of expectoration, hæmoptysis, epilepsy, and chronic headache.[1] As happens in the case of all new remedies, the vogue of hyoscyamus was at first unbounded, and the assertions of Störck met with ready confirmation in all countries. But, as occurs in other cases too, more cautious and prolonged observation detracted not a little from the fame of the newly-discovered panacea. Its activity no one could deny, nor doubt the reality of the symptoms which large doses of the drug produced; but to admit that it was a poison, on the one hand, and on the other, to concede its therapeutical powers, are two independent propositions, each of which must stand upon its own proofs, and the latter has been strongly, and upon apparently good grounds, contested. Greding determined by numerous experiments that if in some instances the main disease was palliated, and in others certain troublesome symptoms disappeared, these advantages were insignificant when compared with the mischances attributable to the medicine.

Ratier, who has given the results of the experiments instituted by Professor Fouquier upon patients affected with epilepsy, hysteria, hypochondriasis, neuralgia, lead-colic, acute articular rheumatism, and cancer of the uterus or bowels, came to the following, among other conclusions: 1st. That henbane is not as powerful a remedy as had before been supposed; 2d. That many cures are attributed to it which the smallness of the dose prescribed renders incredible; 3d. That positive indications for its use are still wanting; 4th. That it is improper in cerebral affections; 5th. That it possesses no uniform or direct control over nervous disorders; and 6th. That it is not a soporific. With the last statement Dr. Chapman's experience agrees. He found, however, that it sometimes disposes to rest by easing pain or soothing irritation.[2] The foregoing results of experiments carefully conducted by competent observers, ought to be borne in mind in estimating the opinions of authors upon the efficacy of henbane in particular diseases. These will now be summarily reviewed.

Neuroses.—Mayerne, Störck, Gilibert, and others affirm that hyoscyamus is a valuable means of curing *epilepsy*, but, besides the fact that no less has been alleged of a multitude of other agents, we have the counter evidence of Scardona and Tissot, that the remedy is always dangerous, and that if it temporarily suspends the attacks, they afterwards return more violently: Greding, moreover, testifies that among

[1] Ratier, art. cit.

[2] Op. cit., art. Hyoscyamus.

fourteen epileptics treated by it, the luckiest were they to whom it did no mischief.[1] In *mania*, for which it was recommended on the principle of substitution, no recent writer of authority commends it. There is more show of its utility in the opposite state of mental disorder, or *hypochondriasis*, for which Frank regards it as a valuable remedy, and Dr. Sigmond thinks that in this disease it is particularly adapted not only to procure sleep, but to soothe the disordered spirits with more quickness and certainty than anything else. Whyte mentions it as a succedaneum to opium, although inferior, and directs from a grain and a half to three or four grains of the extract, night and morning, for the purpose of quieting nervous and hysteric symptoms, when opium confines the bowels.[2]

Neuralgia and other Painful Affections.—In facial neuralgia, Meglin's pills, consisting each of one grain of extract of henbane, and one of oxide of zinc, were greatly extolled by this physician. Their dose was increased daily, until the sight became affected, or they disagreed with the stomach. An attempt has been made to show that the alleged activity of the medicine resided in its vegetable ingredient, but the very insignificant success which has attended its administration by other hands than the inventor, diminishes the interest of this question. A poultice of the fresh leaves of henbane is useful in calming neuralgic as well as other pains, but has no superiority over that made with stramonium leaves, and is not, perhaps, equal to other forms of narcotic fomentation. All severe local pains of the paroxysmal sort are much more amenable to opium given internally, conjointly with analogous applications to the affected part; but where an anodyne must be taken habitually, and there is any peculiar morbid susceptibility to the effects of opium, hyoscyamus may be advantageously substituted. Under these circumstances, and provided no febrile excitement or headache be present, it frequently merits the encomium of Dr. Christison, who states that it allays pain, soothes excitability, and induces soft refreshing sleep; the last, as we believe, only because it has fulfilled the previous conditions. The anodyne properties of henbane may also be usefully employed for correcting the tendency to gripe, which belongs to the resinous and some other purgatives. For occasional catharsis, the association of the principal medicine with laudanum is preferable, but hyoscyamus enters more appropriately into the composition of those pills and other forms of laxative medicines, which are intended to be used habitually. By the Germans, it is employed, almost to the exclusion of opium, in the diseases of children.

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[1] Tissot, Œuvres, vol. x. p. 338. [2] Obs., &c., On Nervous Disorders, p. 363.

Hemorrhages, &c.— There are three conditions in which hyoscyamus has been recommended as a medicine of great utility, these are local inflammation, hemorrhage, and glandular swelling or degeneration. It cannot be pretended that it possesses any specific influence over the first two disorders, nor any, indeed, which is not referable to its anodyne properties, and these, it is believed, are also quite sufficient to account for its alleged resolvent power. For nothing is better established than that the tendency of pain in a part is to hasten and aggravate the morbid processes of which it is the seat. However this may be, opium is incomparably superior to henbane in the affections referred to. The property which hyoscyamus has of dilating the pupil, is sometimes employed in Europe for the purpose of exploring the interior of the eye, breaking up adhesions in iritis, and facilitating operations for cataract. In this respect, however, it is not equal either to stramonium or belladonna, which, in this country, are nearly always employed in preference.

The treatment of poisoning by hyoscyamus is nearly the same as that recommended for poisoning by opium. Emetics, the stomach pump, warmth to the extremities, cold to the head, and if stupor supervenes, internal and external stimulants, may all be directed. When the poison has all been evacuated, acid drinks are recommended to be given, and opium to quiet the nervous agitation which remains.

If, now, it were required to express in a summary manner the therapeutic value of hyoscyamus, as deduced from the considerations which have been presented, the statement need be very brief. In every case to which opium and hyoscyamus are equally applicable, the former is infinitely to be preferred; where opium under no form and in no combination can be tolerated, its anodyne effects may be inperfectly produced by hyoscyamus; as a corrective to the irritant properties of several cathartics, when it is necessary to administer them repeatedly, hyoscyamus is preferable to opium, as having no tendency to confine the bowels. This is, indeed, a brief catalogue of virtues compared with what have been often ascribed to hyoscyamus, but a close scrutiny of the evidence in its favor will, we believe, admit no more.

ADMINISTRATION AND DOSE.—Hyoscyamus is administered in substance, extract, and tincture. The first is not a usual mode in this country, but, if preferred, from five to ten grains of the powdered leaves or seeds may be given. Of the officinal extract, the minimum dose is about two grains, and of the tincture, one or two fluidrachms. But, as Alston long ago said, "the dose of henbane is uncertain," more uncertain than that of any other narcotic. In every case, there-

fore, where it is proposed to employ it frequently, a small quantity should be prescribed at short intervals, and continued until a decided impression is made. By this experiment alone is it possible to graduate the dose according to the patient's susceptibility or to the strength of the preparation employed.

BELLADONNA.—Deadly Nightshade.

Description.—Atropa Belladonna, also called Solanum maniacum, S. somniferum, S. lethale, is a plant of the natural family of Solanaceæ. Its native country is Southern Europe, but it flourishes, when cultivated, in the United States. It generally grows in shaded places, along ditches, hedges, and ruined walls. The plant, which is much admired for its beauty, has a perennial herbaceous stem of a purplish color, cylindrical, branched, somewhat tomentose, and three or four feet in height. The upper leaves are in pairs, the lower alternate, oval, pointed at both ends, soft, of a dark-green color above, but lighter beneath. The flowers are axillary, pedunculated, and form cylindrical purple bells. They are succeeded by a berry which is at first green, then red, and, when ripe, of a dark-purple color, and closely resembles a cherry in appearance. It contains in two separate cells a number of kidney-shaped seeds, and its juice has a sickly sweetish taste. The root is fleshy and creeping. All parts of the plant exhale a nauseous and rank odor, and are pervaded by its narcotic principle, but the leaves only are officinal.

The active properties of belladonna depend upon *atropia*, an alkaloid principle, which was discovered by Brandes, and stated by him to exist in the form of a malate. It is very soluble in alcohol, somewhat less so in ether, and it requires five hundred parts of cold water for solution.

Extractum Belladonnæ.—Extract of Belladonna.

This preparation is the inspissated expressed juice of the leaves. Its average dose for an adult is one-quarter of a grain, and for infants, not more than one-twentieth of a grain should be administered at first.

Extractum Belladonnæ Alcoholicum.—Alcoholic Extract of Belladonna.

It is prepared by percolation and evaporation. Its dose is the same as that of the watery extract.

Tinctura Belladonnæ.—Tincture of Belladonna.

This tincture is usually prepared by percolation, and when made

from fresh leaves, is an active preparation. It is less used than the extract, but may be given in doses of fifteen or twenty drops.

Atropiæ Sulphas, *Lond.*—SULPHATE OF ATROPIA.

This preparation is made by saturating atropia with diluted sulphuric acid, and evaporating the solution to crystallization. It is too potent a medicine for general administration. With due caution, however, it may be given in the dose of one-fiftieth to one-twentieth of a grain, and from one-thirtieth to one-twentieth of a grain may be applied endermically.

HISTORY.—Belladonna was so called by the Venetians, because, according to some writers, it entered into the composition of a cosmetic employed by the Italian ladies. Others will have it that the visions of beautiful women which it sometimes excites, conferred its name upon the plant. Its popular name, which is of German origin, is probably derived from the poisonous qualities with which every part of the plant is endowed.

No authentic notice of belladonna occurs in medical literature before the sixteenth century. For one hundred and fifty years longer, it is chiefly referred to by writers as a poison, under the name of *solanum furiosum*, a title derived from the peculiar delirium which it excites when given in excessive doses. In the latter half of the seventeenth century, it began to be recommended as a resolvent and anodyne in cases of cancer, by many German, and several English physicians,[1] and towards the close of the eighteenth century it came into general use as a remedy for spasmodic and other nervous disorders.

ACTION. *On Animals.*—Mr. Anderson, according to Pereira, states that blackbirds eat the berries of belladonna with impunity; but M. Flourens found that birds fed by him with this substance became blind. On examining them after death he observed that the cranium was stained red opposite the corpora quadrigemina, from which, and from its effect upon the sight, he concluded that these nervous ganglia were chiefly acted upon by the poison.[2] Herbivorous animals do not appear to be affected be devouring any part of the plant, if we may judge by experiments performed upon the horse, the ass, and the rabbit. The active principle of the plant was discovered in the urine of the rabbit, showing that the animal had escaped danger by eliminating, and not by assimilating, the poison. Bouchardat fed two rabbits for a month exclusively on belladonna leaves, without any harm to them. The berries of belladonna administered by Orfila to dogs, pro-

[1] SPRENGEL, Hist., &c., vol. v. p. 478.

[2] Recherches, &c., 1824.

duced no result, but these animals were readily poisoned by the extract taken into the stomach, or injected into the veins, and exhibited, along with dilated pupils, the symptoms already described as belonging to narcotic poisoning in quadrupeds. According to Reisinger, experiments with atropia have produced similar results, when it was given in doses even of a single grain.[1] Bouchardat on one occasion introduced a grain, and on another, three grains of atropia into the cellular tissue of a rabbit's limb, but no poisoning resulted. But when dogs were subjected to similar experiments they became agitated, and were unable to stand up, or to walk without stumbling. When two grains of atropia were injected into the crural vein of a dog, the animal uttered a shrill howl and fell stiff, and apparently dead upon the ground, but recovered in five or six minutes sufficiently to walk across the room. After some hours of rest the symptoms disappeared.[2]

On Man.—In very small doses, the only effect of belladonna is to produce dilatation of the pupils. In somewhat larger quantities, particularly if administered for several days in succession, it occasions dryness of the fauces, and in some instances, gives rise to a reddish efflorescence on the skin. These symptoms may all appear without the slightest disturbance of the cerebral functions.

The effects of larger doses of belladonna can best be learned from an analysis of the symptoms which have been observed in poisoning by this substance. Examples of this accident are very numerous, and have generally occurred from eating the berries of the nightshade, which are not unlike cherries, and have a rather pleasant although mawkish taste.

The absorption of the active principle of belladonna by the skin, was evident in the cases referred to below, in which the medicine was applied in the vicinity of the eye. Other cases are recorded, of even more marked effects from a similar cause. Thus, Dr. Lyman states that having applied a belladonna plaster, measuring two inches by four, to the chest of a nervous female, it produced all the usual symptoms of poisoning by this substance, including a reduction of the pulse to twenty-eight in a minute. The symptoms continued in some degree during four or five days.[3] The phenomena, however, differ widely in different cases. Dr. Jenner states that a belladonna plaster, six by nine inches in size, having been applied to the loins of a man where the skin was affected with minute pustules and ulcers, he was seized with an urgent desire to urinate, and great loss of power in the lower

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[1] Arch. Gén., t. xviii. p. 300. [2] Annuaire de Thérap., 1849, p. 14.
[3] Bost. Med. and Surg. Journ., Jan. 1857, p. 451.

limbs, articulating continually, but uttering no sound. The pulse was full and strong, and between 80 and 90.[1] A case is reported in which a small dog, applied to the breast of a nursing woman who had taken a poisonous dose of belladonna, was instantly attacked with spasms.[2]

Effects on the Nervous System. A sense of tightness or pain is first felt in the frontal region and in the eyes, there is confusion of thought, with giddiness, a feeling of intoxication, and noises in the ears. The sight becomes confused, and objects are seen as through a mist, or they are mistaken for others very different. Spectral illusions are not unfrequent. They are usually of a pleasing character: images of diamonds and other precious stones, flashes of many-colored lights, birds of brilliant plumage, and insects with enamelled wings. Occasionally there is total blindness, even of several days' duration. The mind is agitated and excited by a train of extravagant ideas; there is often decided delirium, and nearly always of a gay description, which either prevents sleep entirely or permits only broken slumbers disturbed by fantastic dreams. It is remarkable that the patient may be quite conscious of his visual illusions and his delirium, but without having the power to prevent the one or control the other.

In certain cases familiar persons around the patient are not recognized, and are called by wrong names, the old and decrepit are addressed as young and beautiful, and even inanimate objects are mistaken for one another. This singular delirium has been compared to somnambulism. It is recorded of a tailor, who had used an injection of belladonna, that he remained on his shopboard for fifteen hours, sewing with great apparent earnestness, using all the gestures which his business requires, and moving his lips as if speaking, yet the whole of the time perfectly insensible.[3] Dr. Simpson mentions a lady who, under the influence of an overdose of belladonna, appeared as if in the act of dressing her hair for hours.[4] Some of the most frightful cases of suicidal and destructive impulse are declared to have had their origin in the use of belladonna, where a predisposition to insanity existed. It is asserted that when tic douloureux has been suddenly stopped by belladonna, this form of madness was developed.[5] A remarkable fact observed in some cases of poisoning by belladonna, is the degree of anæsthesia which it produced. Of this a striking example is afforded by a man who swallowed, by mistake, an enormous dose of the watery extract of this plant. For seve-

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[1] Times and Gaz., Nov. 1856, p. 513. [2] N. Y. Journ. of Med., Jan. 1854, p. 94.
[3] Journ. of Psychol. Med., i. 304. [4] Edinb. Monthly Journ., July, 1858, p. 79.
[5] Ibid., p. 303.

ral days the skin remained so insensible that it could be pinched or pricked without pain.[1] In most fatal cases, sopor succeeds delirium, or may even occur without being preceded by excitement; there is muscular relaxation, a red and tumid face, injection of the conjunctiva, and a frequent or else very infrequent pulse. In some cases, convulsions are the immediate precursors of death. But in poisoning by belladonna narcotism is the exception, not the rule.

Effects on the Muscular System. The vertigo produced by belladonna is accompanied with a remarkable disorder of the muscular system; the gait is unsteady and staggering, there is a sense of numbness in the limbs, with trembling, and jerking movements; the patient unconsciously runs against objects that are in his way, and on attempting to use his hands, finds that it is impossible to control their motions, or to seize small articles, and he is apt to catch at imaginary objects. The involuntary muscles are not less affected. The pupil is largely and immovably dilated, the eye is prominent and extremely brilliant; the voice is sometimes lost, or the sounds uttered are inarticulate; deglutition is difficult or impossible; there is often a singular difficulty in voiding the urine, which appears to be owing to a partial paralysis of the bladder, or, as Barbier explains it, to a spasmodic contraction of the *sphincter vesicæ*. There is sometimes complete paralysis of the *levator palpebræ superioris*, which has been known to continue for months. The dilatation of the pupil produced by belladonna and atropia are differently explained by experimenters; Dr. Harley ascribes it to a paralyzing power acting upon the ciliary branches of the third pair of nerves,[2] while Dr. Benjamin Bell concludes that it depends upon a contraction of the radiating fibres of the iris.[3] Mr. Wharton Jones also dissents from Dr. Harley's views,[4] and Dr. A. Fleming supposes that the medicine causes a contraction of the ciliary arteries, and prevents the turgescence of the iris with blood, while the radiating fibres "are drawn into action by functional sympathy with the contracted arteries."[5]

Effects upon the Circulation and the Secretions. Belladonna in large doses sensibly affects the heart and bloodvessels. The pulse is generally irregular, frequent, and during the active stages of its operation bounding and full, but as the symptoms decline it falls below the natural standard in strength and frequency, while in fatal cases, on the

[1] Lond. Med. Gaz., June, 1848.

[2] Edinb. Journ., Dec. 1856, Feb. 1857; Times and Gaz., Jan. 1857.

[3] Edinb. Journ., July and Dec. 1856, and March, 1857; Times and Gaz., Jan. 1857, p. 107.

Times and Gaz., Jan. 1857, p. 79. [5] Times and Gaz., March, 1857, p. 270, 345.

other hand, it grows rapid, intermittent, and thready. Dr. Gray[1] thus describes the effects of an overdose of the medicine upon himself, and confirms in nearly every particular the descriptions of the best authorities. The eye was dry, "the conjunctival vessels fully injected. There was a total absence of lachrymation, and motion was attended with a sense of dryness and stiffness. The face was red and turgid, and the temperature and color of the surface considerably augmented." In another case, recorded by this gentleman, "the face, upper extremities, and trunk of the body, exhibited a diffuse scarlet efflorescence studded with innumerable papillæ very closely resembling the rash of scarlatina." In himself "the pulse was full, and about 120 to 130. The feeling in the head was that of violent congestion, a full, tense, throbbing state of the cerebral vessels, identically the same sensation as would be produced by a ligature thrown about the neck, and impeding the return of the venous circulation. . . . . The tongue, mouth, and fauces, were as devoid of moisture as if they had been composed of burnt shoe leather. The secretions of the glands of the mouth, and the saliva, were entirely suspended. A draught of water, instead of giving relief, seemed only to increase the unctuous, clammy state of the mucous membrane. About the pharynx this sensation was most distressing. It induced a constant attempt at deglutition, and finally excited suffocation, and spasms of the fauces and glottis, renewed at every effort to swallow. A little saliva, white, and round like a ball of cotton was now and then spat up. . . . . The power of belladonna over the secretion of urine seems very great. I am confident I passed in the course of an hour three pints of urine, accompanied with a slight strangury at the neck of the bladder." Irritation of the scrotum has been alleged to occur as an effect of the internal administration of belladonna. Böcker mentions a case in which a quarter of a grain of the extract, taken twice a day by a consumptive patient, produced, after the second dose, erythema and partial gangrene of the skin of the scrotum.[2]

The close resemblance which the symptoms of poisoning by belladonna bear to those produced by hyoscyamus, dispenses with the necessity of analyzing the former, or of comparing them with the very different phenomena of narcotism from opium. They may all be produced as readily by the introduction of the active principle through the rectum, or the abraded cutis, as the stomach. The action upon the iris is manifested alone when a solution of the extract, or of atropia, is placed upon the conjunctiva, or rubbed upon the sound skin

[1] N. Y. Journ. of Med., vol. v. p. 184.

[2] Beiträge zur Heilkunde, ii. 305.

around the eye; but in this case the effect takes place in that organ only upon or near which the application has been made, or, if the other is affected, it is so to a less degree and for a shorter time. In this case, as in many others, we have evidence of a medicinal action which may be almost entirely local, and is to be explained by the fact that the substance employed expends its force on the nervous and other tissues bounding the vascular capillary network which is placed between the arterial and the venous trunks. The effects of these local applications upon the sight are curious. A Scottish physician, Dr. Grieves, states that he has completely dispelled the phantasms of delirium tremens by merely rubbing the extract of belladonna upon the eyelids.[1] Donders has described under the name of *micropia* a condition of the eye, produced by the same cause, in which all objects appear to be smaller than natural, and similar cases have been reported by Warlomont, Cornaz, Sichel, and others.[2] Both pupils are dilated when a proper dose of the substance is taken internally, and this, with dryness of the fauces, slight headache, and impairment of the vision, may be its only sensible effects.

The singular energy of the active principle of belladonna, *atropia*, is shown by the following examples. Brandes tasted a minute quantity of sulphate of atropia which he found more saline than bitter. He was seized with uneasiness in the head, trembling of the limbs, alternate chills and flushes of heat, and a violent and suffocative constriction of the chest. The pulse grew feeble, and the action of the heart almost imperceptible. The principal symptoms went off in the course of half an hour.[3] Fifteen milligrammes, or about one-sixth of a grain, of atropia applied to a freshly-blistered surface, excite an acute pain, followed, in from fifteen to thirty minutes, by dryness of the mouth and fauces, inability to swallow, dilatation of the pupils, winking of the eyes, and heaviness of the head. To these symptoms succeed giddiness, confusion of sight and ideas, and a peculiar inability to steady the mind or to utter words corresponding with the thoughts; a sort of imbecile or loquacious delirium follows, the field of vision is filled with colored phantasms, and external objects appear yellow. The power of locomotion is sometimes lost, and the limbs feel as if asleep. General sensibility is impaired or destroyed, the respiration and circulation become slow, and the extremities are cold. Meanwhile consciousness may be perfect although the inability to move is complete.[4] The greater number of these symptoms have ensued upon the application to the eye

[1] Month. Journ. of Med. Sci., Nov. 1853, p. 430.

[2] Bull. de Thérap., liv. 427. [3] Trousseau and Pidoux, art. Belladone.

[4] Bouchardat, loc. cit. Grandi, Times and Gaz., Jan. 1855, p. 15.

of a few drops of a solution containing two grains of atropia to the drachm of liquid.[1] An example of this effect occurred in England.[2] The local action of belladonna when applied to the denuded cutis is that of a simple irritant. It excites severe burning, and smarting pain, and delays the healing of the skin.

The mode in which this medicine produces its effects is altogether unknown. Post-mortem inspection in some of the comparatively few cases of death resulting from its use, has revealed nothing which tends to throw light upon this subject. They have usually been cases of children poisoned by eating belladonna berries. Mr. Taylor reports the case of a man who was found dead in bed after taking two grains of atropia. His limbs were rigid and contracted, and a little brown matter issued from his mouth. Congestion of the cerebral bloodvessels, fluidity of the blood itself, some reddish patches upon the mucous membrane of the pharynx and stomach, these are the only lesions which have been discovered after death, and are evidently inadequate to explain the symptoms produced by belladonna. Böcker, indeed, describes its operation as chiefly a moulting, or increased wear, of the blood-corpuscles and of the nervous centres; but of these processes we possess very indistinct ideas.

ANTIDOTES.—The same evacuants and stimulants as prescribed for poisoning by opium. The latter class of means is but rarely required. The remains of excitement, in the decline of the attack, may be combated by opium.

REMEDIAL EMPLOYMENT. *Tumors.*—It was before stated that the reputation of belladonna was originally due to its supposed resolvent powers in cancerous diseases. But for nearly a century physicians have ceased to attribute to it any such virtues, and it is now agreed that imperfect skill in diagnosis must have led to the erroneous belief referred to. Still there can be no doubt that tumors of some kind did get well apparently under the use of belladonna, nor will the mere anodyne properties of this medicine fully account for its imputed success. From a limited observation we are disposed to believe that in addition to this quality, of itself favorable to resolution, both belladonna and stramonium possess a real efficacy in discussing glands enlarged by chronic inflammation. Evers, Autenrieth, Dalruc,[3] and Chevalier,[4] have given very decided testimony in favor of its resolvent powers in engorgements of the breasts, and in scrofulous tumors and swellings of the joints; they employed it both internally and

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[1] BETHUNE, Boston Med. and Surg. Journ., April, 1857, p. 201.

[2] Assoc. Med. Journ., Sept. 1853, p. 818.

[3] EBERLE, Therapeutics, p. 364.

[4] Lond. Med. and Phys. Journ., 1826.

externally. We know of no well-attested instances of its causing the removal of genuine tumors, even of the benign species. It is possible that the curative effects formerly attributed to belladonna in open cancer may be accounted for by its drying influence or astringency, which has been recently dwelt upon by Mr. Ley.[1] He says: "Various vesicular eruptions on the skin are removed by it, and when the contents of the vesicle have become semi-purulent, the true skin ulcerated, the ulcer being deep and devoid of healthy granulations, the edges being under the influence of the creeping vesicle, a single grain of the extract of belladonna will annihilate the eruption, and the ulcer will immediately assume a healthy appearance."

Neuralgia.—Belladonna as an internal remedy for neuralgia appears to have been first employed by Dr. Bailey,[2] who reports sixteen cases observed by himself in which the trigeminus nerve was severely affected, and which were either greatly relieved or permanently cured by the extract of belladonna given in doses of one grain every sixth hour, or oftener when the pain was intense. M. Trousseau, after remarking that it has frequently been employed successfully in the treatment of neuralgia, states that his mode of administering the extract for this affection is to direct one-fifth of a grain to be taken every hour, until vertigo is produced. The frequency of the doses is then to be diminished, but their impression ought to be maintained for several days, or until no trace of the attack remains. The success achieved by Dr. Bailey does not appear to have created many imitators of his practice either in England or in this country, although it has long been in vogue upon the continent of Europe. Indeed, so lately as 1843, Dr. Hutchinson, of Nottingham, speaks of the method as a new one in his own country, and adduces seven cases of well-marked facial neuralgia in which it alone effected a cure.[3] Dr. Hutchinson prescribed the extract of belladonna three times a day, beginning with one quarter of a grain and gradually increasing the dose to one grain, or until the iris betrayed the specific influence of the medicine. Other forms of neuralgia do not appear to be nearly as much as the facial variety under the control of belladonna internally administered; while all forms of the disorder have been found to yield to the application of this remedy upon the unbroken skin, when the affected nerve is superficial, and to its contact with the derm, when the nervous trunk is deep seated. For this reason, and also, doubtless,

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[1] Lancet, 1844, vol. i. p. 542.

[2] Observations relative to the Use of Belladonna in Painful Disorders of the Head and Face, London, 1818.

[3] Lancet, 1842–43, vol. ii. p. 830.

for the purpose of avoiding the unpleasant constitutional effects of the medicine, the endermic method of treating neuralgia with belladonna has been preferred.

Frictions with a solution of belladonna (ʒj of the extract to ℥j of water) were first used successfully in *sciatica* by Dr. Todd,[1] and more recently Hiriart,[2] Hutchinson,[3] and others have employed different preparations. When, according to M. Hiriart, the affected limb is rubbed in its whole length, and several times a day, with an ointment composed of one part of extract of belladonna to two of lard, a pricking sensation is experienced, and slight symptoms of cerebral disorder, which are speedily followed by an abatement of the pain. Dr. Hutchinson, and most others, denude the cutis by means of a long narrow blister over the course of the sciatic, or the anterior crural nerve, as the case may be, and dress it with an ointment composed of one-eighth, or less, of the extract to one part of lard. In the cases of success reported by the gentleman just named, the part of the blister in the cure is not sufficiently considered, as will be seen on referring to the art. CANTHARIS. So far as relates to the local influence of the anodyne, it may probably be obtained without vesicating a large portion of the limb. Small blisters applied over the superficial trunks and terminal branches of the painful nerve, and dressed with a strong ointment, would, there is reason to believe, be found amply sufficient to attain the object in view. In obstinate cases of sciatica which have resisted the plan already indicated, an expedient remains which has been found successful by Trousseau and others. This consists in establishing an issue between the tuberosity of the ischium and the great trochanter of the thigh-bone, and dressing the sore with the extract of belladonna. The writer just named does not hesitate to make the issue by means of an incision carried down to the subcutaneous adipose layer, and he promotes suppuration by means of a ball composed of extract of belladonna and opium. The quantity of the extract applied upon a blistered surface ought not to exceed six grains. In order to alleviate the pungent smarting of the application, the surface of the plaster should be covered with a piece of fine cambric muslin.[4] Since the introduction of atropia, this alkaloid has been used by inoculation in various affections of a painful character, and especially for the relief of neuralgia.

Belladonna is often employed as a topical anodyne application in other than neuralgic pains. Reference has already been made to its

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[1] Arch. Gén. de Méd., 1ère série, vol. viii. p. 272.

[2] Bull. de Thérap., vol. xxii. p. 52.

[3] Lancet, 1843–44, vol. i. p. 53.

[4] MM. TROUSSEAU and PIDOUX, art. cit.

usefulness in discussing tumors by diminishing their sensibility, and that of the adjacent parts. It has been used successfully to facilitate the introduction of *bougies* into the urethra when this canal is strictured and irritable, by covering them with the ointment or extract. In *fissures*, and other painful affections about the *anus*, an ointment of belladonna either alone, or associated with galls or lead cerate, is of signal advantage. *Toothache*, *earache*, *rheumatism of the muscles or joints*, in fact every local painful affection, may be palliated by the due application of this anodyne. The extract may be mixed with oil, alcohol, or water for the purposes of friction, or may be more permanently applied in cataplasms or plasters. These external uses of the remedy are not always without danger. Dr. J. C. Williams relates that he has known impaired vision and partial hemiplegia to result from rubbing a solution of the extract upon the forehead of a lady;[1] a case in which a lady of this city had the pupils dilated and the sight impaired, by a similar application, has come to the knowledge of the author; and Mr. Wade reports a case of poisoning by a belladonna plaster not more than two inches square applied over an eruption of psoriasis on the front of the wrist.[2] These instances and other analogous ones mentioned in the present article, prove that an extraordinary susceptibility, which the practitioner should be aware of, exists in certain cases to the action of belladonna. The danger to life may not, indeed, be very great; but it is always desirable to avoid the alarm and distress which accidents of the sort occasion.

Another occasion for the local application of belladonna is presented by that painful and troublesome affection known as *irritable uterus*, and which is in fact a neuralgic condition of the organ. It may be successfully combated by using a vaginal injection of the extract dissolved in water, three or four times a day; or, according to M. Trousseau, when accompanied with ulceration of the os uteri and with leucorrhea, by means of one or two grains of the extract along with six or eight of powdered tannin, rolled in cotton wadding, and placed in contact with the affected part. The wad of cotton should be secured by means of a thread, accessible from without, and be freshly applied every night, after cleansing the passage with a detergent injection.[3]

Spasmodic Diseases. Belladonna has been lauded as a valuable antispasmodic for several affections in which the state of spasm, if it exist at all, is subordinate entirely to the element, pain. These cases may be disposed of first.

Spasm of the sphincter ani muscle, when the adjacent parts are

[1] Lancet, 1844, vol i. p. 251. [2] Journ. des Prog., vol. iii. p. 235. [3] Op. cit.

ulcerated or irritated, is well known to be excruciatingly painful. As already mentioned, belladonna relieves the pain of this disorder, and by so doing prevents or moderates the spasm which results from it. Dupuytren first employed this remedy in an ointment combined with acetate of lead, and presumed that its efficacy depended upon its direct power of preventing constriction of the sphincter.[1] But the dependence of this latter symptom itself upon the morbid sensibility of the bowel is now proved by the power of simple astringents to cure fissures of the anus.

Spasm of the urethra is also stated to have been overcome, so as to permit the escape of calculi from the bladder, by means of frictions with extract of belladonna, upon the perineum.[2] Here it is evident that the remedy must have been operative mainly through its power of diminishing the irritability of the passage, which, when excited by the presence of the calculus, induced a spasmodic tension of the urethral muscles.

If any further proof were necessary of the correctness of this view, it might be discerned in the efficacy of belladonna as a remedy for nocturnal *incontinence of urine*. Morand,[3] Trousseau, Blache, Bretonneau, Brooke,[4] Hutchinson,[5] A. Hewson, and Condie,[6] have found it very efficient in curing this disgusting infirmity, which it certainly cannot do by virtue of any *relaxing* power it may possess. It blunts the sensibility and allays the spasm of the neck of the bladder, and thus prevents the call of nature until a due amount of urine has accumulated.[7] A case of whooping-cough is recorded in which the medicine caused a cessation of erections of the penis during the whole period of the treatment.[8] As a frequent cause of these occurrences is irritation of the neck of the bladder, we may presume that by calming this irritation the remedy prevented its effects. In like manner Lepri, and after him Trousseau, have successfully treated *spermatorrhœa*, employing the remedy both locally and internally.[9]

A similar explanation ought probably to be given of the relief obtained from belladonna in certain cases of *dysmenorrhœa*. Dr. Gold-

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[1] Bull. Gén. de Thér., vol. i. p. 187. PEIRANO, Month. Journ. of Med. Sci., March, 1852, p. 276.

[2] MOJON, of Genoa, and ABERLE, Annales de Thér., vol. iii. p. 40.

[3] Journal de Médecine, 1845, p. 345.

[4] Times and Gaz., Feb. 1858, p. 114.

[5] Am. Journ. of Med. Sci., Oct. 1858, p. 387 and p. 392.

[6] RANKING'S Abs. (Am. ed.), xxv. 196.

[7] Am. Journ. of Med. Sci., vol. xxxiii., N. S., p. 186.

[8] N. Orleans Med. and Surg. Journ., 1858.

[9] Bull. de. Thérap., xlvi. 235; xlviii. 189.

ing Bird[1] found the remedy very efficacious when there was no organic disease of the uterus, but shreds were discharged at the menstrual period, and severe pain was experienced at the same time in the hypogastric region. When the patient is anemic or leucophlegmatic, one-fourth of a grain of extract of belladonna with one grain of sulphate of zinc may be given every two or three hours until the pain ceases. For plethoric patients ipecacuanha is more suitable than the sulphate of zinc. Between the catamenial epochs, purgatives should be administered, and other means taken to improve the general health. Bretonneau employed belladonna topically under similar circumstances. In estimating the value of this treatment, the fact must not be lost sight of that in dysmenorrhœa with fibrinous clots, the pain often ceases abruptly when at its worst, upon the discharge of the distending coagulum from the womb.

Cases are reported by various authors[2] to prove the antispasmodic virtues of belladonna in *phimosis* and *paraphimosis*, although, as must be evident upon the least reflection, the stricture in these affections is a mechanical result of inflammation, and in no wise of spasm, since there are no tissues concerned which are susceptible of spasmodic action. On examining the cases on record, it appears certain that the local pain is a chief cause of that afflux of blood which maintains the morbid state of the penis, and that the alleviation of this symptom permits the parts to return to their natural condition, under proper manipulation.

Trousseau declares belladonna to be the remedy *par excellence* for habitual *constipation*. It does not purge nor produce loose stools, but only renders defecation easier, and sometimes in the dose of a quarter of a grain the extract will produce several stools. As soon as the bowels become regular the dose of the medicine should be gradually diminished.[3] Cases illustrative of the efficacy of this treatment are reported by Fiessenger, who, however, made use of suppositories containing the extract of belladonna,[4] by Blache,[5] and by Fleury.[6]

The alleged efficacy of belladonna in procuring the reduction of *strangulated hernia* rests upon very slender evidence; admitting it, however, to be proven, the inference is not that it acts by overcoming spasm, since the cause of the strangulation is swelling of the protruded

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[1] Lancet, 1844, vol. i. p. 27.

[2] Amongst others, by Mazade, Bull. Gén. de Thér., vol. vii. p. 67; Mignot, ibid., vol. xx. p. 260; Chabrely, ibid., vol. xxiii. 319.

[3] Abeille Méd., xi. 112.

[4] Charleston Med. Journ., xi. 266.

[5] Annuaire de Thérap., 1849, p. 43.

[6] Archives Gén. de Méd., Mars, 1838.

part. We may more plausibly conjecture that the sedation of pain by the anodyne allays the congestion of the bowel, and so renders its reduction practicable. In the cases of reported success to which reference is made below, belladonna was administered by the rectum, or applied over the hernial tumor.[1] In truly spasmodic affections, or those in which there is abnormal, and, for the most part, paroxysmal muscular contraction, belladonna has been extensively and beneficially employed. In *rigidity of the os uteri* during labor, this remedy was first recommended by Chaussier, as a local application. He, as well as several other writers,[2] have testified to its virtues in overcoming this annoying incident of parturition; but both depletion and nauseants afford a so much readier resource, that they will probably continue to be preferred to a means which it is neither easy nor agreeable to apply.

Whooping-Cough.—Although previously employed in the treatment of this disease, belladonna was first systematically used to cure whooping-cough, by Schaeffer and Wetzler, in 1810;[3] the latter treated thirty children, all of whom were cured, between the eighth and fifteenth day after beginning to take the medicine. He found the most favorable period of the disease for commencing the treatment was between the sixteenth and twentieth days, and the proper dose to be a quarter of a grain of the root, morning and evening, for a child under one year of age. These results were confirmed by many writers, and particularly by Meglin, and by Kahleiss, in 1827.[4] Several years later, Dr. Samuel Jackson, then of Northumberland, Pa.,[5] prescribed the remedy in numerous cases of whooping-cough, and with complete success, directing fractional parts of a grain of the extract at intervals of three hours, until dilatation of the pupil took place, when the medicine was omitted altogether, or given in smaller doses. This treatment was preceded by antiphlogistic measures. Constant, in presenting a summary of his observations at the Children's Hospital, in Paris, in regard to the treatment of whooping-cough, gives the preference to belladonna over all other means; and his report shows substantial ground for this preference, inasmuch as the progress and decline of the disease corresponded with the suspension and resumption of the remedy.[6] Dr. Thomson, of London, bears a similar testimony upon this subject. M. Fuster, professor in the University of Montpellier,

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[1] De Larne, Br. and For. Med.-Chir. Rev., July, 1857, p. 238; Burgatti, Bull. de Thér., liii. 191; Thibeaud, ibid., p. 380; Hermier, Abeille Méd., xiv. 251, 311.

[2] Soma, Bull. de Thérap., xlvi. 547.

[3] Dict. des Sci. Med., vol. iii. p. 74.

[4] Am. Journ. of Med. Sci., vol. vi. p. 238.

[5] Ibid., vol. xiv. p. 364.

[6] Bull. de Thér., vol. vi. p. 230.

employed the vapors of an infusion of belladonna leaves by inhalation, and with uniform success.[1]

Dr. Corson, of Norristown, Pa., says: "During the last seventeen years, I have given the extract of belladonna to hundreds of patients, from two months to fifty years of age, and am firmly convinced that it has a greater control over whooping-cough than any other remedy in common use."[2] Many observers have found it almost inefficacious at the commencement of an epidemic, but very successful during its decline. So Ingmann states, that under such circumstances, it far surpasses all other medicines.[3] MM. Rilliet and Barthez do not appear to have made use of it, but they call attention to the fact that Wendt and Goelis have both seen mischievous consequences result from its use.[4] No other writers allude to such effects, except as following an injudicious exhibition of the medicine, or the omission to suspend it when dilatation of the pupil comes on; even these disquieting symptoms are stated to have been temporary.

The mode of administration advised by Bretonneau, is as follows: A child of five years should take immediately before breakfast, for two days, a pill containing one-twelfth of a grain of the extract; if no effect is observed by the third day, the dose should be raised to one-eighth of a grain. On the fifth day the same dose, and on the eighth day, if no effects are produced, one-third of a grain may be given, and continued for three days, or gradually increased until the pupils are affected, or the cough declines; at that point the dose should, for a time, remain the same.[5]

M. Trousseau mentions insomnia as apt to be produced by belladonna in this disease, whence he usually prescribes opium in combination with it. We have had under treatment, cases of whooping-cough which were distinctly palliated when the extract of belladonna was taken, and aggravated when it is withheld. On the whole, it would appear that belladonna is positively curative in whooping-cough which has passed the inflammatory stage, but that in certain epidemics, it has signally failed, in the hands even of those who have before prescribed it with success. The practitioner should be careful to watch its effects, lest they become alarming to the patient's family, or inflict even temporary mischief.

Belladonna applied to a blistered surface, appears to have been promptly and completely efficient in some cases of *laryngitis* which

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[1] Bull. de Thér., vol. vii. p. 139. [2] Am. Journ. of Med. Sci., Oct. 1852, p. 357.
[3] Journ. f. Pharmacodynamik, 1 Bd., 3 H., p. 312.
[4] Mal. des Enfans, vol. ii. p. 337. [5] Bull. de Thérap., 1856, p. 28.

displayed more or less of a spasmodic element;[1] and as an internal remedy for *nervous coughs*, especially for those which, independently of any local disease of the respiratory apparatus, disturb the rest at night by their persistence and violence.

Tetanus.—Several cases of traumatic tetanus are reported by Dr. Hutchinson,[2] as having been cured by extract of belladonna. Only one of these presents the requisite proofs of the efficacy of the remedy employed. In it, Dr. Hutchinson informs us, the specific action of the medicine upon the pupils was attended with an abatement of the spasms, but the improvement did not advance, until the dose was increased from half a grain or a grain of the extract every three hours, to four grains every two hours. It was then gradually diminished. The treatment lasted about one month. Vial relates three cases of cure by this medicine,[3] and others are reported by Ernst.[4] In the idiopathic form of tetanus, also, belladonna is alleged to have brought about a cure.

Epilepsy.—The attention of practitioners was called by M. Débreyne, in 1842, to the remarkable results of his treatment of epilepsy by belladonna, which, upon the experience of two hundred cases, he regards as the most efficient remedy hitherto proposed for this terrible disease.[5] Even where a cure did not ensue, the violence and frequency of the attacks were singularly diminished. It would seem that recent cases are chiefly, if not exclusively, those which it favorably affects; for after an extensive and faithful trial of the medicine upon numerous chronic cases in the Bicêtre, M. Delasiauve found that in one instance alone, did even a probable cure take place.[6] Nor has any other writer done much more to confirm the statements of M. Débreyne, and of the several German authors who have claimed an equally remarkable degree of success. To those who desire to test this method, it may be interesting to know the best mode of prescribing the drug. A drachm of pure extract of belladonna is mixed with some inert powder, and divided into one hundred and twenty pills, of which one is taken the first day, two the second, and so on until six are taken in the twenty-four hours. If the sight remains unaffected, the dose may be daily augmented by two pills, until ten or twelve are taken in the twenty-four hours. This quantity should continue to be given for two or three months, and after being suspended for a week, the medicine is to be resumed in a somewhat smaller dose, and again increased

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[1] Shelton, Am. Journ. of Med. Sci., April, 1858, p. 340.
Lancet, 1844, vol. i. p. 274.
Ibid., li. 431; lii. 554.
Ann. de Méd. Psychol., vol. x. p. 47.

[3] Bull. de Thérap., March, 1843.

[5] Bull. de Thérap., vol. xx. p. 272.

gradually. According to M. Trousseau, "this course should be persisted in for three or four years;" and he remarks appropriately enough, that "patient and physician must rival one another in perseverance." M. Trousseau is reported to have treated a hundred and fifty epileptic patients according to a similar system, and of this number, to have cured twenty.[1] Michéa states that with the valerianate of atropia he effected three cures.[2] It may be inferred from the preceding statements, that belladonna deserves to be tried in cases of epilepsy dependent upon disordered functions merely, but its relative value in the treatment of this disease is not yet ascertained.

Nervous Vomiting in Pregnancy.—This distressing disorder is very generally regarded as altogether intractable, but of late years, several of the anæsthetic class of narcotics have been found successful in relieving it. In 1842, M. Bretonneau proposed the treatment with belladonna in the form of an ointment, or of a paste made by mixing the extract with extract of rhatany and water. This he directed to be rubbed upon the epigastrium two or three times a day, for five or ten minutes. It is remarkable that the internal administration of belladonna had no effect upon the vomiting, while frictions with the same medicine uniformly arrested it.[3]

Spasmodic Asthma.—In that form of asthma which, whether connected or not with pulmonary emphysema, the dyspnœa is paroxysmal, and there is little or no bronchial secretion, belladonna has been found extremely serviceable. Lenhossek regarded it as a specific in this affection, and Magistel employed the vapors of a watery infusion successfully, by inhalation.[4] Mingled with tobacco and smoked, its action is even more prompt and decided.

Diseases of the Eyes.—The dilatation of the pupil observed in poisoning by belladonna would naturally suggest the employment of this agent for facilitating several operations upon the eye, and for remedying some of its diseases. An accidental notice of the phenomenon alluded to, in a lady who had washed her eyes with an infusion of belladonna, was, however, the starting point of the experiments performed by Himly, in 1801, and which led to his employment of this valuable adjuvant in ophthalmic surgery.[5] There is, perhaps, no other single remedy capable of rendering such important services in this department of the healing art. In the first place, it is used for the purpose of obtaining a distincter view of the parts posterior to the

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[1] Bull. de Thérap., t. 375. [2] Ibid., p. 193.

[3] Ibid., vol. xxxi. p. 130.

[4] Szerlecki, Dict. de Thérapeutique, tom. ii. p. 204.

[5] Bayle, Bib. de Thér.

iris, than is possible when the organ is examined under a diminished light alone. By its means, therefore, the quality of a cataract may be determined, and whether or not adhesions exist between the uvea and the capsule of the lens: the movements of the couching needle can also be kept in view during operations for cataract. Under its influence, moreover, morbid adhesions of the iris may be broken up, and abnormal positions of this organ corrected.

To prepare a cataractous eye, the extract of belladonna, moistened to the consistence of cream, should be smeared upon the brow and eyelids over night, and washed off with a little tepid water a few minutes previous to the examination or operation. When either depression or division of the cataract is proposed, this preparation ought never to be omitted; there is some doubt of its propriety when the lens is to be extracted, because in that case the vitreous humor may escape. On the other hand, dilatation of the pupil renders the extraction of the cataract less difficult, and diminishes the danger of wounding the iris, and consequently the effects of iritic inflammation. Besides, as Himly long ago remarked, the susceptibility of the patient's pupil to the action of belladonna may be carefully ascertained beforehand, and no more of the medicine employed than is requisite to produce a moderate degree of dilatation.

An equally important and more frequent occasion for using belladonna is in *iritis*, in order to prevent unnatural adhesions of the iris. According to Mackenzie, and indeed all the best authorities, it ought to be employed in every case, and in all stages of the disease.[1] It may be applied in the manner above mentioned, or a filtered aqueous solution of the extract dropped into the eye; and this should be done especially in the evening, since the disease advances most rapidly at night. Even when the effused fibrin is not absorbed during the continuance of the dilatation, the iris is at least prevented from contracting adhesions, and, by retaining its natural movements, one obstacle more to the success of subsequent treatment is removed. The earlier in the attack this remedy is administered, the surer will be its success; yet, even after the plastic exudation has acquired considerable tenacity, the steady and prolonged use of belladonna has been known to overcome its hold.

In *hernia of the iris* through an ulcer of the cornea the same means may be successfully invoked. Opacity of the cornea, when circumscribed opposite the pupil, and central cataract in like manner, may be prevented from altogether obstructing the entrance of light into

[1] A Practical Treatise on the Diseases of the Eye, 2d ed.

the globe, while the pupil is kept moderately dilated by belladonna. Knavery has made use of this fact to impose upon persons affected with cataract, and almost totally blind. A few drops of a solution of belladonna, instilled into the eye, has restored momentary vision to the unhappy dupes, as if by a miracle, at the same time blinding them effectually to the trick which was played upon them.

The various effects which have been enumerated are very rapidly and decidedly produced by *atropia*. One grain of this substance, dissolved in a drachm of water, furnishes a solution of which a single drop, placed upon the conjunctiva, will, in from five to fifteen minutes, dilate the pupil of the healthy eye to double or more than double its ordinary medium size, and retain it so during four or five days.[1] Mr. Wilde uses solutions of double or triple the strength mentioned when it is desirable to procure the complete and permanent dilatation of the pupil, but resorts to the simple extract of belladonna when a more moderate and temporary effect is sought, as in examining the eye for cataract. The use of atropia is in some degree objectionable on account of the danger of producing symptoms of poisoning if the solution of it applied to the eye is conveyed through the lachrymal duct to the fauces. The sulphate does not irritate the organ as much as the pure alkaloid, and hence should be preferred whenever inflammation is already present, or whenever the medicine is used to reduce this condition. According to Von Graefe, its utility in such cases arises from its relaxing influence, which prevents the internal structures from being distended with an accumulation of blood.[2]

Intolerance of light which follows operations upon the eye, or accompanies neuralgia of this organ, is much less certainly relieved by the local application of belladonna, or even by the stronger solutions of atropia employed by Mr. Wilde. Internally administered, however, the medicine promptly alleviates photophobia. Yet the necessity for the latter mode of exhibition is not altogether absolute; for in perhaps the first instances in which belladonna was employed to relieve excessive sensibility to light, the extract was applied around the orbit. The cases alluded to, six in number, were of acute and chronic conjunctivitis, and were treated by Lisfranc in 1826.[3]

To Arrest the Mammary Secretion.—Belladonna was long ago used as a resolvent for tumors of the mamma by Alberti, Zimmermann, Autenrieth, and others, and Evers recommended it in cases of milk abscess and induration.[4] In 1829 Ranque used a liniment of laurel-

[1] Mr. Wilde, Dublin Quart. Journ. of Med. Sci., Nov. 1846.

[2] Mosler, Archiv des Vereins für gemeinschäftliche Arbeiten, iii. 19.

[3] Revue Médicale, 1826, i. 17; ii. 384.

[4] Richter, Ausfür. Arzneim., ii. 577.

water, ether, and belladonna, with great success, in drying up the milk;[1] and Schnur published several examples of its utility in similar cases.[2] It was not, however, mentioned by subsequent writers on the diseases of females, nor by others, until, in 1856, Mr. Goolden reported his successful use of it in arresting the secretion of milk.[3] His statement was speedily confirmed by Dr. Willey, of St. Paul, Min.,[4] Mr. Burrows, of Liverpool,[5] Drs. Harris, of Ottawa,[6] Bacon,[7] and Blythman,[8] Mr. Newman,[9] and others. The last-named gentleman reports success in more than a dozen cases, in which no purgative nor other auxiliary treatment was employed. Some assert that it promotes the flow of milk, while it relieves tension and pain;[10] but others explain this occurrence as the first step towards cure, the milk being ultimately dried up.[11] Dr. Spring has suggested that in many of the reported cases the subsidence of the inflammation was spontaneous, because he found the remedy quite ineffectual in true "galactorrhœa."[12] The general coincidence of results obtained by the treatment in question, and the rapidity with which they are said to have been brought about, appear to render this objection inadmissible.

As a Prophylactic against Scarlatina.—When Hahnemann, about the year 1800, was engaged in observing the effects of medicinal agents, he noticed that belladonna produced a papular cutaneous eruption and dryness of the throat. These symptoms he imagined to be a sort of artificial scarlatina, and, at once pressing the fact into the service of his new theory, decided that belladonna was the natural specific for curing, as well as preventing, scarlet-fever. Thus early, too, he betrayed his unfitness for a liberal profession by vending the medicine as a secret remedy.[13] This alleged power of belladonna has done more, perhaps, than anything else to sustain the impudent heresy of homœopathy, and for that reason practitioners have refrained from testing its truth. To do so is, however, both impolitic and unjust; for the allegation is not in itself repugnant to belief, and, if really true, is too important to be slighted.

In estimating the power of any agent to prevent a given event, it

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[1] Journ. des Progrès, xiv. 254.
[2] Hecker's Preuss. medic. Zeit., Aug. 1834, p. 143.
[3] Lancet, Aug. 1856, p. 176.
[4] N. A. Med. and Surg. Journ., i. 462.
[5] Ranking's Abstract (Am. ed.), xxv. 176.
[6] Bost. Journ., Aug. 1858, p. 23.
[7] Ibid., Sept. 1858, p. 114.
[8] Ranking's Abstract (Am. ed.), xxvii. 179.
[9] Braithwaite's Retrospect (Am. ed.), xxxviii. 220.
[10] Berry, Lancet, June, 1857, p. 592.
[11] Kingsford, Lancet, Sept. 1858, p. 266.
[12] Bost. Med. and Surg. Journ., Aug. 1858, p. 80.
[13] Jos. Frank, Pathol. Méd. (Paris, 1838), ii. 128.

is necessary first to know the probabilities of that event taking place independently of all interference. We know that nearly all unprotected persons exposed to smallpox will contract the disease; hence the protective power of vaccination may be inferred with an approach to accuracy. In the case of scarlatina, on the other hand, the degree of contagiousness is not ascertained, for we constantly see families in which one or two persons only, out of perhaps eight or ten, are attacked. In any given instance, therefore, if belladonna were administered to all the members of a family of which one already had the disease, it would be impossible to say, if the disease did not extend, whether its arrest were owing to the exhibition of the medicine or not. But, it is no less certain, if this substance were given to many families, or portions of families, during an epidemic of scarlatina, and, as a general rule, those who had taken it escaped the contagion, while a large proportion of those who had not taken it were attacked, it is certain, we say, that the protective power of belladonna against scarlatina would be unequivocally proven, although the exact degree of that power might not be determined. And such, in reality, we believe to be a fair induction of all the facts which have been recorded concerning this question.

Up to 1830 nearly all the published evidence had been collected by Bayle,[1] who states the following results: Leaving out of the account those authors who have omitted to mention the number of their patients, it appears that, in the midst of scarlatinous epidemics of greater or less severity, 2,027 children and adults made use of the belladonna, of whom 1,948 escaped the disease, and 79 contracted it. These experiments were, in general, performed by competent persons, and the accuracy of their results cannot fairly be questioned. It may, however, be objected that the results are, after all, of a negative value, although derived from an extensive observation, and that Lehmann and one or two others, after trying belladonna faithfully in epidemics of scarlet fever, concluded unfavorably to its protective power. The paucity of the cases of some objectors, and the meagreness of the details furnished by others, deprive their opposition of real weight; and, moreover, the circumstances under which some of the experiments above alluded to were performed render it obligatory to accept their results as true, or to believe, what is more improbable, their untruth. Thus, Dusterberg, at the commencement of an epidemic of scarlatina at Warburg, in 1820, administered belladonna to all the children under his care, but, for the purpose of determining how far the influ-

[1] Bib. de Thér., ii. 503.

ence of the medicine was real, he withheld it from one child in each family. Every one of the latter was attacked, while but few of the former, and who had taken the belladonna during four or five days only, experienced the disease.[1] This instance appears to be conclusive, for its authenticity does not appear to be denied.

Of later experimenters upon the subject under consideration, there are two whose observations were made upon an extensive scale. In the winter of 1840–41, M. Stievenart tested the question in several of the villages around Valenciennes, where scarlatina had already broken out. In one of the villages two hundred out of two hundred and fifty persons took the belladonna, and escaped the fever, while fourteen of the remaining fifty were attacked, and four died. In another village, the medicine was administered to nearly all the pupils of the public school; these, without exception, escaped, while several who would not take the belladonna, were attacked.[2]

During an epidemic of scarlatina in Buncombe County, South Carolina, Drs. Erwin and Hardy kept an account of two hundred and fifty children who were placed under the influence of belladonna, and of that number less than half a dozen had the disease, and they but mildly. Those families which did not take the preparation were with scarcely an exception affected.[3]

An epidemic of scarlatina occurred at the Charleston (S. C.) Orphan House, in 1838. There were 114 inmates of the asylum, and the arrest of the epidemic among them is ascribed to the persevering administration of belladonna.[4] Dr. J. C. Morris administered the medicine to one-half of the children at the Preston Retreat, Philadelphia, and found that 53 per cent. of these were attacked, while 73 per cent. of the remaining half had the disease.[5]

On the other hand, when experiments like the above were tried at Heriot's Hospital, Edinburgh, by Dr. Andrew Wood,[6] and at the Orphans' Asylum, Boston, by Dr. Alley, it was found, to use the words of the latter, that "there was no manifest difference between the two classes as to susceptibility to the contagion."[7]

If, now, we turn to authorities who have not published the details of their experiments so much as the conclusions which they drew from them, and from the collective materials pointed out in a preceding paragraph, we shall still find the prophylactic virtues of bella-

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[1] Rév. Méd., 1824, ii. 371. [2] Bull. de l'Acad. de Méd., viii. p. 567.
[3] Southern Journ. of Med. and Pharmacy, Jan. 1846, p. 41.
[4] Charleston Med. Journ., vi. 476.
[5] Am. Journ. of Med. Sci., April, 1857, p. 334.
[6] Boston Med. and Surg. Journ., Feb. 1857, p. 413. [7] Ibid., April, 1857, p. 241.

donna affirmed by the most eminent physicians, particularly by Hufeland in Germany, and Guersant in France; the latter of whom states that he never failed to employ the method we are discussing, and that he had remarked the almost certain immunity of those who were subjected to it.[1] The dissentients from this view include, it is true, several eminent persons,[2] but, with the exceptions already stated, they do not, in general, appear to have formed an opinion deduced from any enlarged personal experience, but rather to have based their objections on the results of inadequate trials, or upon a very natural distrust of the original source of the statement that belladonna is a prophylactic against scarlatina. Thus Joseph Frank, in the work above quoted, expressly declares that he had not experimented with belladonna, because the use of Hahnemann's ridiculous infinitesimal doses is repugnant to common sense, and because he was conscientiously opposed to making a doubtful experiment upon healthy children with a medicinal dose of one of the most active poisons. It is enough, in refutation of such arguments, to say that the numerous successful trials which have been referred to, were made, not with the phantom doses of homœopathy, but with such as, although minute, were sufficient in a great many instances, to produce an eruption on the skin and dryness of the throat, and yet without, in a solitary case, giving rise to unpleasant symptoms.

On a review of the whole subject, we feel bound to express the conviction that the virtues of belladonna as a protective against scarlatina are so far proven, that it becomes the duty of practitioners to invoke their aid whenever the disease breaks out in a locality where there are persons liable to the contagion, particularly in boarding schools, orphans' asylums, and similar institutions, and among the families of the poor; whenever, in a word, it is difficult to place the healthy at a distance from the sick. The dose which it is proper to prescribe under such circumstances may be thus stated. Dissolve from one to three grains of fresh and well prepared extract of belladonna in an ounce of cinnamon water, adding a few drops of alcohol to prevent fermentation. Of this solution may be given, two or three times a day, one drop for each year of the child's age, to be so administered for two weeks, or longer, if the danger should continue. It is not pretended that the protection, such as it is, is permanent. On each recurrence of an epidemic the same process must be repeated.

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[1] Bull. de l'Acad., viii. 573.

[2] See Begbie, Br. and For. Med.-Chir. Rev., Jan. 1855, p. 101; Balfour, Month. Journ., vii. 426; Ibid., xi. 529. M. Trousseau confesses that he is in doubt upon the subject.

Poisoning by Opium.—Dr. Anderson, of Edinburgh, starting from the idea that because belladonna dilates the pupil, it might also counteract those diseases in which contraction of the pupil is a prominent symptom, administered the medicine in several cases of poisoning by opium. Its effects appeared to answer the expectations of the experimenter.[1] In a case of poisoning by laudanum which had reached an alarming stage, and after five hours had elapsed from the swallowing of the poison, Dr. Mussey, of Cincinnati, administered, first the extract and afterwards the tincture of belladonna, until, in the course of five or six hours, seven grains of the former and an ounce of the latter preparation had been given. Recovery took place; but, except that the patient complained for a few hours of being unable to see distinctly, none of the peculiar effects of belladonna were manifested.[2] Two cases are reported by Mr. Bell, of Edinburgh, in which, when alarming symptoms followed the subcutaneous inoculation of atropia, they were rapidly subdued by the use of morphia applied in the same manner.[3] These facts are very interesting, and harmonize with those elsewhere stated respecting the antagonistic action of opium and sulphate of atropia, the former producing a dilatation, and the latter a contraction of the capillary arteries of the web of a frog's foot.

A similar application of belladonna has been suggested in *delirium tremens* when the pupil is greatly contracted, but as yet there is no proof of its efficacy.

Administration and Doses.—Belladonna may be administered in substance, infusion, extract, and tincture. One grain of the powder of the roots or leaves, and one-quarter of a grain of the extract, are the average doses which it is safe to begin with. They may be gradually increased until the pupil becomes affected. An infusion, made with one scruple of the leaves to half a pint of water, may be given in doses of half a fluidounce every four or five hours. Of the tincture, which is officinal, the dose is fifteen or twenty drops for an adult. In the United States the extract is employed almost to the exclusion of other preparations of belladonna. It is used to make an ointment (ext. belladon. ʒj to ʒij, adipis ℥j), and a plaster (ext. belladon. ℥iss, emp. sapon. ℥ij), which is a convenient application in slight local pains of a rheumatic or neuralgic character. Sulphate of atropia may be given in the dose of from one-fiftieth to one-twentieth of a grain.

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[1] Month. Journ. of Med. Sci., April, 1854, p. 377.

[2] Boston Med. and Surg. Journ., Feb. 1856, p. 56.

[3] Edinb. Med. Journ., July, 1858, p. 6.

STRAMONIUM.—Stramonium; Thorn-Apple.

Description.—This medicine is derived from *Datura stramonium*, a plant which abounds in Europe and the United States, as well as in Eastern countries, growing luxuriantly wherever the soil is rank, but especially near the habitations of men. In this country it is familiarly known as *Jamestown weed*, a name which it derived from the circumstance that a party of soldiers, at Jamestown, Va., were poisoned by the leaves of the plant which they boiled, and ate as greens.[1] This is an annual plant, of the natural family Solanaceæ, three feet high or more, with smooth shining stems and spreading branches, and large leaves of an elongated triangular form, and sinuous edges; they are of a dark green color above, but paler below. The flower is large, funnel-shaped, pentangular, of a pale color, and is succeeded by a green capsule of the size and form of an English walnut, covered with prickles, and containing numerous dark kidney-shaped seeds. The root is thick, fibrous, and white. The whole plant exhales a rank narcotic odor. The leaves, roots, and seeds, are officinal.

The active properties of this plant depend upon *daturia*, an alkaloid principle which was discovered by Geiger and Hesse in stramonium seeds, the part in which it is most abundant. It forms clusters of brilliant colorless prismatic crystals, is inodorous when pure, but in its impure state has a repulsive smell, and a bitter acrid taste resembling that of tobacco. According to Planta's analysis, its composition is identical with that of atropia.

The following preparations of stramonium are officinal:—

Extractum Stramonii Foliorum.—Extract of Stramonium Leaves.

This is the inspissated juice of the leaves. It is directed to be given in one grain doses, but is of uncertain strength.

Extractum Stramonii Seminis.—Extract of Stramonium Seeds.

This preparation, which is stronger and more permanent than the last, is made by evaporating a tincture of the seeds. Its dose is half a grain.

Tinctura Stramonii.—Tincture of Stramonium.

It is made by macerating four ounces of bruised stramonium seeds in two pints of diluted alcohol for fourteen days. The average dose is fifteen minims.

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[1] Beverley's Hist. of Virginia, 1722, 2d ed., p. 121.

Unguentum Stramonii.—Ointment of Stramonium.

A drachm of the extract of stramonium rubbed with an ounce of lard, forms this ointment. It is used as a local anodyne and discutient application.

Medical History.—It is uncertain whether or not the powers of stramonium were known to the ancients, but there can be no doubt that for a knowledge of its remedial virtues we are indebted to Störck, of Vienna, who made various experiments with an extract prepared from the fresh plant, and published an account of them in 1762. Since this period stramonium has held a prominent position in the materia medica, and been the subject of repeated examinations, of which some of the earliest were prosecuted in this country.

Action. *On Animals.*—Various animals eat stramonium with impunity. Insects of the caterpillar tribe feed upon it, and goats devour it without injury. A decoction of the leaves applied to the skin of a young rat produced alternate debility and convulsive movements.[1] Very large doses administered to the horse have induced drowsiness, gaping, and even death.

On Man.—The symptoms to which stramonium may give rise so closely resemble those already ascribed to belladonna, that no detailed analysis of them need be presented. It will be sufficient to point out the principal groups of phenomena which are occasioned by its administration. According to Dr. Cooper,[2] two grain doses of the powdered leaves slightly increase the fulness and frequency of the pulse, and produce a warm skin, moisture of the hands and face, and a little giddiness; while five grain doses cause decided intoxication, dilatation of the pupil, difficulty of speech, nausea, thirst, dryness of the throat, relaxation of the bowels, an increased flow of urine, and some feverishness. In larger, and what may be considered poisonous doses, the first effect is to excite immoderately. The whole aspect of the patient is that of a person with high fever and delirium; he may seem happy, talking nonsense and laughing, or be violent, biting and striking furiously; the movements are irregular and sometimes much resemble the contortions of chorea, or those of an intoxicated person, and complaint is apt to be made of dizziness, with heaviness or lightness of the head and a disposition to faint; the face is flushed, occasionally swollen, the eye bright, the conjunctiva injected, the pupil dilated, and the sight confused, and the skin is sometimes profusely covered with a bright red eruption which may be followed

[1] Cooper, Caldwell's Theses, p. 170, 174. [2] Ibid.

by a crop of minute vesicles,[1] or the eruption may resemble erysipelas at first, and measles at a later period.[2]

The mental excitement and disorder occasioned by an overdose of stramonium may be very aptly illustrated by the case of the soldiers at Jamestown which was alluded to above. Beverley informs us that "some of them ate plentifully of the plant, the effect of which was a very pleasant comedy; for they turned natural fools upon it for several days. One would blow up a feather in the air, another would dart straws at it with much fury; and another, stark naked, was sitting up in a corner, like a monkey, grinning and making mouths at them; a fourth would fondly kiss and paw his companions, and sneer in their faces, with a countenance more antic than in any Dutch droll. In this frantic condition they were confined, lest they should in their folly destroy themselves; though it was observed that all their actions were full of innocence and good nature. . . . After eleven days they returned to themselves again, not remembering anything that had passed." In other cases the patient seems plunged in a reverie which is interrupted by sudden shrieks, or by convulsions; and in others still, the delirium is so furious as to call for forcible restraint. Meanwhile the head is hot, the pupils largely dilated, the face bloated and red, and the hands and feet cold and tremulous.

In Dr. De Witt's case, referred to above, there was manifested a strong aversion to fluids. When a cup of water was brought to the patient's lips she would instantly start from it, and relapse into a convulsive paroxysm. Lobstein observed a similar phenomenon in two instances. At a later stage, in fatal cases, or in such as tend to become so, excitement, hallucinations, and spasmodic movements are succeeded by stupor, insensibility, and relaxation, or even paralysis; the pupil is fixed and inordinately dilated, the pulse rapid and thready, and the skin hot and perspiring. Among the anomalous symptoms of poisoning by stramonium is one observed in the case of a man to whom all black objects appeared green.[3] At no period in the progress of the symptoms, until death grows imminent, is there the least tendency to sleep; on the contrary, there is obstinate insomnia, and yet, on the recovery of the patient, he retains no distinct recollection of what has occurred.

These peculiar qualities of stramonium have rendered it a convenient agent for the speculations of knavery, for there is reason to

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[1] De Witt, Med. Repository, ii. 28.

[2] Dr. R. E. Griffith, Am. Journ. of Med. Sci., v. 252; Faust, Charleston Med. Journ. and Rev., ix. 746; Calkins, Boston Med. and Surg. Journ., June, 1856, p. 398.

[3] Husemann, Journ. f. Pharmakodynamik, ii. 191.

believe that much of the phantasmagoria of sorcery was derived from this source, and that the oblivious intoxication of stramonium has been employed to facilitate and conceal the perpetration of crime. The latter is attributed to the Hindoos, but seems to have had Christian imitators. For, as MM. Trousseau and Pidoux relate, a band of thieves was brought to trial, whose plan of procedure was this: They mixed the powder of stramonium seeds with snuff, and, in places of public resort, were very assiduous in offering the snuff-box to such of their neighbors as they wished to rob. As soon as the victims began to be confused, and talk at random, they were pillaged without difficulty.

In the preceding account it is not easy to discover any essential difference between the action of belladonna and of stramonium; their effects upon the nervous system are nearly identical, and it is only in the fact that stramonium appears to augment the several excretions of the body more than belladonna, that a distinction between the two can be perceived.

The same approach to identity exists between the effects of daturia and atropia, but, according to Schroff, the former is of about twice the strength of the latter. Wertheim arrived at the same conclusions. It is singular, however, as Reil remarks,[1] that their strength should be so unequal while they are identical in composition.

In regard to the operation of this alkaloid, Hoppe concludes from numerous and minute experiments that it expends its power mainly upon the nerves of motion, and especially those of the bloodvessels, while it influences the sensory nerves in an inferior degree. He also intimates that its primary stimulant impression is followed by a state of debility or exhaustion of the nerves, and that the cerebral phenomena which it occasions are due chiefly to vascular congestion of the brain.[2]

ANTIDOTES.—The same as for belladonna.

REMEDIAL EMPLOYMENT.—The similarity of stramonium and belladonna in their poisonous action, doubtless led to the employment of the former in diseases which the latter had been found adapted to relieve. It was, at all events, in affections of the nervous system that Störck first prescribed stramonium, and founded our knowledge of its curative powers.

Insanity.—Störck reports the cure of two cases of insanity, both of which were of long standing, and one of them complicated with an

[1] Mat. Med. der reinen chemischen Pflanzenstoffe, Berlin, 1857.

[2] Die Nervenwirkungen der Heilmittel, 2tes Heft, S. 146.

organic disease, hydatids of the brain. De Durande, Bergius, Greding, Schneider, and Bernard, have also published examples of occasional success.[1] Amelung regarded stramonium as a valuable remedy in acute mania, *mania cum febre*, after depletion, and other antiphlogistic measures had been duly employed. He also held it to be useful in shortening the paroxysms of periodical insanity, and in tempering the violence of the more permanent forms.[2] The late Professor Barton attributed to this agent the recovery of an insane patient, and Dr. Eberle declares that in a case of hysterical mania it afforded unequivocal relief.[3] On examining, however, such of the cases recorded by these writers as appear to have been favorably influenced by stramonium, the greater number are found to be examples of puerperal insanity, the form of mental derangement, which, of all others, has the strongest tendency to recovery, when removed from hostile influences. Yet, stramonium, like other narcotics, may very probably accelerate its cure. Dr. Chapman is of opinion that this medicine will be found more efficacious in melancholia, than in any other form of mental derangement. The late superintendent of the Massachusetts Lunatic Hospital, Dr. Woodward, whose field of observation was so extensive, and so thoroughly scanned by him, expresses his opinion of the virtues of stramonium in the following words: "In some cases its effects are very favorable, in others it not only disappoints our hopes, but sometimes actually coincides with diseased impressions, and aggravates the symptoms. In cases of insanity connected with epilepsy . . . I have seen excellent effects from this remedy . . . the symptoms of both are often greatly diminished in force and frequency."[4]

Some years since, M. Moreau, one of the physicians of Bicêtre, made numerous experiments with stramonium in the treatment of insane hallucinations; being led to do so by the resemblance which this morbid state bears to that produced by the narcotic in question. In several instances the trial met with complete success; but only when the hallucinations were primitive, that is to say, when they commenced with the attack, and formed its prominent characteristic. The remedy was administered in the form of an extract of the purified juice, in doses gradually increased from half a grain to eight grains, and sometimes until dilatation of the pupil, vertigo, and coldness of the extremities, gave notice of commencing intoxication.[5] M. Brierre de Boismont, in his excellent treatise upon hallucinations, states that

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[1] Bayle, Bib. de Thérap., tom. ii. p. 269.
[2] Journal des Progrès, tom. xvii. p. 84.
[3] Eberle's Therapeutics, p. 369.
[4] Annual Report, &c., 1845.
[5] Gaz. des Hôpitaux, Oct. 1842.

other physicians have not been equally fortunate with M. Moreau in the employment of stramonium, at the same time admitting that such a condition as the drug is capable of inducing must be well adapted to break in upon and dispel the imaginary torments of the patient.[1]

Much earlier than the experiments of Moreau, Dr. King, of Suffield, Connecticut, reported two cases which he regarded as meningitis, and the cure of which was evidently due to stramonium.[2] In one, that of a lad about fourteen years of age, there was delirium *with phantasms*, on the third day; on the fifth, convulsive twitchings, coldness of the hands and feet, and largely dilated pupils. At this stage a decoction was made with half a drachm of stramonium seeds in four ounces of water, boiled down one-half, and a teaspoonful of it administered every half hour. The following night the patient slept about fifty minutes, and his delirium was less violent. The medicine was continued in more frequent doses, and on the seventh day from the invasion of the disease, the fever and delirium had much abated, and urine was copiously discharged. On the eighth day, the patient was calm and composed, after a quiet night's rest, and so recovered. Dr. King does not assign a motive for the treatment adopted by him in this case, but it was doubtless the same which guided M. Moreau in the method which he pursued under somewhat analogous circumstances.

Epilepsy.—The evidence in favor of stramonium as a remedy for epilepsy, is, perhaps, quite as slender as for that of any other in the long catalogue of specifics for this intractable malady. A certain number of cures have doubtless followed its administration, and some of them were, in all probability, produced by it. Thus, in the summary furnished by Bayle, it appears that out of forty-five cases reported by various authors, *thirteen* were cured, and as many more relieved by the treatment in question. Of the latter number a portion experienced less frequent and less violent attacks, others became subject to slight fainting fits instead of the convulsive paroxysm, and others, again, at the usual periods of the attacks, suffered from an extremely annoying formication.[3] In the United States, Dr. Archer, of Maryland, celebrated the virtues of stramonium in epilepsy more than half a century ago,[4] and pointed out, more distinctly than others have done, the class of cases in which it is most efficacious. These are, according to his experience, when the fits occur at short inter-

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[1] Des Hallucinations, &c. (Paris, 1845), p. 508.

[2] Med. Repository, vol. ii. (1805), p. 32.

[3] Bib. de Thérap., vol. ii. p. 325.

[4] Cooper, in Caldwell's Theses.

vals, and periodically, and, therefore, afford time for bringing the patient under the narcotic influence, before the commencement of another paroxysm. When the intervals were of irregular length, Dr. Archer found that the treatment was less successful. It is possible that a want of regularity and attention in administering the medicine may account for its failure in epilepsy, when used by other physicians; for, in the observance or neglect of these elements of treatment, lies the secret of a thousand conflicting reports of the virtues of remedial agents. Of other American authorities the only one, besides Dr. Archer, who appears to have brought the treatment we are discussing to a sufficient test, is Dr. Woodward, and he, in the report already cited, ascribes to it very decided curative powers. "In many cases," he remarks, "in which the paroxysms of epilepsy have recurred frequently, they have, for months, been wholly suspended by the use of the tincture of stramonium. . . . This remedy rarely makes any favorable impression unless it is used in sufficient doses to dilate the pupils of the eye slightly, and produce some difficulty of vision more or less of the time."

Spasmodic Asthma.—The utility of stramonium in this affection is vouched for by a larger number of authoritative witnesses than testify in favor of its virtues in any other malady. In the most of the diseases hitherto noticed the medicine was employed experimentally, and on the suggestion of analogy; but in the case before us, it appears to have been popularly and successfully resorted to before it fell under the notice of physicians. In the East, the roots of another species of datura, *D. ferox*, are regarded as a specific for paroxysms of asthma. They are cut into slips as soon as gathered, air dried, and then beaten into fibres resembling those of hemp. These shreds are smoked in a pipe, with or without tobacco, according to the habits of the patient. A knowledge of this circumstance was communicated by the English General, Dent, on his return from India, in 1802, to Dr. Sims, by whom the employment of the medicine was encouraged. Dr. Sigmond[1] informs us that a war of pamphlets and journals, in which the remedy was by turns eulogized and stigmatized, took place upon its introduction into general use. Some of the parties to this conflict were dishonest and mercenary, and their unworthy motives, as well as their abusive publications, seem to have excited in the minds of many honorable practitioners, a deep-rooted prejudice against stramonium itself. Thus Dr. Bree, who had been personally attacked, published an extremely unfavorable account of his experience with the medicine,

[1] Lancet, 1836-37, vol. ii. p. 393.

attributing to it a greater or less degree of injury in twenty-four out of eighty cases, and declaring that the remainder had received no permanent benefit. Much of the testimony of English writers of this date is evidently tainted by undue partiality or prejudice, and must be corrected by that of more impartial observers, which, as will be seen, corroborates the statements of those who first employed the drug in Europe as a remedy for asthma.

The cases of Krimer,[1] five in number, were all well-marked examples of spasmodic asthma, and in all of them the relief obtained from smoking stramonium was not only prompt and complete, but permanent. Much more recently (1836), Miquel published a number of instances of the value of this treatment drawn from his own observation, and from the practice of Biett, Martin Solon, Andral, and Cayol. Among them were several in which the dyspnœa seems to have been produced by pulmonary emphysema, and others in which there was a copious bronchial secretion; nevertheless, in all of them considerable relief was obtained.[2] Chanel,[3] Mirande,[4] and Legal,[5] likewise report a few cases confirmatory of Miquel's results, and more recently (1846), Dr. Namias, an Italian physician, recalls the attention of the medical profession to the importance of the treatment we are discussing.[6] One of the cases related by him may serve to illustrate the subject. A bookseller was subject to severe attacks of asthma in the spring season, which were generally mitigated by assafœtida, emetics, and sinapisms. In the spring of 1845 the paroxysms were unusually violent, the pulse corded and irregular, the face livid, the respiration laborious and carried on by the voluntary muscles. The patient was forced to sit up in bed, and every moment seemed about to suffocate. A pint of blood drawn from the arm, and a dose of ipecacuanha, afforded no relief; nor did revulsives, nor even a renewal of the depletion, act more favorably. At this stage stramonium smoking was prescribed. The relief was almost miraculous; in less than a quarter of an hour the breathing became free, and the patient complained only of fatigue. Next day the cough, which had been dry, became humid, and a regular attack of catarrh succeeded, but without the least oppression of the respiration.

MM. Trousseau and Pidoux[7] are not in any degree behind the authors already cited in their favorable opinion of stramonium in asthma. They are careful, however, to apply this term only to par-

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[1] Bayle, op. cit. [2] Bull. de Thérap., tom. xi. p. 13. [3] Ibid., p. 326.
[4] Ibid., tom. xiii. p. 157.
[5] Thèse de Paris, 1835, and Arch. Gén., 2ème Série, tom. xi. p. 498.
[6] Arch. Générales, tom. xvi. p. 97. [7] Op. cit.

oxysmal dyspnœa independent of structural lesions of the lungs, heart, or great vessels. In this form of the disease, they have seen stramonium effect a complete cure. Still, if it frequently succeeds, it often also fails, even in paroxysmal asthma, while it sometimes promptly mitigates the more permanent forms of the affection. The effect of stramonium fumes on simple spasmodic asthma is marvellous during the first few months or years of its use; but, if the attacks are severe, and frequent, the medicine by degrees loses its power over the disease. It may also be prescribed as a palliative of dyspnœa and cough in consumption, chronic catarrh, and organic diseases of the heart, whenever the violence of these symptoms appears to proceed from nervous disorder.

In this country stramonium is very generally employed to palliate asthma, but little or nothing has been written, beyond an expression of opinion, from which the degree of its utility can be inferred. A partial exception to this statement is that of Dr. Bigelow, who informs us that "it would not be difficult to designate a dozen individuals in Boston and its vicinity, who are in the habit of employing it, with unfailing relief, in the paroxysms of this distressing complaint." Eberle, Chapman, and Dr. Wood, all testify to the occasional efficacy of this treatment, but appear to think that it more frequently fails than succeeds. It may be fairly concluded that the contradictory opinions expressed by different authors, arise from the fact, that those practitioners who have reported the most uniform success, have been careful to ascertain the purely spasmodic character of the cases in which they administered the remedy, while most of those who esteem it lightly have prescribed it in many cases of dyspnœa arising wholly, or in greatest part, from organic disease. Here, as in other instances, correct diagnosis is the only substantial basis of rational treatment.

Much of the hostility against the use of stramonium in asthma formerly displayed by the practitioners of Great Britain, may be attributed to the alarming and even fatal symptoms which occasionally followed this use of the drug, and particularly to the death of the officer who was the means of transplanting the oriental practice to England.[1] This event, however, was not justly attributed to smoking stramonium; for the patient recovered from the comatose state into which his unadvised and excessive employment of the remedy had thrown him, and, on the recurrence of a fit of dyspnœa expired suddenly, probably from disease of the heart. It is, nevertheless, of

[1] Sigmond's Lectures, loc. cit.

the first importance that the remedy should be cautiously employed, and its use confined to those cases in which the nervous element of dyspnœa is the sole, or at least the principal, cause of suffering. All congestion or inflammation of the lungs or brain, and every structural disorder of the apparatus of circulation or respiration which gives rise to permanent shortness of breath, should be held as a paramount contra-indication; and, under no circumstances, ought the narcotic influence to be allowed to extend beyond creating a slight degree of vertigo. When the plethoric condition of the patient is the only obstacle to the employment of stramonium fumes, it may be removed by venesection.

About a scruple of dried stramonium leaves, or half that quantity of the fibres of the root, may be smoked at once. Some persons direct them to be mixed with sage leaves, or with tobacco if the patient is accustomed to it. They may be smoked in a pipe, or cigarette. Another method is to steep cigars in a strong decoction of stramonium; when dry, they are ready for use. The desired effect is much more promptly attained, by drawing the smoke into the lungs, than by the ordinary mode of receiving it into the mouth alone.

In *whooping-cough* stramonium has been prescribed in the same way as belladonna, and for the same purpose; but there is much less evidence of its efficacy. In like manner it has been employed for the relief of *dysmenorrhœa*. Thus, according to Eberle, by exhibiting from twenty to thirty drops of the officinal tincture three times daily, for two or three days immediately preceding the period of the menses, the distressing pains attending this affection will, in some instances, be entirely prevented. In one case it effected a perfect cure.[1] Dr. A. T. Thomson found half grain doses of the extract extremely useful in the same affection, in combination with Plummer's pill and digitalis.[2]

Retention of urine depending upon inflammation or tenderness about the neck of the bladder may sometimes be overcome without catheterism, by cataplasms of the bruised leaves of stramonium, or the extract of this article applied in any manner with moist heat.[3] The anodyne and relaxing qualities of the combined application no doubt unite in producing the effect.

Neuralgia.—Stramonium, like belladonna, has been repeatedly applied to the treatment of the different forms of neuralgia, but with inferior success. For, although, in some instances it has proved equally efficacious, its influence, on the whole, appears to be less

[1] Therapeutics, p. 371. [2] Elem. of Materia Medica, &c., p. 430.
[3] Dr. W. M. Fahnestock, in Am. Journ. of Med. Sci., vol v. p. 251.

decided and certain. The experience of Lentin, Marcet, Begbie, and Kirchoff, as reported by Bayle,[1] is quite unfavorable to the virtues of stramonium in facial neuralgia, but very favorable to them, on the contrary, in sciatica. Yet, according to Wendelstadt, of Hersfeld, stramonium is as truly a specific for facial neuralgia, as quinine for intermittent fever.[2] The paper before us furnishes no details of his cases, and their value must remain conjectural. His mode of insuring the alleged degree of his success, was to prescribe half a grain of the extract, which dose was repeated in an hour, and again in two hours more; on the following day, unless the state of the patient forbade it, a fourth dose was given. As soon as symptoms of narcotism appeared, the daily quantity was restricted to two doses, which was to be increased again on the subsidence of these symptoms, and the medicine continued until the due results were obtained. There is, doubtless, in this methodical and reiterated prescription of a medicine more power than could be inferred from its more casual effects. Other practitioners, and with them several of those cited, prefer the external application of stramonium, in tincture, extract, or substance, as a remedy for neuralgia; and, although it certainly acts as a palliative when thus employed, and in this country is to be preferred to belladonna (at least when the fresh thorn-apple plant can be procured), yet it certainly does not possess equally valuable properties with the latter agent in the treatment of neuralgia.

Rheumatism.—Bruised stramonium leaves, either in their fresh state, or stewed with lard, form a popular and very useful application to the joints, in chronic rheumatism, although perhaps not more so than any other emollient and anodyne cataplasm. The method is, however, a convenient one, and may, in some instances, answer a better purpose than more strictly pharmaceutical preparations. Liniments and ointments containing the tincture or extract of stramonium may be employed in frictions upon the affected part. One of the most intractable forms of chronic rheumatism is that in which Eberle found stramonium to be "the most efficacious remedy we possess," a form "attended by an irritable, quick, but weak pulse, swelled joints, and unattended with any great pain, unless on being moved."[3]

Although principally employed in the chronic variety of rheumatism, stramonium has also been applied to the treatment of the acute articular form, by MM. Lebreton and Trousseau. The former prescribes the medicine in precisely the same manner as that directed for

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[1] Bib. de Thérap., tom. ii. p. 280.

[2] Bull. de Thérap., tom. xii. p. 239.

[3] Mat. Med. and Therapeutics, loc. cit.

neuralgia by Wendelstadt, as above described, and so as to maintain for several days its decided narcotic influence. M. Trousseau vouches for the safety of this treatment, and declares that he has derived advantages from it which none other appeared capable of affording; particularly when pursued in conjunction with active purging.[1] Similar good effects have been obtained by Chomel.[2] These results ought not to surprise us, when we remember the remarkable powers of opium in mitigating the severity, and shortening the attacks of acute rheumatism. There is no reason why, in external applications at least, stramonium and its preparations should not take the place of more expensive and often less pure narcotics, in the treatment of every kind of painful affection. So common and at the same time so powerful an agent deserves more attention from American physicians than it has hitherto received, and of which any published evidence is to be found.

Hæmorrhoids.—Among the local uses of stramonium none excels in imparting comfort so much as its employment in piles and other kindred affections of the rectum. An ointment composed of the extract of stramonium and lead cerate in equal parts is an almost infallible remedy for the intolerable itching and burning which piles, vermicular ascarides, &c., occasion; it forms also a very soothing application in fissures of the anus.

Administration.—The powdered leaves, root, and seeds, of stramonium may be given in substance. Of the two former the dose is about two grains, and of the last, one grain, to be repeated several times a day until the characteristic symptoms produced by the drug begin to manifest themselves. Of the officinal extract of the leaves, one grain, of that of the seeds, half a grain, and of the tincture, fifteen minims, are the average doses. The tincture is one of the best forms of the medicine, and can be used for nearly every purpose to which the other preparations are adapted.

HUMULUS.—Hops.

Description.—Hops are the strobiles of *Humulus lupulus*, a native plant of both hemispheres, with a perennial fibrous root, annually producing long creeping stems which are trained upon poles or trees, to the height of six or seven yards. The strobiles or fruit are of conoidal

[1] Op. cit. [2] Szerlecki, Dict. de Thérap., tom. ii. p. 429.

shape, and are formed by numerous superposed semitransparent scales, of a pale yellowish-green color when fresh, but brownish-yellow when dried. They have a strong aromatic and narcotic odor, and a bitter and spicy taste. They are covered with minute yellowish granules, which have received the name of lupulin, and which contain a larger proportion of active principles than any other portion of the plant.

Lupulin is procured by shaking upon a fine sieve the hop strobiles of the previous year. It is a delicate powder, of a golden yellow color, somewhat harsh and tenacious, and both bitter and aromatic. Its reaction is neutral; it is nearly insoluble in ether, and slightly soluble in water, but is completely so in alcohol.[1] About one-tenth of the weight of the hops employed is thus obtained as lupulin, which, by repeated washings and decantations, is cleansed from the fine sand that is always mingled with it. After being carefully dried at a temperature of not more than 76° F., it may be kept unchanged for years, in well-stopped bottles. The composition of lupulin is exceedingly complex. According to MM. Payen and Chevallier, it contains[2]—1st, an essential oil, which is acrid, of a greenish-yellow color, and strong smell; it is capable of being spontaneously converted into resin, and is procured most abundantly from the lupulin of fresh hops; 2d, a bitter substance, of a yellowish-white color, which, even in a very small dose, produces a loss of appetite and suspension of the digestive function for eight or ten hours, and, according to other observers, heaviness of the head, a sense of weariness, and heaviness of the limbs; 3d, a resinous substance, in the form of yellowish scales, soluble in alcohol, ether, and the alkalies, bitter, and imparting its bitterness to boiling water. The latter substance forms more than one-half of the lupulin, and its proportion is large when that of the essential oil is small.

Medical History.—Hop strobiles have long been held to possess medicinal virtues. By some writers an eastern origin is ascribed to the plant, which was, however, known in Europe during the middle ages, and was first described by Mesue in 1589. About the same time, Arnold, of Villanova, recorded the use of hops to prevent the acetous fermentation of beer. In the following century we find their tonic properties recognized, as well as their tendency to cloud the mind and induce a sort of intoxication.[3] Matthiolus[4] ascribes to them numerous virtues, such as being an antidote to poisons; says that they are useful in gravel, syphilitic and other ulcers and eruptions, and that they are cholagogue, diuretic, emmenagogue, and anthelmintic. In 1803, Dr.

[1] Strumpf, op. cit.
[2] Dieu, Mat. Méd.
[3] Strumpf, op. cit.
[4] Commentaires sur Dioscoride, 1605.

De Roches, in his inaugural thesis, published at Edinburgh, attributed sedative and tranquillizing effects to the hop pillow and other preparations of the medicine; and, four years later, Mr. Freake, of London, claimed for it nearly all the virtues which any previous writer had alleged it to possess.[1] The suggestion of M. Planche, in 1813, that the yellow matter of the strobiles contains the medicinal virtues of the plant, was made practically useful by Dr. A. W. Ives, of New York, who published an essay in 1819, in which he gave to the substance the name of *lupulin*.

Modus Operandi.—As the active properties of hops depend almost exclusively upon the lupulin they contain, it will be unnecessary to consider these subjects separately. All writers agree that hops possess *tonic* virtues, but some—Dieu, for example—consider their power of strengthening the digestion, improving the appetite, and relieving the sense of wretchedness which dyspeptics suffer, as altogether indirect, and only shown as the result of the primary and sedative action of the remedy, which removes the subacute inflammatory condition on which the functional disturbance depends. The infrequency of inflammatory dyspepsia, and its intolerance of even milder substances than preparations of hop, sufficiently refute the statement of Dieu, which appears to be an inference from a medical hypothesis, rather than the result of direct observation. Persons of sickly complexion and impaired strength, who have taken infusion of hops for several weeks, find that the skin acquires a more healthful hue, and all the functions are more vigorously performed. Lupulin appears to possess more distinctly tonic virtues. In doses of from twenty to twenty-five grains it produces a lively sense of warmth in the epigastrium, which extends afterwards to the whole abdomen. Constipation, with colicky pains, is apt to ensue, and the digestion and appetite seem to be invigorated. Experience proves that hops are appropriate where the simple vegetable bitters are useful, and that they are of peculiar utility when a state of nervous excitability is united with feeble digestion. This is attributed to their *sedative* quality. It is not apparent when the quantity given is small, but, according to Mathon, large doses of lupulin diminish the frequency of the pulse. There is more evidence, however, that they act as a sedative by calming restlessness and by strengthening the system against external impressions; by abating, in other words, the susceptibility which is one of the most frequent causes of an excited circulation.

Most writers on the materia medica ascribe to hops *narcotic* proper-

[1] Edinb. Med. and Surg. Journ., 1807.

ties, and cite in evidence the well-known fact that the air of warehouses in which large quantities of hops are stored cannot be long inhaled without producing sleep, which is even related to have been fatal. The hop pillow has also long been a popular remedy for sleeplessness; it was used with advantage in the insanity of George III. But, as Vogt justly remarks,[1] all fragrant plants have a tendency to bring on sleep; the narcotic virtues of hops ought not, therefore, to be inferred from their possessing a similar property. The question can be settled only by noticing the effects of the internal administration of the medicine. Almost all the authorities are agreed that preparations of hops promote sleep, and some ascribe to them distinctly narcotic qualities. The latter writers, however, draw their opinion from the action of the remedy in affections attended with pain or nervous agitation, forgetting that sleep naturally follows the removal of the causes which prevent it, and in this sense alone do the former admit the existence of a soporific property in hops. In none of the experiments made on persons in health, or free from pain, have hops distinctly shown narcotic properties. Barbier[2] states that lupulin, in small doses, has no influence upon the nervous system; but in doses of twenty-four grains, for example, it acts with energy, producing a painful sense of numbness in the limbs, heaviness, and weariness, but neither headache, dulness of mind, nor giddiness, and, above all, no tendency to sleep. Experiments tried by the same author with a decoction of hops gave rise to none of the indications of nervous sedation just enumerated, a fact which may fairly be attributed to the evaporation, by boiling, of the essential oil contained in the strobiles. This explanation is also deducible from the experiments of Desroches, which, as early as 1803, pointed to an essential oil as the so-called narcotic element of hops, a conclusion which the later experiments of Payen and Chevallier confirmed.

Remedial Employment.—The multifarious virtues which have been ascribed to hops would seem to fit them for a great variety of medicinal uses, but in practice they are chiefly resorted to where a gentle *tonic* and sedative effect is sought to be produced. In *atonic dyspepsia* they have been found to be very serviceable, either alone or as an adjuvant to other medicines of greater power. Dr. Ives assures us that "diseases which are the consequence of exhausted excitability, or more directly of a deranged state of the stomach and bowels, are certainly much relieved by this medicine. It frequently induces sleep

[1] Pharmakodynamik, i. 584. [2] Op. cit., p. 420.

and quiets great nervous irritation without causing costiveness or impairing the tone of the stomach."[1] At a still earlier period, Freake attributed to this medicine very decided powers in relieving nervous languor and debility, and, above all, gout, both regular and atonic.[2] It should be taken immediately before meals whenever its tonic properties are chiefly invoked; and in this case lupulin is preferable to the infusion of hops, as being less bulky, and exerting a more powerful, because a more concentrated, action.

Hops have been extensively used in a great variety of diseases in which a tonic and *alterative* are supposed to be indicated; in those, namely, which take their root in a lymphatic constitution, and which offer the proper symptoms of scrofula and its associated diseases, such as rachitis, glandular enlargements, some forms of dropsy, anæmia, amenorrhœa, chronic cutaneous eruptions, &c. Before the discovery of iodine, hops were an almost universal remedy, or adjuvant, at least, in this class of maladies, and were much esteemed for their presumed depurative power. Anæmic children, with puffy cheeks, tumid belly, and a general languor of the mental and bodily functions, were found to recover activity, strength, and color under their use, and the skin, if defaced by eruptions, assumed a natural color and texture. But the preparations of iodine, and more recently cod-liver oil, have almost entirely supplanted other remedies for scrofula and its attendant diseases; it will nevertheless be found advantageous to combine in their treatment the use of hops with that of the more powerful agents, by directing hop-tea to be used by the patients as a common drink.

The *sedative* virtues of hops are nowhere more conspicuously shown than in the treatment of *delirium tremens*. In a large proportion of cases of this affection there is a total loss of appetite, and very frequently the stomach can neither retain nor digest food. With the exception of those few instances in which the organ is in a state akin to inflammation, as shown by epigastric pain and heat, with bilious vomiting, this weakness of the digestive function is speedily removed by a liberal use of hop-tea—of, for instance, two or three quarts in the twenty-four hours. The first draught or two may be rejected, but the vomiting affords relief, and before many hours have elapsed there is a manifest abatement of the nervous agitation, and the indifference to food is lessened. Exercise in the open air contributes largely to these favorable results. Refreshing sleep is procured by the means recommended more readily than by any of the other expedients employed

[1] Ives's edition of Paris's Pharmacologia, 1825.

[2] On the Humulus Lupulus of Linnæus. London, 1806.

for the purpose in delirium tremens, but not, as it seems, by the narcotic virtues of the medicine so much as by its power of calming agitation. In these and other cases of sleeplessness from over-excitement or want of "tone" of the nervous system the hop pillow is deserving of trial. A remedy employed in so unusual a form would of itself be apt to make a favorable impression.

Dr. W. B. Page, of Philadelphia, was the first to draw attention to the value of lupulin as a remedy for painful priapism in venereal cases, and for involuntary seminal emissions. Dr. E. Hartshorne knew it "to destroy the venereal appetite in a man addicted to onanism."[1] The experience of Dr. Page has been confirmed by that of numerous physicians. In France it was thought useful by Débout in various cases of morbid erection of the penis, including those in which this condition was produced by contusions, by gonorrhœa, and by the operation for phimosis.[2] Zambaco found the tincture of hops more efficacious than lupulin.[3] Pescheck notices the tonic property of the latter as a valuable adjuvant of its more specific operation in spermatorrhœa.[4] Herzfelder proved its advantages in cases of nocturnal incontinence of urine,[5] and Dr. G. B. Wood in a case of irritable bladder in which opium was not tolerated.[6]

Hops have been a good deal employed as an *anti-periodic*, and numerous evidences might be cited of their efficacy in slight cases of intermittent fever. But the same might be said of almost every medicine containing a bitter principle. As an *external* application, in the form of a poultice made with water in which hops have been infused, or of a fomentation formed by saturating the strobiles with hot water, spirit, vinegar, or beer, hops form a popular and most useful application in a great variety of painful affections. For *muscular rheumatism*, *sprains*, *bruises*, *boils*, *toothache*, *flatulent colic*, and, in general, all painful affections without high inflammation, these applications are extremely useful palliatives. An *ointment* compounded with the hop is said to have eased the violent pain in the last stage of cancer when all other applications were ineffectual;[7] but this needs confirmation.

Administration and Dose.—An eligible form of administering this medicine is the *infusion*, made by adding half an ounce of hops to a pint of hot water. Of this the medium dose is f℥ij to f℥vj every

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[1] Am. Journ. of Med. Sci., July, 1849, p. 293.

[2] Bull. de Thérap., xxviii. 557; xliii. 325; xliv. 289, 385; xlviii. 128.

[3] Ibid., xlvii. 161.

[4] Brit. and For. Med.-Chir. Rev., July, 1856, p. 265.

[5] Bull. de Thérap., lii. 187. [6] Trans. of Coll. of Phys. of Phil., June, 1857.

[7] Freake, loc. cit.

two or three hours. Lupulin may be given in the pilular form, or mixed with a little jelly or syrup, in the dose of from six to twelve grains. The tincture of hops is but seldom employed. A pure and strongly hopped beer contains all the virtues of the remedy in so high a degree, that, as Mitscherlich remarks,[1] there are but few cases in which any other preparation of it is necessary. But the ordinary malt liquors of this country are too unscrupulously adulterated to deserve this praise. The so-called "lager beer," when it can be obtained in a pure state, is an infinitely preferable form for administering hops to the other fermented drinks.

DULCAMARA.—Bittersweet; Woody Nightshade.

Description.—Solanum dulcamara, or bittersweet, of the natural family *Solaneæ*, is a woody, climbing vine, indigenous to Europe, but naturalized in the United States. It grows in hedges and on the skirts of woods, where the soil is fertile and shaded. Its stem and leaves are slightly pubescent; the latter are of a dark-green color, petiolate, lanceolate at their further extremity, and auriculate at their base. The flowers are in branched racemes opposite the leaves, of a violet color, but sometimes white, and are succeeded by small oval berries of a brilliant scarlet color. Both the roots and berries of the plant are operative, but in medicine the twigs and stalks only are employed. They are most active if gathered in the autumn, when they are cut in pieces of two or three inches long and carefully dried, with the pith which they contain. In their fresh state the stalks exhale a rank and nauseous smell, and have the bitter-sweet taste described below. In the United States, dulcamara is found in the Eastern and Northern States, and most abundantly in damp and shady places; but that which grows in high and dry situations is said to be the best.

Dulcamarin is the name given to a substance obtained from this plant, and which was first isolated by Wittstein in 1852. Like the plant, its first and transient tase is bitter, but it leaves a more persistent sweetness on the palate. Dulcamara also contains the alkaloid *solania*, and most abundantly in the green substance of the stalks. To the naked eye, solania has the appearance of a fine white powder, but under the microscope is seen to be formed of acicular crystals and rhomboidal scales. It has neither taste nor smell, according to Clarus, but Schroff describes its taste as feebly cool, acid, and saline, and as

[1] Lehrbuch, &c., ii. 134.

irritating the throat. It is insoluble in cold water, but in hot water it is partially, and in hot alcohol and in glycerin completely, soluble.

Medical History.—Dulcamara, like many other medicines, has by turns been neglected and extravagantly praised by writers on the materia medica; some have altogether passed it by, while others held it to be almost a specific in many diseases. The number and credit of the latter class are such as to enforce respect, in spite of the silence or even the contrary statements of other respectable authorities; it may therefore be profitable to learn what virtues have been ascribed to the medicine by those who employed it most extensively and with the greatest degree of success.

It is generally supposed that Dioscorides intends to describe the plant in question under the name of *Ampelos agria*, or *Vitis sylvestris*, which he affirms to be curative of dropsies. Its berries, according to him, are useful in softening the skin and removing pimples and freckles, and his commentator, Matthiolus, informs us that the Tuscan ladies employ them for this very purpose.[1] According to the same writer, Galen describes a precisely similar use of the plant. Fuchsius and Tragus, in the sixteenth century, were among the first to give it the name it now bears, for they noticed that the taste of the twigs was bitter on their first being chewed, but afterwards sweet.[2] Dulcamara was held in great esteem by Boerhaave, and its virtues were celebrated by his school. Linnæus, and, in France, Sauvages, were no less earnest in its praise, which was extended by Razoux, Carrère, De la Grésie, Starke, and others.[3] It was to be feared, as indeed it turned out, that, like other objects of extravagant eulogy, this medicine might become undervalued or entirely neglected. At the present time it is far less frequently employed than it used, and than its virtues entitle it, to be; for that these are considerable, no reasonable doubt can remain.

Solania, probably the most active principle of dulcamara, was discovered in *S. nigrum*, by Defosses, in 1821, and afterwards in various solaneæ, including the present.

Action. *On Animals.*—It is reported by Floyer that thirty berries of the bittersweet killed a dog within three hours, but Dunal gave fifty berries to another dog without any effect.[4] Oesterlen, too, throws doubt upon the first of these statements, for he gave a dog two hun-

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[1] Commentaires, liv. iv. ch. 175.

[2] The *present* Latin name expresses an idea the very reverse of the fact, and has doubtless misled several authors in their description; *e. g.* Mérat and De Lens, Dict., &c., vi. 411.

[3] Murray, op. cit.

[4] Murray, Mérat and De Lens, op. cit.

dred berries, and a cock fifty, without any effect whatever.[1] These differences might, perhaps, according to Mr. Taylor,[2] be explained by supposing that the active properties of the plant vary in power at different seasons of the year, were it not that they exist, as has been seen, even in regard to the berries, which can only be gathered at one season. In experimenting with the watery extract, Dunal produced equally negative results as with the berries, for he administered no less than four ounces of this substance to dogs without any bad effect; and Oesterlen gave it in ounce doses to a patient, but caused no untoward symptoms.[3] These results might perhaps be attributed to the bad quality of the preparation, for Bruschi produced symptoms of poisoning in animals by means of an extract made from the leaves.[4]

The fact that solania, an active poison, can be obtained from dulcamara proves that the contradictory results mentioned above must have been due to accidental causes. According to Sobernheim, a single grain of this substance, made soluble in water by means of dilute sulphuric acid, killed a small rabbit in six, and a larger one in eight, hours. About an hour after taking the poison the animals became incapable of moving their hinder feet forwards; the hind legs of the smaller one were also quite stiff, and the toes stretched out; then followed great dejection, retching, and signs of pain. No evidences of inflammation were discovered on dissection; the veins were distended with blood. The condition of the hinder extremities is remarkable from its resemblance to that produced in horned cattle fed upon sprouting potatoes, which contain alcohol. An epidemic erysipelas among swine has been attributed to a like cause, but the experiments of Fraas show that these animals may take as much as half a drachm of solania, or of its salts, without noticeable effects.[5] Geiger found that solania did not produce dilatation of the pupil like the other alkaloids of the solaneæ. When administered to a dog or cat in doses of from two to four grains, it brings on vomiting, and drowsiness which lasts for several hours. Fraas states that in ten-grain doses it only excites vomiting and quickens the circulation in a dog. A cat took eight grains of this substance without loss of life; after vomiting violently, it fell into a profound sleep, which lasted for thirty-six hours.[6] Otto, and also Fraas, found that rabbits were destroyed by doses of sulphate of solania varying from one to three grains. Clarus drew a like conclusion from his experiments, and also inferred from them that death in these cases is produced by a de-

[1] Sobernheim, p. 56.
[2] On Poisons, 2d Am. ed., p. 670.
[3] Sobernheim, loc. cit.
[4] Giacomini, ed. cit., p. 301.
[5] Virchow's Archiv, vi. 225.
[6] Giacomini, ed. cit., p. 301.

pressing influence upon the medulla oblongata, which induces serous congestion of the lungs. A similar congestion of the kidneys was observed, and the urine was found to be albuminous.[1]

On Man.—The accounts furnished by authors of the effects of dulcamara upon persons in health are extremely contradictory. The greater number assert that very large doses of the medicine must be taken to produce any sensible or marked effects, while others assure us that it exhibits poisonous qualities in comparatively small doses. As an illustration of the latter class may be cited instances related by Hufeland, in which the mere sleeping in a room where dulcamara was drying gave rise to symptoms of poisoning. They may have been, and probably were, due to the odor which the plant exhaled. Oesterlen denies that the medicine possesses any narcotic virtues; and unquestionably there is no adequate proof that it tends *directly* to induce sleep. Its influence upon other portions of the brain than the sentient and perceptive organs, as well as upon the circulatory apparatus and its dependencies, the glands, is much more demonstrable, as will appear in the sequel. It ought not, however, to be concealed that cases of narcotic poisoning are ascribed to this plant—such, for instance, as the following reported by M. Chailly:[2] A child, eighteen months old, swallowed a fresh flower of dulcamara, and immediately fell into a profound sleep, which lasted for eighteen hours, after which the infant was still disposed to stupor, and its pupils were dilated. These symptoms gradually disappeared in the course of the day. The case was related before the Medical Society of Paris, and doubts were expressed as to the reality of the alleged cause of the symptoms—doubts which it is not easy to avoid sharing. Children, attracted by the bright-red color of the berries of dulcamara, very frequently eat them; but, as Neumann remarks, it is very rare that any worse effect than vomiting is produced. Neumann states that delirium tremens is much more apt to follow the use of potato brandy than of other alcoholic drinks, and suggests that this fact may result from the liquor containing solania, derived from the skins of the potatoes in the process of manufacture.[3]

In moderate or medicinal doses the preparations of dulcamara give rise to no definite symptoms, at least until the medicine has been used habitually and for a considerable period. But if large doses are taken from the beginning, nausea and vomiting pretty certainly ensue; there are dryness, heat, constriction, and stinging of the throat, thirst, and

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[1] Journ. of Pharm., i. 245.

[2] Rev. Méd. de Paris, 1835, ii. 291.

[3] Heilmittellehre, 2te Aufl., p. 222.

sometimes diarrhœa. Old and nervous persons are apt to have convulsive movements of the lips, eyelids, and hands, with tremulousness of the limbs, especially if the surface of the body is at the same time chilly. The head feels heavy and giddy, and occasionally some delirium has been noticed, but the latter symptom so rarely as to countenance the suggestion that it was produced by *solanum furiosum*, and not by the milder plant under consideration. A protracted use of the medicine is said to have caused paralysis of the tongue and dilatation of the pupils. Occasionally dulcamara gives rise to an erythematous eruption on the skin, a fact that should not be lost sight of in considering the efficacy of the medicine in cutaneous diseases. Dr. G. B. Wood has observed in several instances, when the system was under its influence, a dark, purplish color of the face and hands, and at the same time considerable languor of the circulation.[1] Its influence upon the function of secretion is admitted by almost all the authorities. In moderate doses it is said to increase the activity of this function in the skin, kidneys, and lungs; but, in making these statements, enough consideration has not perhaps been given to the watery vehicle in which it is always administered; the increase of the renal secretion, at least, most probably depends upon the latter element. The alleged diaphoretic quality of the medicine is better established by direct observation, and is confirmed by the collateral evidence which proves its tendency to the skin.[2] Carrère and Starke both mention itching and heat in the female organs of generation, with painful strangury, and sometimes even venereal desires, as among the effects of the medicine. Should this statement be correct, as well as the one made by several physicians that it has the power of *subduing* the sexual appetite of maniacs and others in whom this propensity is morbidly active,[3] both facts should be borne in mind as illustrating the sometimes opposite effects of medicines when administered in health and in disease.

The operation of solania resembles in many points that which has just been described. Schroff administered this substance to healthy persons in various doses, from one-thirtieth of a grain to three grains, and observed increased cutaneous sensibility, itching of the skin, gaping, general numbness, sleepiness, slight tonic cramps in the legs, and increased frequency of the pulse, which at the same time grew feeble and thready; there was some dyspnœa and oppression in breathing, with nausea and unsuccessful efforts at vomiting; the head

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[1] U. S. Dispensatory.

[2] Sobernheim, Giacomini, Murray, et al., op. sup. cit.

[3] Dr. G. B. Wood, U. S. Dispensatory.

was hot, heavy, and dizzy, with drowsiness, yet with inability to sleep; the extremities were cold, the skin dry and itching, and there was marked general debility. The pupil remained unchanged; the sleep was restless, and disturbed by frightful dreams.[1]

What has now been stated is sufficient to warrant the judgment of Vogel, who takes Joseph Frank to task for asserting that the preparations of dulcamara are inert. Its narcotic action may be, and probably, indeed, is feeble and uncertain, but however that may be, it must at any rate be regarded as a valuable agent for improving nutrition and secretion slowly and gradually, and bringing about the cure of numerous chronic affections which depend directly upon a feeble or vitiated state of these functions.

Remedial Employment.—Dulcamara has been chiefly employed in eruptive, rheumatic, and catarrhal affections, as an internal medicine. But it had previously been in more general use as an external application to cancerous and other sores, as well as inflamed or bruised parts, under the idea that it possessed narcotic virtues. Subsequently it was employed in decoction to bathe the skin irritated by eruptions, and it was for these affections that the medicine was first prescribed internally. Linnæus states that in Upland it is looked upon as a specific against scabies, and bears a name expressive of the belief.[2] Crichton claims to have cured twenty-one out of twenty-three cases of lepra by the use of the following decoction: ℞.—Dulcamaræ ℥j; aquæ Oiss; decoque ad Oj, et cola— of which he ordered two ounces every morning, noon, and night, increasing the quantity until a pint was consumed daily.[3] In like manner Gardner states that he met with almost constant success in using this remedy for pustular and vesicular as well as scaly eruptions. Even the most inveterate cases yielded to its influence, and that without any local application. But these results he ascribes to his thorough and persevering manner of exhibiting the medicine, which will be described below.[4] That others have reported much less favorably of its powers must in all probability be imputed to their defective manner of administering it.

M. Bretonneau[5] looks upon dulcamara as one of the most useful agents in the treatment of all the affections which have been mentioned, and of those internal diseases which arise simultaneously with the disappearance of cutaneous disorders, and which used to be attributed, perhaps not without reason, to the repercussion of a morbid humor. M. Rayer states that he has several times employed the

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[1] Pharmakologie, p. 552.
[2] Murray, loc. cit.
[3] Edin. Med. and Surg. Journ., ii. 65.
[4] Lond. Med. and Phys. Journ., May, 1830.
[5] Trousseau and Pidoux, ii. 109.

decoction of dulcamara with success in lepra, but at the same time remarks that he has also carried the remedy so far as to produce dizziness without making a sensible change in the disease.[1] Clarus[2] goes further, and says that lepra vulgaris, psoriasis guttata, and pityriasis are not benefited by this medicine. Yet he admits its utility in chronic eczema, acne, impetigo of the face, and ecthyma vulgare, particularly when they occur in persons of a scrofulous constitution. Chapman confirms by his testimony the favorable statements that have been made, declaring that he has known it to remove chronic eruptions when even the better established remedies had totally failed.[3] These, and such other proofs which might be adduced, should suffice to dispel the incredulity which some authors have expressed in regard to dulcamara, and to restore it to a due degree of usefulness.

Dulcamara has been strongly recommended in *gout* and *rheumatism*, and especially the muscular variety of the latter, by almost all the writers who have recorded its virtues, and with justice, it may readily be believed, when we regard the sedative, diaphoretic, and narcotic virtues of the plant, and the indications it can thereby fulfil in the diseases mentioned. Boerhaave, Hufeland, Linnæus, Bergius, and many minor authorities, assert it to be useful in these diseases, especially when they have assumed the chronic form, and when also they seem to be allied to a cachectic state of the general system in connection with syphilis or scrofula. It is, indeed, against this cachexia which serves as the warp on which so many chronic diseases are woven, that dulcamara seems to be one of the most efficient agents, and well worthy of being prescribed in conjunction, or in alternation, with the numerous remedies which are also employed for its removal.

In many diseases of the chest dulcamara has enjoyed a wide reputation which it chiefly owes, no doubt, to its sedative virtues, by means of which coughing is rendered less frequent and severe. Thus may be explained its reputed virtues in spasmodic coughs such as belong to emphysema and hooping-cough, and to certain cases of phthisis, which last it has even had the reputation of curing. In this manner also may we account for the fact that it is habitually employed by Italian practitioners in both acute and chronic inflammations of the lungs.[4] Chronic pulmonary catarrh and bronchorrhœa are reported by many authors to have been cured by this medicine, but its combination with other active agents renders the task of assigning to it a just share in the result, impossible. It has been thought to be most

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[1] Mal. de la Peau, art. Lépre.

[2] Loc. cit.

[3] Therapeutics, ii. 225.

[4] Giacomini, op. cit.

evidently useful in those cases of pulmonary disease which have followed directly upon the sudden disappearance of a cutaneous eruption.

ADMINISTRATION AND DOSE.—The stalks and twigs are the officinal portion of dulcamara. The extract and decoction are officinal, but the former is of doubtful virtue and is seldom used. The officinal decoction can be depended on only when it is of a bright green color and has the characteristic odor and taste of the fresh plant. It should always be well stirred before being taken. From one to two fluid-ounces should be administered three or four times a day, and the dose gradually increased until the characteristic effects of the medicine begin to appear. It may be mixed with milk to conceal its nauseous taste. A hydro-alcoholic extract prepared in vacuo would probably be more efficient than the decoction of dulcamara.

CANNABIS INDICA.—INDIAN HEMP.

DESCRIPTION.—*Cannabis* is an annual plant of the natural order Cannabinaceæ. The Indian variety, *C. Indica*, is much larger and stronger than *C. sativa*, and reaches a height of twelve or fifteen feet. It has an erect, branching, angular stem, and deeply-incised palmate leaves, with acutely dentated edges. The male and female flowers are upon the same plant, and grow in axillary clusters. The fruit is ovate and one-seeded. The seeds yield oil abundantly.

The medical properties of the plant reside in a resinous substance which exudes from glands upon the surface of the stalks and leaves, and which is also procured by boiling the tops in alcohol and evaporating to the consistence of an extract, which is officinal (EXTRACTUM CANNABIS). This substance is of a dark olive-green color, soft and adhesive when warmed, has a fragrant narcotic odor, and a bitter and acrid taste. It is soluble in alcohol and ether, but not in water. The resin separated from the gum, albumen, lignin, &c., with which it is associated has received the name of *cannabin*.

HISTORY.—Herodotus is reported by Hesychius as saying that the Scythians make use of hemp-seeds to dry up the semen,[1] and Pliny also states that this power is attributed to them.[2] Diascorides recommends them in the form of a cataplasm to soothe inflammations and discuss tumors.

The Chinese were acquainted with hemp as an anæsthetic as early

[1] THEOPHRASTUS, ed. Bodæus, p. 945. [2] Hist. Nat., lib. xx. cap. xcvii.

as the third century of the Christian era. According to Stanislas Julien, a celebrated Chinese physician named Hoa-Tho (A. D. 220) operated on his patients after having rendered them insensible by means of a preparation of wine and hemp powder (Martius), or, adopting another version, by means of hemp alone. "Then, according to the case, he made openings and incisions, performed amputations, and removed the cause of mischief; he then brought together the tissues with points of suture and applied liniments."[1]

About the eleventh century of the Christian era there arose in Persia the famous sect of the *Assassins*. The persons held to be worthy of membership in this bloody community were subjected to the most seductive impressions while under the influence of the haschisch, and led to believe themselves the chosen instruments of a supernatural power. The chief of the sect alone possessed the secret of its use. The novice was invited to his table and there intoxicated with this substance. He was then carried into a delicious garden where he enjoyed, as a foretaste of heaven, all those sensual and enervating delights which the Prophet has promised to his followers. At last, overcome by them and the narcotic influence of the drug, he was removed to his former situation, and on awaking was persuaded by his wily tempter, as well as by his own recollections, that he had partaken of the bliss of Paradise. Haschisch was used to produce a pleasurable intoxication, a state of ecstasy, and not, as some relate, for the purpose of throwing those to whom it was administered into a state of madness and frenzy, during the continuance of which they performed the most barbarous actions, and, running a muck, became promiscuous *assassins*. The derivation of the word is in this wise: *Haschischa*, which signifies merely *plant*, became the title of this, which was esteemed the most excellent or potent of all plants, and from it the name *Haschischin* was derived to distinguish those who, by means of its intoxicating properties, were initiated into the mysteries of the sect. Hence the modern word *assassin* has come to signify one guilty of the peculiar crime of the *Haschischin*.[2] The mischievous effects of haschisch are said to have caused its prohibition in Mohammedan countries until the fifteenth century, when Sultan Ahmed permitted its use, which soon became general, and, according to the historian, brought on the corruption and degradation of the human race.[3] Ebn Baithar states that in large doses the drug induces

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[1] Snow on Anæsthetics, p. 4.

[2] M. de Sacy, Von Hammer's History of the Assassins, Lond. 1835.

[3] Bouchardat, Manuel, p. 53.

extreme lassitude with delirium, that its habitual use weakens the intellect in a remarkable manner, and that excessive doses produce a maniacal condition terminating in death.[1] Its effects were witnessed at Amboyna by Rumphius in 1695. He calls it *herba stultorum*, and says that throughout India the leaves and seeds are extensively used to dispel anxiety and excite agreeable dreams; that a maniacal state sometimes ensues; that he has known it to cause, when smoked with tobacco, a frantic pugnacity in some, sardonic grins and menaces in others, and lamentations in others.[2] Nearly the same effects are ascribed by Chardin to the immoderate and protracted use of the drug among the Persians.[3]

But the use of hemp to produce intoxication is not confined to the Orientals. The plant is said to be cultivated by the Hottentots for the purpose of smoking only, and it is used in like manner by the negroes of Brazil, who doubtless brought the habit with them from Africa. In Russia, Poland, and other neighboring countries, the peasants are extremely fond of parched hempseed, which they eat upon black bread with a little salt, and even the nobles of these regions when hunting or travelling find it an agreeable condiment.[4] It is related that remaining long or sleeping in a field of hemp has produced feebleness of sight, vertigo, and intoxication. But such power in the hemp of temperate or cold climates may fairly be called in question, for the product in which the active properties of the plant reside scarcely exists beyond the regions which lie within or border upon the tropics. Even in Persia, it is asserted by Kœmpfer, that the hemp which grows near Ispahan and in some other places, alone possesses the intoxicating qualities which have rendered it so famous, and that the seed obtained from these localities and sown elsewhere will not produce a plant of equal powers. These differences have been explained as follows.[5] The extraordinary symptoms produced by the Asiatic hemp depend on a resinous secretion with which it abounds, and which seems totally absent in the European kind. Nor, according to Mr. Jameson, does it exist even in the Indian hemp which grows upon the plains. In Central India it is collected in the following manner: a man clothed in leather passes in every direction through the hemp fields, and allows the branches of the plant to brush against him, the resinous exudation adheres to his clothing, and is afterwards scraped off and rolled into balls for sale. Dr. Royle compares this glandular, resinous secretion to that which forms in the

[1] Edit. Sontheimer, ii. 328.
[2] Herbarium Amboinense, v. 208.
[3] Murray, Apparat. Med., iii. 613.
[4] Murray, loc. cit.
[5] O'Shaughnessy, On the Preparations of the Indian Hemp.

strobiles of hops and constitutes their active portion; he also states that it is collected by the natives by pressing the upper part of the young female plants between the palms of their hands, and then scraping off the secretion which adheres.

The principal forms in which hemp is met with in the markets of the East are, 1. *Haschisch* (which signifies *the* herb *par excellence*), is the Arabian name, and *Gunjah* is the Indian appellation given to the dried tops of the plant gathered some time before the seeds reach maturity. It is resinous to the touch, and its odor is agreeably narcotic.[1] 2. *Bhang*, an Indian preparation consisting of the larger leaves and capsules. It is the cheapest form used in India. 3. *Churrus*, which is the resinous secretion of the hemp mixed with a variable proportion of the leaf fibres.[2] 4. Other preparations are made by mixing the resinous product or the powdered plant itself with various aromatics and stimulants, such as musk, essence of roses, and cantharides. A highly excitant compound is formed in this manner, and one well adapted to produce some of the symptoms which Eastern observers ascribe to haschisch, but which the unadulterated plant and its resin create but slightly, if at all.

In 1839, attention was called to the properties and medicinal virtues of cannabis by Dr. O'Shaughnessy, Professor of Chemistry in the Medical College, Calcutta, who had enjoyed many opportunities of studying its effects in disease, and of witnessing the phenomena occasioned by it when used to produce intoxication. Subsequently its virtues were tested by numerous competent observers, who made good its claim to a permanent place in the materia medica.

Action. *On Animals.*—It is asserted by some authorities that the water in which hemp is steeped to prepare it for manufacture, is capable of poisoning animals that drink of it. A veterinary surgeon, M. Dubaud, has known seventeen horned cattle to perish from this cause in the course of three years. The French government, regarding this influence as certain, forbids the process of hemp rotting in running water. Yet Parent-Duchâtelet states that he and his family drank with impunity water in which this operation had been carried on. The effect probably depends on the quantity of the active principle of the hemp contained in the water, and must, therefore, vary according to the extent of the reservoir, &c., in which the rotting is conducted. M. Liautaud found in some experiments upon animals,

[1] P. Alpinus says: "Assis nihil quidem aliud est, quam pulvis ex cannabis foliis paratus, quem cum aqua dulci mistum in massam redigunt."

[2] Dr. A. Christison, op. cit.

that the preparations of hemp invariably produce in carnivorous animals and fish a sort of intoxication manifested by vacillating movements, dulness, and sluggishness, while herbivorous animals offered no sign of its influence in whatever dose it was administered.[1] The experiments made by Dr. O'Shaughnessy gave essentially the same results. In none of them, he remarks, "was there the least indication of pain, or any degree of convulsive movement observed. They all tended to demonstrate that, while carnivorous animals and fish, dogs, cats, swine, vultures, crows, and adjutants, invariably and speedily exhibited the intoxicating influence of the drug, the graminivorous, such as the horse, deer, monkey, goat, sheep, and cow, experienced but trivial effects from any dose we administered." The experiments performed by M. Mabillat led to a similar conclusion.[2]

On Man.—Of the action of haschisch many and various descriptions have been given which differ so widely among themselves that they would scarcely be supposed to apply to the same agent, had we not every day a no less remarkable instance of the same kind before us, in the case of alcohol. As the latter enlivens or saddens, excites or depresses, fills with tenderness or urges to brutality, imparts vigor and activity, or nauseates and weakens, so does the former give rise to even a still greater variety of phenomena, according to the natural disposition of the person and his existing state of mind, the quantity of the drug, and the combinations in which it is taken.

P. Alpinus describes briefly the effects of haschisch (assis) as being a sort of drunkenness, in which men act madly, or continue for some me in a state of ecstasy enjoying delightful visions.[3] The account furnished by Dr. O'Shaughnessy of the delirium produced by the incautious use of hemp in India, is more particular. "The state is at once recognized by the strange balancing gait of the patient, a constant rubbing of the hands, perpetual giggling, and a propensity to caress and chafe the feet of all bystanders, of whatever rank. The eye

[1] Dieu, Matière Médicale, iii. 401 and 414, and Bouchardat, Manuel, p. 54.

[2] Des effets physiol. du chanvre, Strasbourg, 1858.

[3] P. Alpinus speaks also of a preparation procured from India, and highly prized by the Egyptians, but whose composition is unknown. He calls it *bernavi*, and thus describes its effects. "Ab assumpta uncia hujus electuarii, homines primo hilares fieri incipiunt, multaque loquuntur, et canunt amatoria, multumque rident, aliaque deliramenta læta produnt, quæ amentia fere per horæ spatium in his perdurat; a qua iracundi fiunt, in iramque præcipitantur, effrenesque redduntur, in qua parum persistunt; demum iidem sic tristari incipiunt, tantoque mærore atque tristitia, et timore angi, ut continue plorent et lamententur, quæ paulo post, ab his deliramentis multum fessi somno correpti, digerunt, ac finiunt redeuntes ad pristinam sanitatem."—*De Med. Ægypt.*, lib. iv. cap. ii. p. 262.

wears an expression of cunning and merriment which can scarcely be mistaken. There is no increased heat or frequency of circulation, and the skin and general functions are in a natural state." But, as was remarked, the effects vary extremely in different cases. In some, mere laziness and stupidity are induced; in others a pleasing state of reverie without any other remarkable condition; and many break into loud laughter, or fits of dancing and singing, and manifest venereal appetite, or an inclination to quarrel, according to their various dispositions. In many there is a remarkable desire for food, which the person eagerly devours, while at the same time he does not appear to be satisfied, and can with difficulty control his appetite. After the stage of excitement sleep supervenes; and, on waking, the experimenter returns to his natural state, except that the ideas are often confused for a little, and in some cases vertigo is present to a slight extent.[1] M. de Chaniac[2] says that it usually exaggerates the thoughts which fill the mind at the time when it is taken, yet it generally tends to excite mirthful ideas. One of its most ordinary effects is to cause repeated bursts of laughter, which are sometimes scarcely suspended for several hours.

The mental effects of cannabis when fully developed are exceedingly curious, provided the subject be one possessing the imaginative faculty in a high degree. One of the best descriptions of them is the following by M. Moreau of Tours,[3] of the effects of a full dose of the drug. "There is a slight acceleration of the pulse, with a somewhat retarded respiration, and a genial warmth diffuses itself through the body with the exception of the feet, which are usually chill. The wrists and forearms seem as if loaded with a weight, and movements are automatically performed as if to shake them free. At the same time, vague muscular sensations (known in English by the expressive term *fidgets*), prompting to continual restlessness, are experienced in the lower extremities. A very common feeling is that of the brain boiling over and lifting the cranial arch like the lid of a teakettle. . . These and other disagreeable feelings generally both precede and follow the *fantasia*, as it is called, or the dreamy ecstasy, to enjoy which the drug is generally taken. It is really *happiness* which is produced by the haschisch; and by this is implied an enjoyment entirely intellectual, and by no means sensual, as we might be induced to suppose. The haschisch-eater is happy not like the gourmand or the famished man when satisfying his appetite, or the voluptuary in the gratification of his amative desires, but like him who hears tidings

[1] Dr. A. Christison, loc. cit.
[2] Annuaire de Thérap., tom. xiii.
[3] Brit. and For. Med. Rev., Jan. 1847.

that fill him with joy, &c.;" in other words, he is absorbed by a consciousness or internal sensation of happiness without reference to any definite cause producing it or any object towards which it tends.

M. Aubert describes the influence of haschisch upon him in the following terms: "I was engaged in conversation when I felt a prickling sensation in my feet, and in my head a stricture which gave way suddenly, and my skull seemed empty. Every object wore a new aspect; my companion's face assumed a grotesque expression; I burst out a laughing and continued to laugh for almost an hour. The merest trifle renewed my mirth. Meanwhile the most various and whimsical ideas coursed swiftly through my mind. I experienced the most perfect sense of comfort. For me there was no longer past, present, or future; the fleeting moment limited my whole existence. Then followed a calm, and sleep stole over me. The whole night was but one long delightful dream. On awaking, I remembered perfectly all that had taken place, and my head was not heavy nor my mouth dry, as it would have been after a debauch in opium or wine."[1]

Dr. A. Christison made several experiments with the extract of cannabis, and, in the paper above referred to, has related their results, of which the following is a summary: "On trying Mr. Robertson's extract once for toothache, I found that about four grains taken about 3 A. M. caused in an hour cessation of pain, a pleasant numbness of the limbs, giddiness, a rapid succession of unassociated ideas, and impossibility to follow a train of thought, frequent intervals of sleep, and slight increase in the force of the pulse. Next morning there was an ordinary appetite, much torpidity, great defect and shortness of memory, extreme apparent protraction of time, but no peculiarity of articulation or other effect; and these symptoms lasted until 2 P. M., when they ceased entirely in a few minutes after taking lemonade. . . . . On another occasion, I took one grain of the extract dissolved in spirit. I felt a peculiar numbness creeping through my body and limbs. On lying down, the numbness continued, but in fifteen minutes my sensations became agreeable. I laughed heartily several times, answered questions incoherently, and immediately forgot what they were about and what I had answered. Delightful reveries came over me, and whatever I looked at became lost, as it were, in a maze; the lamp appeared to be slowly turning round, and when I lost sight of this, the red lines on the paper of the room appeared to intertwine in a most beautiful manner. The most

[1] Dieu, op. cit., p. 411. Some other cases will be found in Bull. de Thérapeut., xxxiii. 248; Dierbach, op. cit., iii. 1169; Pereira, Mat. Med., ii. 213.

remarkable effect was the constant succession of new ideas, each of which was almost instantly forgotten. When roused to tea, I eat ravenously without feeling satisfied. I slept soundly at night afterwards, and the next day was stupid and forgetful, but was much improved by drinking lemon-juice."

It would unduly extend this description to present even an abstract of the interesting experiments performed by Schroff and by Mabillat;[1] they presented all of the phenomena which have been signalized by the observers already quoted, and also some which have been less fully described by other writers. In particular, general sensibility was materially affected. Under the primary influence of the drug, the whole body was the seat of sensations compared to those produced by slight electric sparks, and an acrid heat was felt wherever the skin was pressed. Subsequently, there was universal anæsthesia, while the mind continued clear; there was no consciousness of the contact of the feet with the ground, or of other parts of the body with surrounding objects; the very muscular sense appeared enfeebled or lost, and that of pain was blunted or entirely destroyed.

Dr. John Bell, of New Hampshire, in a very interesting account of the effects produced by the drug upon himself, alludes particularly to a sort of double consciousness, in which, while the sense of personality was perfect, the reality of the strange sensations felt, and of the visionary objects seen, appeared to be equally absolute. This, however, gradually merged into the fullest and most complete belief in the actual existence of a thousand hallucinations.[2]

In several of the accounts that have now been cited, allusion is made to the power of hemp to stimulate the venereal propensities. The editor of the *Edinburgh Medical Journal* states that during a residence at Tetuan, in Barbary, he learned that the Moors are said to use the drug as an aphrodisiac, and ascertained that among the Jews it was taken secretly by very many as an excitant to venery. But for this purpose it seems to have been combined in a conserve with opium. Sterility among the women and impotence among the men is exceedingly common in Barbary, so that, according to this author, one out of every twelve of the married Jewesses in that country are either barren or have borne only one child.[3]

The preceding extracts present the most interesting phenomena produced by the administration of cannabis. They correspond very nearly with those which the Orientals seek to produce by means of

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[1] Des Effets Physiologiques du Chanvre, Strasbourg, 1858.

[2] Boston Med. and Surg. Journ., April, 1857, p. 209.

[3] Month. Journ. of Med. Sci., i. 58.

this drug. But a different class of symptoms is sometimes occasioned by its use. Dr. Lawrie, physician to the Lock Hospital, of Glasgow, reports twenty-six cases in which cannabis was administered.[1] In reviewing them, the reader is struck by the almost total absence of that pleasurable intoxication described above. In many nausea and vomiting were produced; in several there were convulsive paroxysms; frequently the thirst was distressing; the pulse was rendered frequent, weak, and intermittent; the pupils were largely dilated, and, on the whole, the effects of the drug were so far from agreeable that "the majority of those who took it once only did so a second time on compulsion." The contrast of these with the above-related results is very remarkable, and the more so because the most of Dr. L.'s patients belonged to a class of persons habitually greedy of stimulants. Dr. Christison, in noticing these cases, insists that they are exceptional ones, and moreover that all of the patients were females, and that the medicine was not administered in sufficiently large doses. But it appears more rational, because more consistent with experience in regard to cerebral stimulants in general, to explain these discrepancies by a reference to the mental habits of the persons in whom the phenomena occasioned by hemp were observed. The impressionable and imaginative Oriental and the highly-educated and refined European must, under any cause of mental excitement, display a very different class of phenomena from the illiterate peasant, or the wretched and generally ignorant creatures who formed the subjects of Dr. Lawrie's experiments. A similar contrast has been alluded to in the history of opium, and it would be far more extraordinary that persons of such opposite mental conditions should exhibit identical symptoms from the same stimulus than that they should be affected in the manner that has been described.

The habitual abuse of this drug entails consequences no less mischievous than are produced by alcohol and opium; the face becomes bloated, the eyes injected, the limbs weak and tremulous, the mind sinks into a state of imbecility, and death by marasmus is the ultimate penalty for the overstrained pleasures it imparts.

We are not acquainted with any case of death directly resulting from the poisonous action of cannabis. But several are recorded which illustrate its effects in excessive doses.

In one, a Moor, of Algiers, under the influence of undue indulgence in smoking haschisch, became furious, and assaulted a number of Jews, seven of whom were more or less seriously injured, and one

[1] Month. Journ. of Med. Sci., iv. 939.

died. He afterwards professed that he remembered nothing whatever of the occurrence.[1]

In several other cases there was observed loss of consciousness, collapse, or stupor, with an insensible pupil, pale, clammy, and insensible skin, extreme debility, and a small, feeble pulse. In one instance a fear of death and belief that it was imminent was observed, and in another, that of a Mussulman, there was a well-marked cataleptic condition, so that any limb remained elevated, flexed, or in whatever position it was placed by the attendants.[2]

Remedial Employment.—As a remedy for disease, cannabis has been chiefly applied to spasmodic and painful affections, and in several of these its curative powers are unquestionable; but whether they can be placed upon the same level with opium, or even belladonna, is a question which can scarcely at present be answered in the affirmative. Since, however, these medicines cannot be administered in very large doses without some risk to life, it is probable that cases may occur in which the superior safety of cannabis may compensate for its inferior power, and therefore it may appropriately occupy a place in the Materia Medica.

Tetanus.—The cases of this affection recorded by Dr. O'Shaughnessy undoubtedly demonstrate, as the author remarks, that when given boldly in large doses the resin of hemp is capable of arresting the progress of this formidable disease, and in a large proportion of cases of effecting a perfect cure. The cases alluded to were all of the traumatic form. The following may be taken as a specimen. A female, æt. 25, had had tetanus for three days, the consequence of a cut received upon the elbow a fortnight before. When admitted into the hospital the symptoms were violent, and on the evening of the same day three grains of hemp resin were given her at bedtime, and repeated on the following day. The next morning she was found in a state of complete catalepsy, and remained so until evening, when she became sensible, and a tetanic paroxysm recurred. The hemp was resumed, and continued in two-grain doses every fourth hour. From this time until the third dose was taken tetanic symptoms returned. She subsequently took a grain twice a day until the fifth week after her admission, when she left the hospital apparently quite well. Prof. Miller, of Edinburgh, says: "My own experience speaks loudly in favor of the hemp. I can now record three fortunate cases under its

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[1] Brit. and For. Med.-Chir. Rev., xxi. 535.

[2] Compare Edinb. Month. Journ., March, 1852, p. 270, Dublin Quart. Journ., Aug. 1858, p. 229, and Times and Gaz., Feb. 1859, p. 185.

use, all traumatic tetanus, and a case which proved fatal, but where great alleviation of suffering was produced." In some of the cases a tolerance of the remedy was observed similar to what occurs under like circumstances when the disease is treated with opium.

Two cases of trismus nascentium are reported by Dr. P. C. Gaillard,[1] and of the traumatic form of tetanus one case by Mr. Skues,[2] one by Mr. Cock,[3] and one by Dr. Bailey, as cured by cannabis.[4]

It is proper to add that in several cases reported by Dr. Duncan and others there was neither palliation nor cure of the disease; but, owing to the complete absence of the symptoms peculiar to intoxication by cannabis, there is reason to surmise that a feeble or even a worthless preparation was administered.

Neuralgia, *Rheumatism*, *&c.*—In the first-named disease, the preparations of hemp have been found to palliate the symptoms very generally, and in not a few intances to effect a perfect cure. Dr. Donovan has reported many such,[5] and Dr. Clendinning,[6] Sir James Murray,[7] and Dr. C. B. Williams, have added to the number; but whether the preparation used by them was not strong enough or not always given in sufficiently large doses, its effects were certainly not comparable to those of belladonna or stramonium in the same affection. In some cases of *rheumatism* the action of cannabis appears to have been salutary, yet so far inferior to that of the more familiar remedies for this disease, as to entitle it to a very secondary position in the long list of anti-rheumatic medicines.

In *chorea* Dr. C. Williams found that cannabis palliated the agitation of the muscles, but exerted no decidedly curative influence.[8] Dr. Corrigan, however, has published three cases, one of which was inveterate, but all of them cured by this medicine,[9] and Dr. Storer one of several months' duration, and which became worse under the administration of carbonate of iron, but rapidly improved and finally recovered when the tincture of cannabis was given in doses of six drops three times a day.[10]

As a *hypnotic* it is recommended by Dr. A. Christison, especially where opium from long-continued use has ceased to produce its proper effects. The same writer mentions a case in which the medicine entirely allayed the intense itching of eczema while the patient con-

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[1] Charleston Med. Journ., viii. 808.
[2] Edinb. Med. Journ., iii. 877.
[3] Times and Gaz., July, 1858, p. 8.
[4] Charleston Med. Journ., xiv. 348.
[5] Dublin Med. Journ., Jan. 1845.
[6] Med. Times, No. 192.
[7] Dublin Med. Press, March, 1843.
[8] Lancet, 1842–3, ii. 266.
[9] Med. Times, and Bull. de Thérap., xlviii. 234.
[10] Boston Med. and Surg. Journ., Oct. 1855, p. 209.

tinued under its effects, and procured for him refreshing sleep which no other means could obtain. The influence of cannabis in dissipating *hallucinations* of vision and hearing, has been very marked in some cases reported by Moreau.[1]

The exhilarating effects of cannabis led M. Moreau to conjecture that it might prove a valuable remedy in *melancholy*, and in some trials that he made of it, a temporary amendment resulted. M. Brierre de Boismont made similar experiments, but without any encouraging results. Cannabis has also been employed with satisfactory effects in the treatment of *delirium tremens*.

From some experiments, cannabis would appear to excite contractions of the uterus. Dr. Churchill states that it has been successfully tried by himself and other physicians in Dublin, to moderate or arrest *uterine hemorrhage*, such as is so apt to occur at the period of the cessation of the menses. The preparation used was the tincture of the resin, and was given in doses of from five to fifteen or twenty drops three times a day. Its effects in many cases were very marked, often instantaneous, but generally complete after three or four hours. In some few cases of ulceration of the womb with hemorrhage, it seemed to be equally beneficial. Preparations of hemp are reported to resemble ergot in another respect. It was found by Dr. Christison to possess a remarkable power of increasing the force of *uterine contraction* during labor. It augments the intensity and sometimes the duration of the pains, and shortens the interval between them. These effects of cannabis come on more quickly than those of ergot; they are more energetic, and perhaps more certainly induced, but at the same time of shorter duration. Unfortunately, however, they are far from certain to follow the administration of the drug. Dr. John Grigor administered it in sixteen cases, but in nine of these no increased uterine action was perceptible, while in the remaining five it increased the contractions in strength and frequency. It did not manifest any anæsthetic effect. The preparation employed was a solution of 24 grs. of the extract in an ounce of alcohol, of which from 25 to 35 drops were given at a time.[2]

ADMINISTRATION.—"The extract in the form of pill produces the most gradual effect, but its action is very uncertain." (*Christison.*) Its dose is from one to six or more grains. The tincture may be taken in doses of from ten drops and upwards in sweetened aromatic water. It should contain three grains of the extract to a drachm of alcohol.

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[1] Bull. de Thérap., li. 283, 375.

[2] Month. Journ. of Med. Sci., Aug. 1852, p. 124.

This preparation should be swallowed immediately on its being added to the water. But whatever form is used, it should first be proved to possess active properties by experimental doses given to healthy persons. Lemon-juice, according to Dr. Christison and other writers, has the power of modifying the intoxicating effects of cannabis, and even of suspending them entirely. An emetic of salt and water is said to remove the intoxication at once. Even spontaneous vomiting diminishes it sensibly. In the East, tobacco and coffee are used to increase and sustain the action of the drug.

ANTISPASMODICS.

ANTISPASMODICS are stimulant medicines which control spasm by their action upon the spinal marrow rather than upon the brain. Spasm is the abnormal involuntary contraction of muscular fibre. It may be tonic or clonic. Tonic contraction is permanent, clonic contraction implies alternate rigidity and relaxation of the affected muscles.

Three classes of spasmodic affections may be recognized, which arise from as many different kinds of causes.

First, and least directly related to our present subject, are those in which the blood contains a poisonous matter generated within the system, consisting of retained excreta, as in Bright's disease, idiopathic jaundice, &c.

Second, direct mechanical irritation of the nervous centres or cords, as in traumatic tetanus, wounds and inflammation of the brain or spinal cord, mechanical irritation of these parts by injuries, effusions, tubercles, exostoses, and other tumors. To these may be added sudden congestion and excitement of the brain followed by exhaustion, as in violent paroxysms of passion.

Third, direct exhaustion of the system. Various causes may lead to this result. Physical fatigue produced by prolonged muscular exertion frequently occasions either general convulsions, or spasms (cramps) of those muscles which have been especially overtasked. The exhaustion following protracted mental excitement, or an intense strain of the feelings, operates in the same manner, and such is often the effect of depressing passions, or sexual excesses (in which a mate-

rial loss is added to overwrought emotion), and, above all, impoverishment of the blood, whether produced by hemorrhage, by defective nutrition, or by an imperfect supply of the vital stimuli light and air. To these last-mentioned and indirect causes producing anæmia and the nervous diathesis must be added the influence of insufficient muscular exercise, and the simultaneous operation of agencies tending to over-stimulate, and therefore to exhaust, the nervous system.

All, or nearly all, of these causes abound in large cities, where the tainted atmosphere, the perpetual turmoil, the incessant activity of all the passions, and those especially which seek for gratification in luxury and ease, lower the tone of the system, blanch the skin, impair the blood, soften and waste the muscles, and at the same time so exalt the susceptibility of the nervous system that it shrinks from the impression of ordinary sensations, exaggerating, distorting, and misinterpreting them. The eye is averted from the light of day, which is shut out by delicately-tinted curtains; the ear dreads the harsh sounds of the working world, and carpets and tapestry deaden its echoes; intoxicating perfumes mask the noisome smells from all surrounding decay; none but the softest and most delicate tissues and the most polished forms encounter the touch, and only the most dainty food invites the fastidious palate. Modern voluptuaries, like the ancient Sybarites, would fain forbid by law all noisy crafts, and let no cock survive to disturb their morning slumbers with his "shrill clarion." The imagination meanwhile dwells in fairy land, far away from the substantial glories of nature and their invigorating power, and the passions, finding none of the nobler objects which consecrate them in the battle of life, consume the body in the fire of sensual excess. Thus, losing more and more of its power, the whole system gradually falls into the condition of a musical instrument that is out of tune, whose keys, when struck, no longer give harmonious notes, but only jangled and discordant sounds. To use the technical, but strongly expressive, phrase, it has lost its *tone*.

This word is even more significant here than in its application to that mere relaxation, without nervous disorder, which has been described as the peculiar subject of a tonic treatment. In that case there was a loss of power; in this there is a want of harmony in the functions, and an absence of the unity which in vital processes, as in all compound actions, is essential to strength. As might be expected, from the extreme susceptibility and mobility of her nervous system, woman much more frequently than man illustrates the laws or displays the phenomena of spasmodic affections, whether this be owing to some radical difference in her general organization from that of

man, or whether it depend upon the special organs which in so striking a manner distinguish her from the opposite sex. Certain it is that, even during the normal periodical activity of the generative organs, the female exhibits a peculiar susceptibility to external impressions, and experiences internal sensations with a keenness of perception which is almost morbid. A step further, and we find many women at ordinary times betraying no symptom of deranged health, but who at the menstrual epoch appear suddenly to have changed their nature; the unity and harmony of their system are broken up; each separate organ utters in its own language its peculiar cry of distress; sharp pains rack the head, the eyes refuse to bear the light, incessant buzzing or tingling noises distract the ears, spasms seize the throat and hinder swallowing, or the chest, and oppress or hurry the breathing, the abdomen, and strain it with ineffectual retching, or fill it with the racking pains of uterine colic. Every sound and sight and contact gives a new impulse to the anguish, causing involuntary startings and causeless alarms, and not infrequently these struggles of the body end in a violent convulsion of fully-formed hysteria. The symptoms of functional nervous disorder are, indeed, almost infinite, and are really limited only by the number of perceptions of which the brain is capable. Besides those just enumerated, may be mentioned the illusions or phantasms which fill the vision, and which are often of a grotesque or frightful character; or, on the other hand, the brain may be oppressed with a lethargy like that produced by opium; somnambulism and ecstasy are also met with; the organs of the special senses may be inordinately excited, or as remarkably enfeebled; and even the muscles, both voluntary, and involuntary, rigidly contracted, or as utterly relaxed as if their connection with the nervous centres had been severed.

It is a peculiarity of nervous diseases that they are, so to speak, self-generating. Their first occurrence predisposes to their perpetuation. This probably depends upon a double cause. On the one hand, it is to be observed that all employment of nervous energy is at the expense of the nutrition. Scarcely anything, hardly even direct loss of blood, more thoroughly exhausts the strength than violent nervous commotion. Pain may kill, and so may a shock without pain. Hence every paroxysm of a convulsive nature leaves the patient languid, exhausted, feeble, inapt and indisposed to all exertion, and consequently ever becoming more and more liable to a renewal of the attack. On the other hand, the nervous system is prone to form habits of action. A movement once performed, tends to reproduce itself, at first consciously, and, by habitual repetition, unconsciously

at last. The notes that were at first struck, one by one, with painful and awkward efforts, are at last formed into a flowing melody, in which the mind has no consciousness of the individual sounds. Every day, in our ordinary and habitual pursuits, we perform a thousand acts of which we take no notice, and of which we probably have no intellectual perception. Those which at first are voluntary, tend, little by little, to pass into the domain of instinct, or, still further beyond the control of the will, into that of excited or reflex actions, in common with the organic movements upon which nutrition depends. Thus, by exhausting the power and therefore lowering the tone of the system, and by the tendency of all nervous acts to become habitual, disorders of the nervous system, and those especially which involve the motory function, perpetuate themselves indefinitely.

The body, with its multiplicity of organs all tending to carry it forward in life steadily and safely, is a chariot drawn by many steeds, whom Archæus, the charioteer, gathering their numerous reins, guides with an unwavering hand; but whenever one more restive than the others bolts from the path or rears in the traces, the rest are thrown into confusion, and but for the soothing word, the strong curb, or the stinging lash, might dash the vehicle to pieces. The organs are united and harmonious so long, and only so long, as the tone of the system is strong enough to prevent or to repress the outbreaks of individual parts. Each leans upon the rest, and all combine to preserve and to enliven the organism; but no sooner does the moderating power of the nervous system relax, than their silent and consentaneous movements cease, and one or two, many or all the parts may be thrown into disordered action, which becomes the worse confounded and inextricable the longer it lasts. There is no greater marvel among the wonders of the living mechanism, than the noiseless ease with which its manifold functions are performed so long as perfect health continues. But for the cravings of hunger, or the calls of nature, the man of sound constitution would scarcely suspect that there was within him a complex and surpassingly ingenious mechanism. Weakness immediately betrays the secret. No sooner is strength impaired than each organ begins, as it were, to make its individual presence and influence felt, by its disordered movements, or by the voice of pain.

A simple reference to the first and third classes of the causes of functional spasmodic diseases which have been above enumerated, makes it plain that they are all of a depressing nature, whether they operate directly upon the nervous system through the mind, or indirectly through the blood and the function of nutrition. The second class of causes, on the other hand, comprises those which, while the

organism maintains its normal vigor, excite spasm by their excessive irritation of the nervous system. In other words, spasm occurs when the power of resistance of the system is below the normal limits, although the excitant may not be excessive; and it is equally produced when the system retains all its vigor, if the excitant is greatly in excess of the normal degree. In the latter case it is evident that a treatment is called for which shall diminish the violence of the cause, if possible, and blunt the sensibility of the system to its impressions. In the former case, on the other hand, it is equally clear that the proper balance of the system is to be restored by infusing power into the nervous system, and thus bringing its parts again into harmonious action. The return of power to this system renews its tone, but its irritability at the same time declines; for the last-named quality is always in an inverse ratio to the former. This is indeed illustrated on a large scale by a comparison made between warm and cold-blooded animals. It is the former which display the least, and the latter which exhibit the greatest, degree of irritability; and, as is well known, these are always selected as the subjects of experiments intended to illustrate the excito-motory function. Indeed, the muscular fibre of the frog forms one of the most delicate tests of the lower degrees of galvanic action. When the power which the brain possesses of regulating movement is withdrawn or impaired, excited, spinal, or convulsive actions occur under the influence of irritants which at other times would occasion no response in the muscular system. Hence it is that all spasmodic phenomena which are not directly the effect of mental influences occur most readily during sleep, and that in decapitated animals muscular spasm can be excited with the greatest facility.

Bearing in mind that two sorts of causes, alike in nature but opposite in their relation to the animal economy, may give rise to spasmodic phenomena, that the one is excessive in relation even to the average vigor of the system, and that the other may be so slight as only to manifest its operation when the nervous sensibility is morbid, it is easy to comprehend that both sedatives and stimulants may act as antispasmodics, and more particularly that medicines which in small doses excite the nervous system, but in large ones depress it, may exert such an action. It has been seen elsewhere that this is a property of narcotics, and that opium especially, when freely administered, will control the most violent forms of certain convulsions. This it appears to do by blunting the sensibility to pain, and the irritability due to mechanical causes, as foreign bodies in tetanus; and two antispasmodics, ether and chloroform, operate in a similar manner when duly administered. But whenever spasm arises from less intense

causes acting upon a highly susceptible organism, relief is not to be sought by plunging the system into a torpid state, such as is produced by narcotics, but by stimulating it through the gentle and peculiar action of antispasmodics.

These medicines palliate and terminate spasm as an immediate and direct effect, and not, as narcotics do, by benumbing the sensibility; but their precise operation is so peculiar as to entitle them in an eminent manner to be classed alone. Undoubtedly they are nearly all stimulants when prescribed in antispasmodic doses. Ether and chloroform, and the latter especially, have been considered sedative in their operation, and justly, no doubt, when used as anæsthetics. This is emphatically true of chloroform. As regards ether, however, it had long been used as a nervine, and even as a cerebral stimulant, long, indeed, before its anæsthetic powers were discovered; and even now it occasionally displays stimulant properties alone in whatever dose it may be administered. Its associated medicine, chloroform, is not less unquestionably a stimulant of the nervous system whenever its action is restrained below the point of anæsthesia. Valerian, assafœtida, castor, musk, and camphor, all produce more or less exhilaration of the mind, some increased frequency of the pulse, and some warmth of skin. Wherefore, it cannot be doubted that they all allay nervous disorder, in some cases alone, and in others associated with adynamia, or prostration depending upon pravity of the blood and nervous exhaustion as the effect of such a change in the circulating fluid, by a direct stimulant influence upon the nervous centres. The typhoid state, whether it occur in the so-called typhus and typhoid fevers, or as a phase of other febrile affections, often presents in a high degree a spasmodic derangement of the nervous system, and just in so far as it depends upon direct debility of this system, more than upon alterations in the constitution of the blood, will it be modified favorably by medicines of the present class. That is to say, when this state is developed in the course of such diseases affecting persons of a constitutionally nervous temperament, or who have become impressionable by loss of strength, or the operation of mental influences, antispasmodics will be more efficient in promoting recovery than where the ataxic phenomena depend more directly upon the violence of the disease itself. In such cases, that is, when ataxia grows out of adynamia resulting from profound changes in the blood, alcoholic stimulants are alone entitled to the physician's confidence. For the class of diseases now referred to, antispasmodic medicines are not as frequently used by the physicians of any other country as by those of Germany. Thus in Great Britain and Ireland, where typhus is endemic, these remedies

appear to occupy a very secondary position, if any at all, in the treatment of this disease. But we are persuaded that by keeping in view the distinction above insisted upon, and limiting their administration to cases in which ataxia depends upon the patient's constitutional susceptibility, rather than upon the morbid changes in the blood, they will be found in many cases prompt and certain remedies.

But, as has so often been repeated, antispasmodics are principally adapted to the cure of diseases which are either primarily seated in the nervous system, or in which the extraneous cause of its disorder is inconsiderable when compared with the spasm which it produces. In the former, pure antispasmodics are frequently sufficient to effect a cure, or at least to dissipate the symptoms of the existing paroxysm; but in the latter it is usually necessary to combine with them narcotics, or to employ those agents of the present class which in full doses combine an antispasmodic with a narcotic power. Thus it is of little avail to administer valerian, camphor, musk, or assafœtida, to allay the agonizing spasms of the ureter in nephritic, and of the gall-ducts in biliary colic, or of the rigid uterus in parturition, while the most complete relief of pain, and an easy discharge of the distending body, are secured by the appropriate administration of chloroform or ether.

The disorders which antispasmodics are peculiarly adapted to relieve are both general and local, and depend upon a morbid susceptibility of the whole nervous system, or upon an exaggerated excitability of some particular part. The former of these conditions has already been referred to as that which is most common in women and men of a delicate and feminine organization, and is usually manifested by a morbidly acute condition of the senses, and a state of the mind which leads to the exaggeration or perversion of all external impressions and all internal sensations. In its highest degree this state merges into hysteria, or into insanity when an hereditary predisposition or powerful exciting mental causes favor the production of derangement of the mind. Antispasmodics are of infinite service in the lower grades of this condition. Nothing is more astonishing in the operation of remedies than the promptness and certainty with which a dose of valerian or assafœtida dispels the gloomy visions of the hypochondriac, calms the hurry and agitation of nervous excitement, allays commencing spasm, and diffuses a soothing calm over the whole being of one who but an hour before was a prey to a thousand morbid sensations, and thick-coming fancies of danger, wrong, or loss. And even on the verge of an outbreak of hysteria or frenzy, these medicines, or a dose of ether, or of Hoffmann's anodyne, has often sufficed to calm the rising waves of excitement, or ward off the attack.

But the success of this method depends altogether upon the predominance of a pure nervous element in the case. It is scarcely necessary to remark that neither hysterical nor maniacal excitement which is independent of the nervous diathesis, is favorably affected by antispasmodic medicines, and least of all, that which presents itself in persons of a full and plethoric habit. In such cases active bodily and mental employment, the cold bath, and purgatives are more effectual.

The local nervous disorders which are more or less curable by medicines of the present class, chiefly affect the heart and lungs, but they are, except in the case of spasmodic asthma, very seldom of a purely nervous character, and this affection is much more under the control of debilitants than of any stimulants whatever. The inhalation of anæsthetic vapors is, to some extent, an exception to this rule. In whooping-cough assafœtida has been vaunted as a specific remedy, and it would appear peculiarly suited to correct the material bronchitic disorders which exist in this disease, yet it is curable by several other and different remedies more surely than by this. There is a nervous cough which appears to be one of the innumerable manifestations of hysteria, and when this is the case, antispasmodic medicines will be found to relieve it. But unless the proof of its hysterical character be very distinct, a cough may generally be referred to a material cause requiring a different class of remedies from these for its removal; and, unfortunately, there are but few well-instructed practitioners who have not been called upon to pronounce a so-called nervous cough, the evidence of an organic and incurable disease of the lungs.

But while the danger of falling into this error is insisted upon, it would be an equally gross, if not so serious, a mistake in every instance to attribute, not only the symptom, but its degree of severity, to the physical disease which may be present. In the case but just now referred to, a constant and harassing cough, without any reason for its existence in the seat or the extent of the pulmonary affection, may depend, in a great degree, upon nervous irritability, and may be palliated or even suspended for a time by a judicious combination of antispasmodics and narcotics. The same remark is applicable to those cases in which, while there is complete integrity of the lungs, a cough is excited by irritation in some other organ, cases which often require a searching investigation before the real cause of the symptom can be detected. Such examples are by no means confined to the hysterical and nervous, although perhaps most frequent among them.

In other affections, also, a spasmodic and a material element are combined. A familiar example is furnished by whooping-cough,

which is most efficiently treated by remedies of the expectorant associated with those of the antispasmodic class. In emphysema of the lungs a similar association frequently occurs when this disease is marked by asthmatic paroxysms, and also in many cases of organic disease of the heart. In these and all analogous instances, remedies of the present class, and especially anæsthetic inhalations are prescribed with advantage.

The forms of nervous disease which affect the muscular system with debility or paralysis, are but little influenced by antispasmodic medicines. Persistency of loss of power appears to be the element most opposed to their success, for it will be observed that in all cases whatever, in which they act beneficially, the phenomena are not uninterrupted, however frequently they may recur.

As might indeed be suspected, after the simple announcement of this fact, agents of the present class are seldom competent to effect a cure of any of the more prolonged diseases in which they are administered. They palliate the present phenomena, and may for some time continue to do so, but their influence is transient, and in spite of the administration of increased doses, it finally ceases to be felt. Partial exceptions to this statement are found in oxide of zinc and ammoniated copper. But the former of these medicines, and perhaps the latter also, are entirely destitute of the properties which distinguish the vegetable medicines associated with them, and were it not for their apparently specific influence upon the nervous system, both might be classed with tonics more appropriately than with antispasmodics. Apart, then, from these exceptions, while antispasmodic medicines exert a powerful, it is still a temporary, superficial and palliative operation, preparing the system for the more permanent and radical influence of tonic remedies and the appliances of dietetics and hygiene.

Most of the medicines we are about to examine, will be found to possess in common the singular property of a strong and penetrating odor. In two instances it is animal in its source and character, and in several more it has peculiarities which suggest its resemblance to animal rather than vegetable emanations. This is a very striking and curious fact, especially when viewed in connection with the analogy of this odor with that of ammonia, the double source of the latter in the two animated natural kingdoms, and its analogous influence on the nervous system. It cannot be that these resemblances are accidental, but to propose an explanation of them would, perhaps, lead further from the pathway of fact into the field of speculation, than would be consistent with the limits prescribed to the present work.

ALLIUM, vid. *Expectorants.*

ASSAFŒTIDA.—Assafœtida.

Description.—Assafœtida is the concrete juice of *Ferula assafœtida* (Linn.), *Narthex assafœtida* (Falconer), an umbelliferous plant which flourishes in Persia and the adjacent countries. This fact was determined by the German traveller Kaempfer in 1687. It is procured from incisions made in the upper part of the root. In commerce it is met with in the form of tears, or more commonly in irregular reddish-brown masses. Its chief constituents are resin and gum, and it contains from 50 to 75 per cent. of the former and about 20 per cent. of the latter, besides nearly 4 per cent. of volatile oil.

The following are the officinal preparations of assafœtida:—

Emplastrum Assafœtidæ.—Assafœtida Plaster.

This plaster is made by incorporating assafœtida and galbanum with lead plaster and wax.

Mistura Assafœtidæ.—Assafœtida Mixture.

This preparation, sometimes called *lac assafœtidæ*, or *milk of assafœtida*, is made by triturating two drachms of assafœtida with half a pint of water. The addition of the tincture to water produces a similar, but more stimulating, mixture, which is especially adapted for use as an enema.

Tinctura Assafœtidæ.—Tincture of Assafœtida.

The tincture is made by macerating, for two weeks, four ounces of assafœtida in two pints of alcohol, and filtering through paper. Its dose is a fluidrachm.

Pilulæ Aloes et Assafœtidæ.—Pills of Aloes and Assafœtida.

These pills are made by beating together equal parts of aloes, assafœtida, and soap, and dividing into pills so that each shall weigh about four grains. From two to five may be given at a dose.

Pilulæ Galbani Compositæ.—Compound Pills of Galbanum.

Six drachms each of galbanum and myrrh, and two drachms of assafœtida, are beaten up with a sufficient quantity of syrup, and divided into two hundred and forty pills. Each pill contains about three and a half grains of the mass. From three to five pills may be given at a dose.

History.—The name of this drug is said to have been imposed by the school of Salernum,[1] but was no doubt originally derived from the Persian *asa* or *assa*, which signifies gum.[2] The Germans call it *stercus diaboli*, while in the East it is known by a title which signifies *God's*

[1] Murray, Apparat. Med., i. 361. [2] Strumpf, i. 756.

meat.[1] These epithets sufficiently express the aversion which the drug excites in those who are unaccustomed to its use, and the esteem it is held in by those who are more familiar with its qualities. It is uncertain whether σιλφιον of the Greeks, and *laser* of Latin authors,[2] really designate the substance under consideration; the account which they give of its uses, therefore, loses much of its interest in connection with the present subject, particularly as it adds nothing to the knowledge which later and more definite observation has furnished.[3]

When fresh, and before it has concreted, assafœtida is said to have an extremely powerful smell and taste, which it loses in a great degree by age. The odor bears a striking resemblance to that of garlic, but is at the same time more fetid and aromatic; the taste is acrid and bitter, and very persistent in the fauces. In Persia it is used as a condiment, either mixed with the food or rubbed upon the vessel in which the latter is contained. It is regarded as useful in correcting the flatulence to which the Orientals, as great vegetable-eaters, are subject.[4] These people employ it also as an application to wounds, and believe it to possess aphrodisiac virtues. Acosta relates that it is used in the East to relieve horses of wind confined in the bowels, and also that it is thought to appease the toothache when introduced into a carious cavity.

Action. *On Animals.*—When assafœtida or its volatile oil is administered to animals, and some hours afterwards they are killed, the characteristic odor of the drug has been detected in the blood of the mesenteric veins, according to some authorities. (*Flandrin.*) The reporters of the Philadelphia Academy of Medicine,[5] in some of their experiments, did not detect the characteristic odor in the serous cavities, the thoracic duct, or in the blood of the carotid artery. But in another one, when the fetid solution had been thrown into the rectum of a cat, its odor was soon afterwards recognized on the animal's breath, and in the blood of the jugular vein and of the carotid artery. When a solution of the drug was injected into the abdomen of a cat, its odor was perceived in the animal's breath, in the serous and mucous cavities, and in the blood. Although a portion of these experiments furnish negative results, the remainder demonstrate that assafœtida is absorbed by the bloodvessels.

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[1] Acosta, p. 281.

[2] Pliny, Hist. Nat., lib. xix. cap. 3.

[3] For a full account of the historical question vid. Strumpf, loc. sup. cit.

[4] In the repugnance which we feel at the idea of using so loathsome a substance as a condiment, we are apt to forget that garlic-eating, which is equally offensive, prevails in the most refined of Christian nations, and that half-putrid cheese and stinking game are ranked among the greatest delicacies by English epicures.

[5] Phila. Journ. of Med. and Phys. Sci., iii. 290.

On Man.—Jörg endeavored to estimate the action of assafœtida, and made comparative experiments with it upon eleven persons in good health.[1] He found that distinct effects were produced by doses of a single grain, and that they often lasted for two or three days; and also that the susceptibility to be influenced by the drug varied in different persons. In doses of gr. ss—gr. xx, it gave rise to the characteristic aliaceous eructations which often lasted for twenty-four hours, showing how long the medicine remained in the stomach; a burning sensation in the fauces which continued for many hours, and a swelling of the underlip, were observed in several cases; the digestion was not rendered more active, but rather impaired; there was pain, oppression, and fulness of the stomach, distension of the abdomen, a discharge of fetid gas from the bowels, frequently a strong inclination to go to stool, and sometimes thin and repeated evacuations. At the same time the head was more or less affected with flying pains, various nervous or hysterical phenomena displayed themselves, and there was a general sense of malaise. The pulse and respiration often became slower, the cutaneous and pulmonary exhalations were increased, the urine was not augmented but became more acrid and burning; the sexual desire was sometimes excited, and the menstrual period advanced. In larger doses, 10 to 30 grs., assafœtida increased the secretions of the abdominal and pulmonary organs, but especially of the liver and bowels, augmenting the peristaltic action of the latter. It excited the appetite and digestion, produced discharges of intestinal flatus, improved morbid secretions of the mucous membrane, and caused the expulsion of intestinal worms. A continued use of the medicine, on the other hand, enfeebled the digestion, and still larger doses, besides colic and heat in the abdomen, produced nausea, vomiting, and diarrhœa.

After reading this detail of numerous and distinct symptoms produced by small doses of assafœtida, the reader will scarcely be prepared for M. Pidoux's statement, that after taking half an ounce of good assafœtida at a single dose, he was not aware of any change except that all of his secretions became horribly fetid for the space of two days.[2] Jörg could not detect the smell of assafœtida in either the urine or the sweat of persons who were using it. But, it is affirmed, on the other hand, that among the Asiatics, who, as already stated, make a free and daily use of this substance, it renders the perspiration intolerably offensive. Barbier detected the smell very distinctly in the urine of a girl who was using assafœtida. The characteristic odor

[1] Compare Jörg, Materialien, Mitscherlich, Strumpf, &c.

[2] Thérapeutique, 5ème éd., ii. 220.

has also been perceived by others in the secretion from ulcers, as well as in the urine of those who were taking it.

In attempting to appreciate the action of the remedy, Neumann observes: whether it acts directly or indirectly on the nervous system is a question of trifling moment, even if it were possible to answer it. It is certain, however, he proceeds, that it invigorates the brain and muscular system, and influences the organic life of the nervous and vascular systems more beneficially perhaps than any other medicine. Whatever part of the economy it acts upon favorably, it does so simply by increasing its normal power. While its only disagreeable influence on the stomach is to excite fetid eructations, it, on the other hand, improves the appetite, strengthens digestion, and relieves spasmodic affections of the intestines. Upon all the other systems, he is of opinion that it acts as a wholesome stimulant, among other things strengthening the vision and enlivening the spirits. This favorable statement, it must be remarked, is not fully borne out by general experience, which proves it to play, like other nervines, a very subordinate part in the cure of disease.

Remedial Employment. *Diseases of the Nervous System.*—It is not in purely nervous affections that assafœtida has gained the greatest credit; the most that can be expected from its use is to palliate the symptoms during the paroxysms of the disease; the radical cure is to be sought for in the use of more powerful medicines. In *epilepsy* it may be held as perfectly useless; and that little can be expected from it, may be inferred from the fact that it rarely forms part of the cumbrous list of specifics for this affection. Assafœtida is one of the most valuable agents that can be employed in the treatment of *hysterical* cases, because it palliates several extremely annoying symptoms, but not because it is capable of removing the principal or radical disease. Cullen, who lauds its anti-hysteric virtues, would seem to have reference only to its action during the paroxysm, for he remarks, that when it could not be taken by the mouth, he has "found it given in glyster to be very effectual."[1] *Hypochondriasis* may sometimes be benefited by the direct influence of assafœtida upon the nervous system, but more generally the degree of good it is capable of is due to the action of the drug upon the digestive function, which is the source and starting point of the morbid phenomena in this disease. But of this action more specific mention will be made below. According to Neumann nothing more effectually relieves the paroxysms of *spasmodic asthma* than assafœtida, and he recommends as extremely prompt and effica-

[1] Mat. Med., ii. 367.

cious the following mixture: ℞.—Tr. fœtid. ʒiij; tr. lobeliæ ʒj; of which forty drops are directed for a dose. Evidently the lobelia is, in this instance, the capital ingredient of the prescription, and consequently the evidence of the author cannot be allowed to weigh against that of Pereira, who says that he has never seen assafœtida give relief in purely spasmodic asthma, or of Cullen, who states that he seldom found it of much service. Trousseau and Pidoux, however, affirm that in their hands the remedy has produced incontestably good results. Several authors speak of the efficacy of assafœtida in *neuralgia*, but there is no proof of its possessing even a palliative influence over this affection, except indirectly, or by improving the vigor of the digestive apparatus, and diminishing the susceptibility to external impressions, which is so frequently the immediate cause of the neuralgic paroxysms. But, even in this respect the medicine is very much inferior to those which influence more directly and powerfully the source of the disease.

Diseases of the Respiratory Organs.—In *chronic catarrh* with or without spasmodic dyspnœa, assafœtida is frequently of marked advantage. Cullen regarded it as more useful in such cases than the other fetid gums, and Neumann states that he has found it, in combination with oxymel of squills, perhaps the most efficient remedy that he employed. When the wheezing is considerable, and the expectoration is rendered difficult by general debility, or when the cough is spasmodic, much benefit may be derived from this medicine. Such a combination of symptoms occurs frequently among persons advanced in life. Miller, Kopp, and others, have vaunted the efficacy of assafœtida in *whooping-cough*. The last-named writer affirms, also, that children have less repugnance to it than to some other medicines which seem less nauseous, so that they readily become used to it, and even grow fond of its taste when it is combined with mucilage and sugar.[1] It has also been recommended to administer it by enema in the evening to prevent, or at least moderate, the paroxysms which destroy the rest and exhaust the strength of the little patients. But in a disease of such long duration, an occasional resort to this method is all that can be recommended. Dr. Chapman speaks favorably of the medicine, but agrees with the best authorities in delaying its use until the febrile stage, if any, shall have passed by, or been overcome by antiphlogistic remedies.[2] Aberle esteemed it highly under similar circumstances, and more recently Ancelin reports his successful use of it by enema.[3]

[1] Archives Gén. de Méd., xvi. 289.
[2] Therapeutics, ii. 266.
[3] Bull. de Thérap., li. 283.

Diseases of the Digestive Organs.—In that torpid condition of the bowels which is so commonly associated with general debility, when digestion is imperfectly accomplished, and severe attacks of colic supervene; when tympanitis, sometimes of an immoderate degree, oppresses the breathing, and becomes the immediate exciting cause of an hysterical attack; when at the same time there are some signs of chlorosis, or this disease is fully developed, a combination of symptoms is presented, of very frequent occurrence among females, and particularly those of a highly nervous temperament, a combination which is the cause of extreme suffering to the patient, and often proves of great annoyance to the physician. No single medicine is more useful than assafœtida in removing this complicated assemblage of symptoms, acting as it does upon the digestive organs to overcome constipation, expel flatus, and improve the tone of the stomach, and in this way relieving the nervous system from an irritation which constantly tends to throw it into disorder, while it gives tone directly to this system, and renders it less susceptible to morbid impressions from within or from without. Indeed, the principal utility of the drug is displayed in cases of this very description; the other affections in which it has been recommended, might be nearly, if not altogether, as well treated without its aid, but the combination of symptoms just described is relieved with equal promptness and certainty by no other agent. Its efficacy is much increased by modifying the mode of its exhibition according to the symptoms of the individual case. Thus, when, such as they have been above detailed, they occur in persons of an anæmic or chlorotic constitution, the assafœtida should be associated with aloes and iron, and taken soon after, or immediately before meals. But when a flatulent and hysterical attack has already commenced, there is but one efficient method of employing the drug, which is by administering a large enema of the milk of assafœtida. It usually operates without delay, producing profuse and repeated discharges of flatus. If there is reason to suppose that undigested food remains in the lower bowels, a stimulant purgative containing assafœtida ought also to be prescribed.

In various other diseases assafœtida has been reputed to be useful. Many cases might be referred to in which it appeared to aid in the destruction and expulsion of *worms*, but it is much inferior to numerous vermifuge medicines. In *caries* of the bones, it is thought to be useful by several writers, one of whom, Neumann, speaks of its utility as "generally admitted." The proofs of this statement are difficult to be procured. The author just quoted, and several others, advocate the use of assafœtida in *typhus* and *puerperal* fevers; but except to meet one incident

of the latter affection, there is no satisfactory ground for the favorable opinion he expresses. The symptom alluded to is tympanites, which occasionally is so extreme as to impede respiration seriously, and probably, also, to interfere with the action of the heart. Nothing can be more appropriate than fetid enemata to mitigate the suffering and lessen the danger which this state involves.

After *nervous apoplexy*, or that form which seems to consist in simple congestion of the brain, of such violence, however, as to produce more or less paralysis, the latter symptom may continue for some time after the attack, and gradually diminish until it completely disappears. A gently stimulating treatment addressed to the nervous system hastens the cure. Among the remedies for this condition, assafœtida deserves a prominent place, for its property of imparting vigor without exciting, renders it appropriate. It has also been recommended as a cure for *chorea*, especially when the disease occurs about the age of puberty in females. The establishment of the menstrual function frequently cures spasmodic affections, and the emmenagogue properties of assafœtida may therefore become the indirect means of its removing the nervous disorder. Under other circumstances, its power over chorea may be regarded as almost null.

Administration and Dose.—Assafœtida plaster is sometimes applied to the abdomen to relieve habitual flatulence, and to the back of the chest in whooping-cough. It has also been said to prevent the development of caries of the vertebræ, but the symptoms mistaken for that disease, were probably those of spinal neuralgia.

As a clyster, for ordinary purposes, a simple mixture by trituration of assafœtida with hot water suffices; the officinal preparation is more actively cathartic. It is, perhaps, the most useful of all the modes of administering the drug.

Assafœtida mixture is the most prompt and decided in its action of all the forms for administering assafœtida by the mouth, but its taste renders it objectionable. *Dose:* from one to two tablespoonfuls frequently repeated.

The various simple and compound pills into which assafœtida enters, are best suited to those habitual states of flatulence in nervous and feeble subjects which are so common in this class of patients. The best formulæ are those which combine with this drug a laxative and a tonic, such as *pil. aloes et assafœtidæ*, and the *pil. galbani compositæ*.

The drug is seldom prescribed alone, but in powder or pill, its dose is from 5 to 15 grains. The tincture of assafœtida may be occasionally given in the dose of a fluidrachm, but owing to the alcohol contained in it, it does not answer for habitual use.

DRACONTIUM.—Skunk Cabbage.

Description.—*Symplocarpus fœtidus* is an indigenous plant, growing in low and moist situations. It has very large, smooth, and fleshy leaves, ovate or heart-shaped, with greenish bracts. The flower-sheath is hood-shaped, and marked with purple spots. The flowers are numerous and small, and are closely set upon a rounded or elongated spadix. The root, which is the officinal portion, is a large tuber, with numerous fleshy fibres. The whole plant exhales an acrid, rank, and nauseous smell, which has obtained for it the name given above, and that of polecat-weed, &c. It has a very acrid taste. These qualities are partially dissipated by drying; but, if the operation is carefully conducted, the root retains a portion, at least, of its virtues.

Action and Uses.—Dr. Bigelow states that in small doses this plant is stimulant and antispasmodic, and in large ones narcotic, and that thirty grains of the powdered root, if freshly prepared, will bring on vertigo, nausea, and frequently vomiting.[1] Locally, it acts as an irritant.

Its medicinal power was first indicated by Schoepf as being expectorant, stimulating, and incisive (incidens), and the Rev. Dr. Cutler, of Massachusetts, drew attention to its virtues in *spasmodic asthma* by describing its effects upon this disease in his own person. He employed the powdered root in doses of from thirty to fifty grains during the paroxysms. Dr. Bigelow states that in certain forms of asthma, and in *chronic catarrh*, it has succeeded, even when the disease had previously been of great obstinacy; and Eberle says that in chronic cough, attended with a cold, phlegmatic habit of body, he employed it with the most decided benefit. Dr. Thatcher, and also Dr. Heintzelman, state it to be useful in the spasmodic stage of *whooping-cough*. In *hysteria*, *spasmodic pains*, in "spasmodic affections of the abdominal muscles during parturition or after delivery" (*Thatcher*), in *chronic rheumatism*, and also in "*dropsy*," it has been recommended. It may therefore be used when its quality is good, but several other medicines are more to be depended upon.

From ten to twenty grains of the recently-dried root may be given at a dose. An infusion made by displacement, with an ounce of the root to a pint of cold water, may be prescribed in the dose of one or two tablespoonfuls. A saturated tincture may be prepared in the same manner, and administered in the dose of one or two teaspoonfuls.

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[1] Mat. Med., p. 167.

SUCCINUM.—Amber.

Description.—Amber is supposed to be the fossil resinous product of some extinct species of conifera, an opinion based upon the microscopic examination of the vegetable fragments contained in it. Other views of its nature and origin have been proposed by various naturalists, who have pronounced it to be concrete petroleum, hardened honey, oil of turpentine solidified by an acid, a product of the decomposition of wax, and various other things altogether fanciful.[1] Amber is found chiefly upon the borders of the Baltic Sea, and in the North of Asia. It occurs in yellow or reddish translucent masses, which are brittle, and have a resinous fracture. When rubbed briskly, it becomes negatively electric; and at the same time, or, still better, when powdered and thrown upon coals, it emits a grateful and aromatic fragrance. It has no decided taste. It is soluble in strong alkaline fluids, and somewhat less so in ether. Two preparations of amber have been used in medicine, viz., *succinic acid*, and *rectified oil of amber* (Oleum Succini). The latter is obtained by the dry distillation of amber. When freshly prepared, it is a yellowish transparent liquid, with a pungent and peculiar odor, and a hot, acrid taste. In composition it is a hydro-carbon, but is oxidized by exposure to the air, and becomes dark and thick. Succinic acid is obtained from amber by sublimation. When purified, it forms white crystals, of acid qualities, soluble in cold, but more readily in hot water, and in alcohol.

Action and Uses.—The fumes arising from amber thrown upon burning coals are apt to provoke coughing. *Succinic acid* is said to raise the pulse, promote diaphoresis and the secretions of the lungs, and to augment the activity of the nervous centres. *Oil of amber* is a powerful irritant of the skin. When taken internally, it is reputed to be antispasmodic and stimulant. The first-named preparation was once employed in mucous profluvia of the lungs and urinary organs, much in the same manner as the terebinthinates continue to be used. In debility of the nervous system, and in spasmodic diseases, it was also reputed to be efficacious. Some fanciful persons have even imagined that strings of amber-beads around the neck or limbs control convulsive diseases of a hysterical type.[2] It is, with more probability, reported to be useful in *retrocedent gout* and *rheumatism*. Oil of amber has also been given internally for the same affections, but more

[1] For a learned history of this substance consult Strumpf, Handbuch, &c., i. 787.

[2] Revue Médicale, lxxxv. 84.

especially in *eruptive diseases*, *epilepsy*, *hysteria*, *whooping-cough*, and *amenorrhœa*. Externally it is employed as an addition to stimulating liniments for *rheumatism* and *paralysis*, and as a rubefacient to the spine in convulsive disorders, especially those of children. The fumes of amber thrown on live coals are sometimes used, or raw cotton impregnated with them is applied to the affected parts, in the first-named diseases. Powders and pastilles intended to correct foul smells by fumigation generally contain amber.

The *dose* of succinic acid is from five to fifteen grains, and of the oil of amber from ten to fifteen drops.

VALERIANA.—Valerian.

Description.—The root of *Valeriana officinalis*. This plant is a native of Europe, and belongs to the numerous family of Valerianæ, a name said to be derived from the Latin *valere*, and intended to express the wholesome properties attributed to the plant. The *nard* or *spikenard* of antiquity, so renowned among the aromatics of the East, was a preparation of valerian, *V. Celtica*. Valerian grows throughout Europe, and in every variety of soil, but is said to have a stronger smell and taste when produced in dry and elevated than in low and moist situations. Its most important constituents are—1st, an *essential oil*, which is described below; and, 2d, an *acid* (valerianic), which is a clear, colorless, oily fluid, having an acid and pungent smell and taste, and which forms salts.

Extractum Valerianæ Fluidum.—Fluid Extract of Valerian.

This extract is made by displacement with a mixture of alcohol and ether. It is the best form in which valerian can be exhibited for ordinary purposes. The dose is one or two fluidrachms.

Infusum Valerianæ.—Infusion of Valerian.

Half an ounce of valerian is macerated in a pint of boiling water for an hour in a covered vessel, and then the liquid is strained. The dose of this infusion is a wineglassful.

Oleum Valerianæ.—Oil of Valerian.

It is obtained from valerian-root by distillation, and, when fresh, is of a pale-green color, and has the pungent aromatic taste and smell of valerian in a high degree. It grows brown and thick with age, and becomes resinous by attracting oxygen from the air. It is the most powerful preparation of valerian, and may be administered in the dose of four or five drops, suspended in sweetened water. It is soluble in alcohol and ether.

Tinctura Valerianæ.—Tincture of Valerian.

This tincture is made by percolation, with four ounces of valerian to two pints of diluted alcohol. Its dose is stated to be from one to four fluidrachms, but the proportion of alcohol in either quantity is too great to warrant its repeated administration.

Tinctura Valerianæ Ammoniatæ.—Ammoniated Tincture of Valerian.

This preparation is made by macerating four ounces of valerian in two pints of aromatic spirit of ammonia for fourteen days, and filtering the solution. Its peculiar antispasmodic virtues are equally well exhibited by an extemporaneous mixture of the aromatic spirit of ammonia and the fluid extract of valerian. Its dose is one or two fluidrachms.

History.—Valerian seems to have been used as a medicine from an early period. All the ancients describe it as being diuretic and emmenagogue.[1] Galen affirms that by its means he cured adults and children of epilepsy. Fabius Columella vaunted its anti-epileptic virtues, which are also maintained by Alston.[2] Hoffmann regarded its diuretic properties, at least, as unquestionable. Externally, says Schroder, it strengthens vision, removes opacities of the cornea, allays headache, promotes the menses; in baths, it excites perspiration; inhaled, it dries up catarrhs; it tempers the malignity of carbuncles, cleanses foul ulcers, &c. One of the most singular properties of the plant is its effect upon cats, which Matthiolus describes in these terms: "Cats are so fond of valerian that they smell it at a great distance, and purr with delight while they are eating it." A modern author[3] paints a still more vivid picture of this singular phenomenon. "In places where valerian is stored," he remarks, "cats may be seen rolling themselves upon it, mewing and purring in the most extraordinary manner, then attacked with spasms and convulsions, and at last expiring in a perfectly voluptuous frenzy." Pringle and Dresky supposed, from their experiments, that valerian had antiseptic properties, the one finding it superior to salt, and the other to cinchona, in this respect.[4] Both were probably mistaken.

Action.—The only phenomena excited in the lower animals by valerian have just been described. It acts upon man, in health, as an excitant, but not powerfully. Its powder, applied to the nostrils, produces sneezing, and may be conveniently used as a sternutatory. When taken habitually, and in moderate doses, it augments the appe-

[1] Adams, Comment. on Paul Ægineta, iii. 396.
[2] Mat. Med., i. 535.
[3] Foy, Mat. Med., i. 428.
[4] Apparat. Med., i. 275.

tite and the activity of digestion, without restraining the action of the bowels. Two drachms at a single dose generally occasion a sense of heat and weight in the abdomen, eructations, and frequently vomiting, colic, and diarrhœa; and, along with these symptoms, some excitement of the circulation, augmented warmth of the whole body, and either perspiration or an increased flow of urine. The first effects of valerian upon the nervous system, in doses of from one to two drachms, are to render the mind tranquil, to incline to good humor, and dispose to exertion; but these results are usually accompanied with a lively formication in the hands and feet, and a sensation about the head and spine which has been compared to the aura epileptica. Sometimes there is a sense of embarrassment in the head, with heaviness, or even pain.[1] The action upon the circulation is chiefly shown in those of its morbid states in which the pulse becomes frequent and feeble, denoting the exhaustion which succeeds an over-excited state of the nervous system; under these circumstances it renders the pulse less frequent, and at the same time stronger. Barbier mentions the following phenomena as exhibited by a patient in the Hôtel Dieu of Amiens. When about falling asleep, he suddenly started up, believing that he saw a great light, and that the side of the ward opposite to him was in flames. Other patients imagined that flashes of fire were darting from their eyes. But such phenomena would appear to be exceptional.[2] The largest dose of extract of valerian, and the most striking effects from it, are those in a case of alleged poisoning by it which is reported by Dr. Abell.[3] Within a period of eight hours a man of nervous temperament took two drachms of extract of valerian. He became delirious, threatening and vociferating violently. His pulse was frequent, tremulous, and irregular, and the pupils extremely and fixedly dilated. He was blind, recognized no one, imagined himself beset by dangers, and staggered in walking. He had also a constant desire to urinate. Under the influence of a grain and a half of sulphate of morphia the pupils contracted, sleep ensued, and in two hours he was awakened without difficulty and in a perfectly rational state of mind. The symptoms here detailed are so evidently those of poisoning by belladonna, that we must presume the extract of this substance to have been taken by mistake.

Joerg thinks that when given in very moderate, yet operative, doses, the action of valerian lasts for three or four hours, or in large quantities from eight to twelve hours, and that its influence is more lasting

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[1] See Mitscherlich, Strumpf, op. cit.; and Joerg, Archives Gén., xxv. 402.

[2] Op. cit., ii. 153. [3] Boston Med. and Surg. Journ., Mar. 1856, p. 117.

on the brain than on the bowels. In all of the instances now referred to, the doses employed were greatly larger than it is usual to administer in disease; yet it would not be just to infer that the smaller quantities are inoperative. A dose of four or five grains of sulphate of quinia produces trifling symptoms, if any, in the healthy subject; uva ursi, in large doses, occasions no distinct phenomena; even the common articles of food and drink give rise to no specific effects; yet it cannot be said that they do not powerfully modify the vital state. The virtues, then, of valerian are to be sought for under conditions of the system which are adapted to bring its effects into strong relief, states in which the susceptibility to the medicine is morbidly increased, and in which, therefore, it may be presumed that its curative power is enhanced. The experiments of Reissner upon rabbits, with large doses of valerianic acid (ʒj to ʒiij), proved it to be a local irritant, and capable of destroying life. In smaller doses the symptoms were marked, but not peculiar, consisting chiefly of quickened, and then of languid, breathing and pulse, with debility or loss of power in the limbs.[1]

Remedial Employment.—Valerian is a prominent medicine among those called nervines, and is in fact used almost exclusively in the treatment of functional disorders of the nervous system. Although most frequently prescribed as a palliative of the more urgent symptoms of several among these affections, it has nevertheless a well-supported claim to a more important position, as the following statement will show.

Epilepsy.—In the historical sketch given above, it was seen that among the earliest of its recorded uses valerian was prescribed as a remedy for epilepsy. At various epochs down to the present time, it has enjoyed a reputation for curing this malady, but without attaining an uncontested right to the title of an anti-epileptic, a lot which indeed it shares with every medicine which has been distinguished by this name. The doubts which obscure the virtues attributed to all medicines are magnified in the case of such as are used in the treatment of nervous affections. The irregularity of the phenomena presented by the former, their protean changes, their dependence upon accidental circumstances, the close relation in which they stand to the mental and moral conditions of the patient, render it extremely difficult to distinguish these affections from one another, and those among them of an organic from those of a functional origin. A mature and experienced judgment guided by all the light which science has shed upon

[1] Reil, Chem. Pflanzenstoffe, p. 64.

this obscure subject, is the only, though by no means an infallible, safeguard against falling into error. Such circumstances render the task a very difficult one to arrive at a just valuation of the testimony recorded in favor of valerian as a remedy for epilepsy, for it is certain that not a few writers have been imposed upon by the epileptiform convulsions which occur in hysteria and those which frequently arise from temporary disturbance of the excito-motory function, by intestinal worms, and other local and mechanical causes. Nothing can illustrate the obscurity of this subject and the difficulty of distinguishing epilepsy from less serious convulsive affections, than the unsuccessful attempts which have been made to found such a distinction upon the essential nature of the analogous affections. Thus, when it is said that "the term epilepsy presents to the mind the idea of an essential morbid modification of the cerebro-spinal innervation, a serious, profound, chronic, and obstinate modification, which sooner or later ends by impressing upon the functions, which it at first disturbs at intervals, alterations of a permanent character which annihilate all the functions of the nervous system of animal life,"[1] we have an hypothesis and a description combined, a formula which does not add a single idea to our previous knowledge, nor offer us any assistance in recognizing examples of the disease. The only means by which the error of confounding epileptic and epileptiform convulsions can be avoided, is to compare diligently, and one after another, the symptoms presented in each case with those derived from model examples, after which the truth will generally appear. Thus the essential phenomena of the epileptic convulsion are the following: it either occurs without warning, or if any, it is in the form of the *aura epileptica;* the loss of consciousness and sensibility is sudden and complete; the convulsions are tonic, and they are more violent on one side than on the other; the face is purplish or livid, and there is froth upon the lips; after the fit there is at first stupor, then maniacal excitement; finally the mind grows feeble when the disease has continued long. Now if these diagnostic marks could be applied to the cases of presumed epilepsy said to have been cured by valerian, the truth would be much more accessible, than it actually is, for in nearly all of the instances, and especially in those recorded by the older writers, the symptoms are very imperfectly described, or as more frequently happens, their details are quite omitted. Occasionally, however, an illustration of the remark just made presents itself, as in "a case of epilepsy of twelve years' duration cured by valerian."[2] The author asserts that "the

[1] Pidoux.

[2] Edinb. Med. and Surg. Journ., xxx. 297.

symptoms which attended the paroxysms were indubitably those of epilepsy," yet the paroxysms were preceded by a sensation of *globus* in the throat. The case ceases at once, therefore, to illustrate the virtues of valerian as a remedy for epilepsy. The other symptoms might be of doubtful significance, but the *globus hystericus* is a pathognomonic sign of hysteria. It is to be suspected that many other cases said to be of epilepsy and cured by valerian, would as little sustain a critical scrutiny as the one just referred to; there are not a few, however, in which the anti-epileptic virtues of the medicine are placed beyond cavil, and these will be pointed out in the next paragraph.

The use of valerian in the treatment of epilepsy was, as has been already stated, of very ancient origin; its revival is due to Fabius Columella, who published a treatise setting forth its having cured him of this malady when all other means had failed; but he is said to have subsequently relapsed.[1] Wepfer relates that he rescued from this disease several girls and boys by the long-continued use of simple valerian root, and among them a girl under the age of puberty who suffered not less than fifteen paroxysms in the course of twenty-four hours.[2] Much of the vogue enjoyed by valerian as a remedy for epilepsy is ascribed to its recommendation by Tissot. This author indeed declares his persuasion that when valerian fails to cure it is because the disease is incurable; but nearly all of the support that he offers for this opinion is a number of cases compiled from previous and cotemporary writers, although he asserts that he had cured by its means a "large number" of idiopathic epilepsies.[3] But as he speaks of "epilepsy and nervous affections which require strengthening nervine remedies," it is probable that he did not distinguish very clearly the former from the latter diseases. Enough remains, however, after all of these deductions from Tissot's evidence to prove that in his hands valerian did sometimes really cure epilepsy, and the proof is corroborated by later testimony. J. Frank says that, although able to present only one cure for ten failures, he still regards the powder of valerian given in large doses, and long continued, as occupying the first rank among vegetable anti-epileptic remedies.[4] Guibert found that where it did not cure the disease, it still moderated the violence of the spasms and rendered them less frequent.[5] Vogt calls attention to the circumstance that nearly all popular nostrums for epilepsy contain valerian, and Richter instances several of this

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[1] Murray, i. 275. [2] De Affect. Capitis., Obs. cxxv.

[3] Malad. des Nerfs, chap. vii. art. xxv.

[4] Malad. du Syst. Nerveux, chap. xxxviii. art. vii. [5] Revue Méd., xxviii. 380.

sort.[1] In 1838, M. Ferrus made a report to the French Academy of Medicine on a memoir of M. D'Huc, in which the author relates seven cases, of which six were recent and the remaining one of seven years' standing. Valerian was administered in decoction and extract, and of the latter the daily dose was from one to two drachms. Under its use, the paroxysms declined in frequency and severity, and ceased after a period of from five weeks to three months. In all of the cases except one the cure appeared to have been permanent. Other patients treated subsequently by M. D'Huc presented less satisfactory results.[2] Richter relates several cases of cure in his own practice by means of such combinations as are referred to in the foot-note. Dr. Copland from his own experience speaks favorably of valerian, provided that it be appropriately administered, and that depletion and evacuations have been premised in plethoric cases.[3] On the whole, there can be no doubt that valerian has sometimes cured genuine epilepsy, and that it is most successful in young patients, and when the disease is of recent origin. In the case of children it must not, however, be forgotten that the remedy is an efficient anthelmintic, and that it very probably has sometimes cured the spasmodic affection by destroying the worms upon which the attacks depended. In other cases, where the convulsions have originated in fright, suppressed emotion, or in a simple susceptibility of the nervous system to more ordinary impressions, the efficacy of the remedy is still more unequivocal. But even here it must be given in large doses and perseveringly continued, while other agencies adapted to improve the tone of the nervous system, strengthen the digestive powers, and withdraw injurious excitants, should be prescribed in conjunction with it.

Hysteria and other Nervous Diseases.—In fully developed hysteria, and especially in that form of the affection which occurs in plethoric and otherwise robust females, it is doubtful whether valerian is a remedy of much value. As a palliative, it may be usefully employed to avert paroxysms which some accidental excitement would have provoked, or even to mitigate them when they cannot be averted. It is more useful if the disease attacks females of a weak constitution and excitable temperament, with imperfect digestion, and enfeebled by care and anxiety, and when a tonic as well as an antispasmodic treat-

[1] Ausfürliche Arzneimittellehre, iii. 26. The same author presents the formulæ of several nostrums employed successfully for this disease. They all contain oil of cajeput, and some of them pomegranate, *e. g.*: ℞.—Valerian, ℥ij; pomegranate leaves, ℥ss; oil of cajeput, 4 drops. Given three times a day.

[2] Bull. de l'Acad. de Méd., ii. 759. [3] Dict. of Medicine, art. Epilepsy.

ment is called for. In such cases it not only is efficient in mitigating the individual attacks, but it will sometimes contribute materially to the complete cure of the disease. The cases alluded to approach most nearly to that undefined disorder of the nervous system which is described in the next paragraph.

This disorder may be described as *hysterical*, rather than as being in itself *hysteria*. It seldom occurs among females who lead an active and laborious life, or among the rural population. Most frequently its subjects are met with in large cities, or wherever habits of luxurious living prevail, where the senses are stimulated to excess, and the imagination is over-strained by exciting scenes, conversation, and books, and by occupations which the artificial wants of civilization create. It consists, at first, in a morbid sensibility to external impressions; the patient at last seems to suffer, in the absence of any outward cause, all of the pains which external excitants are capable of producing, or appears to have the faculty of transforming into real sensations the suggestions of a disordered fancy. It is a state familiarly known as the *vapors*, and is a form of hypochondriasis. Tissot and Trotter have described its varying phenomena very accurately, and Trousseau and Pidoux present the following abstract of them: One patient complains of oppression, of stricture of the throat or temples, or palpitation of the heart; another of throbbing of the temples, and noises in the ears, a sensation like the commencement of a cold in the head, local shudderings, and flushes of heat in the face; another is unable to remain quiet in the same spot, and has what is so expressively termed the *fidgets*, with gaping, yawning, and hiccup; or the same phenomena may be somewhat modified, and the patient find no comfort except in active, and even in fatiguing exercise; others, again, complain of a difficulty of swallowing, of borborygmi, eructations, and burning sensations in the abdomen, with flatulent distension coming on suddenly and as suddenly subsiding, præcordial distress, causeless alarms, morbid susceptibility, &c. All of these symptoms are completely under the control of valerian. One or more doses of it will dispel, as with a charmed power, the unnatural disorder of the functions, and restore calmness and equanimity to a patient in the midst of torments none the less harassing because they do not threaten life. And although this medicine is not sufficient of itself to eradicate the disorder, it yet so promptly and effectually removes the most prominent and distressing symptoms, as to place the patient in a condition the most favorable for profiting by the measures directed against the morbid state from which the nervous derangement springs.

Several cases are related by Latour[1] which offer a somewhat modified aspect of the same disease. One of his patients was a lady whose general health was perfect, and in whose circumstances there was nothing to explain the symptoms which she exhibited. Whenever she sat down to meals she grew pale, and experienced a suffocating constriction of the chest, followed by hurried and laborious inspirations and frequent gaping. These symptoms lasted for ten or twelve minutes at first, but were prolonged by the displeasure which they caused the lady's husband, who took them to be voluntary. During a year various methods of treatment were employed, cold and sea bathing, bismuth, quinine, but all in vain, and the symptoms were at last removed by powdered valerian in the dose of a drachm taken daily before dinner. Within a fortnight the attacks ceased, and were not renewed.

In other instances, the hysterical affection assumes the mask of some more familiar disease, or is superadded to a definite derangement of the health. Hysterical headache is one of the most common forms of attack. For this troublesome affection an application of dry valerian to the forehead and temples is strongly recommended by Richter. The same author praises the medicine in those spasmodic attacks which follow loss of blood, and especially profuse and painful menstruation, as well as those which accompany an impoverished state of the system in chlorosis, leucorrhœa, scrofula, &c. M. Déclat has published an account of the efficacy of *valerianate of ammonia* in a case of facial *neuralgia*, which had for years resisted every other known treatment, both local and general.[2] In *gout* the fever is often a consequence of an irritable rather than of an inflammatory state, and is beneficially influenced by valerian, which calms the tumult of the system and gives the patient ease. When this affection attacks the stomach with spasmodic rather than inflammatory symptoms, the same remedy is applicable, and the oil is the most efficient form for its exhibition. *Cramp in the stomach* is readily relieved by the same means, and that morbid sensibility of the organ which is a frequent cause of chronic vomiting. A mixture of one part of the ethereal tincture of valerian with two of the compound spirit of lavender, has been successfully employed for this affection, in the dose of thirty or forty drops three times a day. Enemata of the infusion of valerian

[1] Bull. de Thérap., xx. 343.

[2] Brit. and For. Med.-Chir. Rev., Jan. 1857, p. 261. This compound may be prepared, according to Mr. Pierlot, by saturating a solution of valerianic acid in water, with carbonate of ammonia, and adding a small proportion of the alcoholic extract of valerian.—*Annuaire de Thérap.*, 1857, p. 46.

are recommended in *chronic dysentery* accompanied with tormina and tenesmus. Valerian is useful in calming the *palpitation of the heart* which so frequently accompanies dyspepsia. It also moderates the paroxysms of *whooping-cough*.

Valerian is deserving of a trial in *mental derangement* produced by sorrow and anxiety, homesickness, disappointment, the puerperal state, &c., before the disease has become rooted, and the patient possessed with a fixed idea. It is also recommended in *nervous atony* simulating paralysis, a state in which the symptoms of apoplexy are sometimes met with, while the features are pale, cold, and sunken, the pulse small, slow, and infrequent, and the attack ends with a copious discharge of limpid urine.[1] This medicine is also valuable in another condition, which is frequently mistaken for fever, and mischievously treated by debilitating means. The patient is troubled with a sense of *fulness in the head*, a full, hard, and frequent pulse, and in the after part of the day, congestion of the face, headache, burning of the palms of the hands, and perhaps neuralgic pains. Valerian seldom fails to mitigate these symptoms, and sometimes relieves them entirely, but more commonly it paves the way for medicines of more radically curative powers. In other cases of essentially the same nature, the patient is subject to *vertigo*, accompanied with palpitations of the heart. The blood seems to rush suddenly into the head, and as suddenly to leave it, and fall back upon the heart. The combination of symptoms now described, is not an infrequent accompaniment of the menopause, and even of the first establishment of the menses, and although it then is, partially at least, dependent upon plethora, the necessity of bloodletting can generally be avoided by the administration of valerian.

This medicine is a valuable adjuvant in the treatment of *delirium tremens*, and is often sufficient to control the symptoms in those slighter cases which arise in consequence of the shock of unimportant surgical injuries. It is frequently serviceable, also, in *nervous headache* produced either by mental or physical causes.

St. Vitus' dance is in many cases successfully treated by this medicine. Several examples of the sort are recorded by Murray, but in most of them it would seem that iron, Dippel's animal oil, or some other medicine was united with the valerian.

Inflammations and fevers of a nervous type are reported, especially by German authorities, to be favorably influenced by valerian. Neumann states, as conditions for its use, the absence of enteric inflammation, and an uneasiness which impels the patient to change his pos-

[1] Richter, loc. cit.

ture every moment, and when there is either delirium, or the mind is so excited as to be in a state of constant tension. This author ascribes to valerian a quality analogous to that belonging to opium, a power, namely, of moderating the excitement of the vascular and muscular systems growing out of excessive and irregular nervous action.[1] The same indication is regarded by Richter, after Jörg, as debility combined with morbid sensibility, and he describes it as follows: the pulse is small, unequal, and jerking; the movements uncertain; the tongue trembles when protruded; there is quiet delirium, and some insensibility; a cool, pale, dry, and inactive skin; incomplete, and rapid respiration with sighing; injected and dull eyes; limpid urine; restlessness, sleeplessness, anxiety, &c. Valerian is regarded as all the more valuable here, because there are hardly any contra-indications to its use; and it is confidently recommended even during inflammation of internal organs, gastric disturbance, bilious, mucous, and putrid states of the economy, profluvia, exanthems, &c. It is also especially commended in simple catarrhal and rheumatic affections occurring in persons of an excitable temperament and predisposed to nervous attacks, and in all fevers in which the peculiarities of this temperament predominate. In most of the above cases it may be combined with stimulants and other antispasmodics, as well as with tonics, and especially with cinchona.

Indications very similar to the above, but furnished by a somewhat different pathological condition, are set forth by Pidoux. They are presented by those inflammatory and other affections in which depletion has been carried to excess, and consist of certain nervous symptoms which interfere with convalescence. Thus sometimes in the decline of pneumonia, and typhoid fevers, when ataxic and adynamic phenomena supervene in consequence of profuse hemorrhage from the nose or bowels, and the abdomen continues tympanitic but indolent, when, in a word, debility and excitability prolong one another, great benefit is to be derived from valerian. The same indication sometimes presents itself in the course of *eruptive fevers*, in consequence either of the repercussion of the eruption, or of some other accidental cause giving to the symptoms a typhoid or malignant type.[2] These general statements have received confirmation from the experience of Dr. J. Leasure, of Pennsylvania, in the treatment of *typhoid fever* with *oil of valerian*. He at first used it in cases of extreme prostration and exhaustion, when alcoholic stimuli were either rejected or proved ineffectual, and afterwards in earlier stages of the disease. It

[1] Heilmittel. p. 570.

[2] Mat. Med. and Thérap., ii. 178.

usually provoked diaphoresis, and at the same time diminished the diarrhœa. In two cases complicated with delirium tremens the symptoms of this affection were evidently under the control of the remedy.[1]

As a *vermifuge* valerian is deserving of some credit, although it is doubtful how far it acts specifically in destroying intestinal worms. It is more certainly useful in counteracting the weakness of the bowels which these parasites produce. A somewhat celebrated vermifuge of Störck is composed as follows: ℞.—Sulph. potassæ c. sulphure, jalapæ, valerianæ, āā ʒj; oxymel, scillit. ʒiv. Dose for an adult ℥ss four times a day.

Administration and Dose.—Valerian may be administered in *powder*, in doses of from thirty to ninety grains, repeated three or four times a day. Its disagreeable taste may be somewhat disguised by the addition of a few grains of mace. The *infusion* is prepared with one or two drachms of the root to half a pint of water, to be taken in twenty-four hours. An *extract* prepared by displacement may be prescribed in doses of from ten to forty grains. The *fluid extract* is to be preferred. Its dose is from one to three fluidrachms. The *tincture*, owing to the quantity of alcohol contained in a dose, is not an eligible form of this medicine. The ammoniated is preferable to the simple tincture. The *oil* of valerian is a favorite form of the medicine in German practice, and is more decidedly antispasmodic and stimulant than the other preparations. It may be prescribed in the dose of from four to six drops mixed with sugar, or dissolved in ether or sweetened acids, and is perhaps, after the fluid extract, the most eligible form of the medicine for temporary uses. The infusion is applicable to the greatest number of cases. The powder is said to be preferable in cases of epileptiform convulsions, and for worms.

CASTOREUM.—Castor.

Description.—Castor is a glandular secretion contained in a pair of sacs on either side of the space between the anus and prepuce or vulva of the beaver (*Castor fiber*). It is regarded as a sort of smegma intended to lubricate the adjacent organs. It is more abundant in the male than in the female animal. In the fresh state, castor is soft and unctuous, but not fatty, to the feel, and it grows waxy by keeping; its color is brownish yellow, and it has a strong musky or hircine smell. The castor of commerce is of two sorts, the Russian and the American,

[1] Am. Journ. of Med. Sci., April, 1855, p. 370.

the former of which is by far the most powerful, and commands more than thirteen times the price of the latter.

HISTORY.—The ancients imagined the castor sacs to be testicles.[1] In the Hippocratic writings castor is prescribed with pomegranate juice for chronic vomiting, and its odor is recommended for hysterical affections, and especially for hysterical headache. It was prescribed with Chian wine for suppression of the menses and difficult parturition, and was employed in nearly every description of spasmodic disorder.[2] The use of castor in hysteria is mentioned by Herodotus. Dioscorides adds to this account that it is administered in clyster to arouse persons in lethargy, particularly when mixed with vinegar and rose oil.[3] Pliny quotes Sextius against the notion that the beaver, when pursued, bites off its testicles, and he even appears to distinguish between these organs and the true castor sacs. In addition to previous accounts, he states that castor provokes sneezing when smelled, enumerates the nervous diseases in which it is useful—including tetanus, neuralgia, and paralysis—and adds that it is an antidote to the stings and bites of venomous insects.[4] Galen refers to its virtues in low fevers and in flatulent colic, and speaks of inhaling its fumes from live coals. Avicenna says, among other things, that it remedies the excessive operation of hellebore. Sofia mentions its efficacy in nervous palpitation of the heart, and another writer compares its action to that of musk.[5] In later times the use of castor became more restricted, and although here and there it was still recommended for tetanus, whooping-cough, and even epilepsy, it was more generally directed for the relief of accidental spasms.[6] Even in these affections it was seldom used alone, but generally in union with more powerful antispasmodics, to which, indeed, the effects of the combination must be mainly attributed. The high price of the best castor, and the inefficacy of the ordinary specimens found in commerce, have combined very greatly to restrict its use in medicine.

ACTION.—Experiments upon healthy persons would seem to prove that the action of castor upon them is almost null. Thus, in 1768, Mr. Alexander used it in various doses, to the extent of two drachms, without experiencing any other effect than disagreeable eructations.[7] Jörg and his associates took doses of this substance varying from one

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[1] For information on the history, dissemination, &c., of the beaver, see an abstract of a paper by Dr. CHARLES WILSON, Edinb. Med. Journ., iv. 82.

[2] DIERBACH, Arzneim. des Hippokrates, p. 229.

[3] Liv. ii. chap. xxiii.

[4] Liv. xxxii. chap. xiii.

[5] EBN BAITHAR, ed. cit., i. 262.

[6] STRUMPF, i. 1043.

[7] Experimental Essays, p. 83 et seq.

to twenty-four grains, but, except repeated eructations, and a persistently bitter taste in the mouth, no striking symptom was manifested, either by the skin, or by the digestive, vascular, or nervous systems. From these experiments it was inferred that castor is merely a very indigestible substance, and one unworthy of being retained in the materia medica. But, as Richter has pointed out,[1] such a conclusion is unwarrantable; for not only does unquestionable evidence of the antispasmodic virtues of castor abound, but many other agents, also, which have no perceptible influence on healthy persons, exert a decided power upon the sick, even when given in small doses. A familiar example of this truth is presented by alcoholic stimulants. Thouvenel, however, states that two drachms of the residue obtained by evaporating the ethereal tincture of castor augmented his nervous energy, produced a sensation of heat in the epigastrium, and rendered the pulse more frequent.[2] In persons of a highly nervous temperament, and in females actually affected with hysteria, it has been found to excite the pulse, increase the warmth of the skin, and the cutaneous transpiration, and, in large doses, to produce some fulness and dulness of the head.[3] It is also alleged by Thouvenel to increase hysterical attacks in morbidly susceptible females when given alone, but in combination with opium to produce the best results. A similar opinion is expressed by Richter. Other authorities, moreover, ascribe to it a power of lessening the narcotic action of opium, while it derives from combination with this medicine an increase of its antispasmodic powers.

Uses.—Castor has been employed and vaunted in the treatment of a number of diseases in which derangement of the nervous system forms either the principal or a subordinate element. Among diseases of the first class may be enumerated hemicrania, spasm of the œsophagus, and hysterical spasms of every variety;[4] and among the latter, muscular subsultus and agitation occurring in low fevers, also hiccup, flatulent colic, and spasmodic dysmenorrhœa. Yet, even when it operates most favorably in purely spasmodic affections, it can only be regarded as a palliative, capable of alleviating the existing paroxysm, but without further efficacy in the disease. When hysteria is connected with abdominal cramps and tympanitis, with uterine colic and scanty menstruation, a case is presented in which, by the concurrence of all the older authorities, castor is peculiarly useful. And more recent observers have confirmed their statements. Trousseau and Pidoux

[1] Op. cit., iii. 319. [2] Barbier, ii. 239. [3] Strumpf, loc. cit.

[4] It has also been recommended, with Peruvian bark, in whooping-cough, by Dr. Morris, Med. Obs. and Inq., iii. 281.

limit their description of the indications referred to by mentioning only amenorrhœa and painful tympany of the abdomen. Allusion is made to those cases of *uterine tenesmus* in which the paroxysms of expulsive pain are accompanied with the discharge only of a few drops of blood. It may be doubted, however, whether the tenesmus in these examples is not more promptly and effectually relieved by belladonna, and the accompanying tympany by fetid enemata. Richter is of opinion that castor is very prejudicial to persons of a certain constitution, which he describes as a relaxed organization, connected with great susceptibility, excitability, and a tendency to inflammation. But so exact a determination of the virtues of such a medicine as castor may be suspected of being hypothetical.

The value of castor in the nervous forms of low fevers, if real, is so far inferior to that of valerian, opium, and the diffusible stimulants, as to demand no more than a passing notice. It seems to be chiefly indicated in the flatulent colics which sometimes arise in these affections, either spontaneously, or, what is more common, perhaps, from the injudicious use of purgatives. Cloquet, however, is reported to have used it with advantage in the last stage of adynamic fevers, but whether alone or in combination does not appear.[1]

Administration and Dose.—Castor may be administered in *substance*, in doses of from ten grains to two drachms, according to the quality of the specimen employed. The dose of the *tincture*, which is officinal (Tinctura Castorei), is from half a fluidrachm to two fluidrachms. As ordinarily found in the shops, castor and its preparations cannot be depended on; and even if the finest quality of Russian castor were always accessible, its extravagant price and very limited usefulness would render it a luxury that might easily be dispensed with.

MOSCHUS.—Musk.

Natural and Medical History.—Musk is a peculiar substance obtained from the *Moschus moschiferus*, an animal found in Central Asia, and which chiefly inhabits the mountainous regions lying between Siberia, China, and Thibet. This animal bears some resemblance both to the goat and the deer, but is without horns, and its canine teeth are very long, prominent, and curved. It lives on thickly wooded mountains, and is extremely timid. The musk sac, which is found upon the belly of the male, and behind the umbilicus, is an oval

[1] Mérat and De Lens, op. cit., ii. 140.

pouch covered by the abdominal integuments, and presents on its under face a longitudinal groove which lodges the anterior extremity of the penis. The sac itself is formed by three membranes, the internal one of which is thrown into folds which form septa and cells in which the musk is secreted. The opening of the sac is immediately in front of the orifice of the prepuce. In the living animal the musk is semi-fluid. It is most abundant in the adult, and during the rutting season, at which time, also, its odor is strongest. The object of this secretion has by some been conjectured to be the excitement of the female organs during the act of coition; it is also regarded as analogous to the sebaceous secretion which is formed within the prepuce of other mammals; but the two explanations do not conflict with one another.[1]

As found in commerce, musk is in small, dark-brown grains, and has an unctuous feel. Its taste is bitter and rather acrid, and its odor extremely penetrating and permanent. It is soluble in hot water and in alcohol, ether, and the yelk of egg. Besides neutral animal matters, it contains ammonia, a volatile oil, and a fatty substance.

The strong and permanent odor of musk is not due to a volatile principle, for it cannot be driven off by distillation, nor isolated in any manner. When dried by the help of sulphuric acid, it loses its odor for the time, but when moistened directly, or allowed to attract moisture from the air, it regains its smell. Geiger and Reimann dried and moistened musk alternately for thirty successive times, but without in any degree impairing its odor. These facts have given rise to a belief that the smell of musk depends upon a gradual but incessant decomposition of the substance. It has also been suggested that as the extrication of ammonia causes the volatilization of particles which are naturally inodorous, and as it is proved that ammonia is constantly given off by musk, therefore the odor of this substance is developed by the continued extrication from it of ammonia. The same odor, it may be mentioned, is one of the most common in the vegetable and animal kingdoms. The musk geranium, the musk rose, the musk melon, &c., are familiar examples. Several substances, among which bile may be mentioned, exhale it while undergoing decomposition. It strongly impregnates the exhalations of some females during the menstrual epoch, and especially of the negro and mulatto. Dr. Graves relates a case of delirium tremens which was treated by opium only. After the first day or two of the attack the patient began to perspire

[1] Dieu, Mat. Méd., i. 507 et seq.

very profusely, and to exhale so strong an odor of musk that it very soon filled the whole house.[1]

Musk appears not to have been known to the early Greek or Roman physicians. Most of the Arabian writers celebrate its virtues, which they represent as cordial, stomachic, antispasmodic, and aphrodisiac.[2] It began to be spoken of in Europe during the sixteenth century, as a remedy for hysteria, and the fact was then already noted that in very sensitive persons its odor was capable of bringing on hysterical attacks.[3] It was, however, chiefly celebrated for its power of relieving such paroxysms; according to Wedelius it was a "divine remedy" for lipothymia, syncope, palpitation, and asphyxia, and Schrœckius places its power of relieving soporose affections, lethargy, and coma, in the very first rank. Upon its first introduction into European practice, and indeed until the last century, it was regarded as a sovereign remedy for a great variety of affections. It is now almost as much neglected. The exorbitant price which the drug commands, and the difficulty of obtaining it pure, have no doubt contributed to restrict the field of its usefulness.

ACTION. *On Animals.*—Tiedemann injected five grains of musk, dissolved in two ounces of water, into the crural vein of a dog. Respiration was quickened, and the expired air smelled of musk; the pulse was not rendered more frequent, nor was the temperature of the animal increased. Partial insensibility followed, and a cataleptic condition; there were slight spasms during sleep, tetanic phenomena, copious and bloody stools, coma, infrequent respiration, a thready pulse, and then death. The muscles were found to be rigid; the intestinal mucous membrane was reddened, and the canal contained dark blood, as also did the veins.[4]

On Man.—Tralles, in 1783, pointed out the following qualities of this drug. It has a great and wonderful power over the whole nervous system, quickens the circulation, raises the animal temperature, congests the brain, producing drowsiness and intoxication, and causes a sense of oppression and anxiety in the chest.[5] According to Sundelin, about fifteen minutes after taking a scruple of musk a feeling of excitement or intoxication is experienced, with a quickened, full, soft, and somewhat more frequent pulse, and the skin is slightly moistened. These symptoms continue for about two hours, and do not leave behind them the least sense of lassitude or confusion of the senses. The

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[1] Clinical Medicine, p. 816

[2] PAUL. ÆGIN., Comment. Adams, iii. 469.

[3] Vid. TRALLES, inf. citat; and SCHRŒCKIUS, Ephemerid. Acad. Nat. Cur., 1686, p. 231.

[4] MITSCHERLICH, op. cit., ii. 371.

[5] Com. de rebus in Sci. Nat. et Med. gestis. xxvi. 434.

breath, perspiration, and urine, diffuse a strong musky smell even upon the day following the experiment.[1] Barbier found the same smell also in the excretions of those who had taken musk, and could detect it upon his own fingers after merely feeling the pulse of one of these persons.[2] The breath and eructations of a patient to whom an enema containing musk had been administered, offered its characteristic smell and taste; and the serous cavities, and indeed the whole body, was found impregnated with the odor in the case of a person who had taken musk, immediately before death.

The following are the results of Jörg's experiments with this substance. The medicine was administered to eight healthy persons, including himself. Doses from one-half to five grains induced no other phenomena than eructations in which the odor of musk was very strong. Doses from four to fifteen grains were followed by fulness and oppression at the epigastrium; by an increase in some cases, and in others by a diminution, of appetite; the throat and œsophagus were dry, yet there was no thirst; there was slight wandering of mind and giddiness, tightness about the temples, neuralgic pains of the head, and some disturbance or weakness of the mind. In several cases, gaping, drowsiness, and lassitude, followed, and several sensitive persons displayed considerable excitement of the nervous system, and quivering or twitching of the whole body. In general the pulse was more frequent by several beats than usual, and at the same time rather fuller. In some cases there was an increased sense of warmth, and moderate perspiration. The operation of the drug usually terminated in six or eight hours, yet several persons more impressionable than the rest had musky eructations, and felt drowsy, for twelve or eighteen hours. The ensuing sleep was deep and long. Contrary to the observations of other experimenters, Jörg found that neither the urine nor the perspiration smelled of musk, but in some cases the former exhaled a strong ammoniacal odor.[3]

Strumpf thus indicates the modified action which certain morbid states induce in the operation of musk. While large doses, or small ones frequently repeated, occasion in healthy persons more or less oppression with agitation of the nervous system, they, on the other hand, secure repose and strength to those in whom the nervous system is enfeebled or deranged, imparting animation and freedom to the action of the brain, and restoring the lost balance of the nervous system. When duly administered to the sick, it gives vivacity to the eyes, often causes a slight injection of the conjunctivæ and flush-

[1] Strumpf, op. cit., p. 1031. [2] Mat. Méd., ii. 231. [3] Materialien, p. 285.

ing of the cheeks, a fuller and somewhat slower pulse, warmth of the skin, perspiration, increased discharge of urine, and some irritation of the genital organs. When this excitement of the whole nervous system is followed neither by a natural state nor by an amelioration of the disease, the ultimate condition of the patient is one of greater debility than at first.

Hiltscher[1] ascribes to musk almost exactly the same qualities as those just pointed out, and dwells upon the necessity of giving full and repeated doses in order to develop its effects distinctly. He also blames the custom of prescribing the medicine only as a last resort, a custom which, he says, has led the sick and their friends also to look upon the prescription of musk as a sentence of death.

Remedial Employment.—In *febrile affections*, distinguished by *ataxic* rather than typhoid symptoms, or, to use the distinction of Vogt,[2] when the nervous is more damaged than the vascular system, in *febris nervosa versatilis* rather than in *febris stupida*, musk is indicated; for, in pure typhus, when *prostratio virium* is the most prominent symptom, it is more mischievous than useful, while wine is almost a specific. The distinction here pointed out is probably the one aimed at by M. Pidoux when he attempts to define ataxia pathologically as follows: "Ataxia consists in a want of unity between the nervous and the organic functions, for in this proportion and in the degree of its force or firmness the life of the individual and the degree of his vital resistance abide."[3] In using this language, the author may be suspected of having fallen into one of those puerilities which consist in cheating one's self by a jingle of words. The state alluded to will be best understood by means of a description. It usually presents itself after the more active and open symptoms that mark the invasion of the attack, while the pulse is moderately strong and full, the countenance animated, and the vitality of the skin unimpaired. The eye is then observed to grow dull, the hearing becomes impaired, the breathing is anxious and sighing, the speech feeble and stammering; there is a mild muttering delirium rather gay than sombre, floccitation, muscæ volitantes, and hiccup; the tongue is tremulous, and may be brown and dry, smooth and polished, or uneven and pasty; there is subsultus tendinum and twitching of the facial muscles and of the lower limbs; the skin is hot, dull, dirty, dry, and harsh, or else covered with a profuse sweat; and the pulse is small, frequent, tremulous, and irregular. This state tends to pass into coma or collapse, in either of which musk would be as unavailing as improper; but to counteract the symptoms

[1] Sobernheim, op. cit., 192. [2] Lehrbuch, &c., i. 269. [3] Op. cit., ii. 202.

which have been described, nothing acts with more promptness or certainty. This is doubtless the state which Cullen had in view in the following passage:—

"We abstain from musk in inflammatory cases, or in cases where the diathesis phlogistica is supposed to exist, and in topical affections of the brain; but I am disposed to say that even in these cases it may be employed with more safety than opium, so far as my experience goes; and in fevers, without much nicety in discerning the circumstances, wherever the symptoms of *strong spasm* appear, where there is a *delirium*, *subsultus tendinum*, and *convulsive motions*, without the irritation being remarkable, and where we presume the disease to be in the nervous system, there musk has been of considerable service."[1]

Sarcone, who used the remedy very extensively in the epidemics of Naples, is thus cited by M. Dévay in a paper on *Malignity in Febrile Diseases*.[2] After describing the ataxic condition, he thus portrays the effects of musk: "It was a delightful thing to see patients who had been convulsed pass by degrees from a peaceful sleep into a state of drowsiness that lasted for several hours or even days. Subsequently the pulse began to be undulating and decidedly quickened, the skin was often covered with a warm, general, and often offensive sweat; the urine began to flow with ease and seemed to contain a whitish deposit; and putrid stools, or the discharge of a foul and stinking serum, took place." "We have several times," says M. Dévay, "had occasion to confirm the remarks of Sarcone. In the course of four months we met with six cases of ataxic typhoid fever, in which the nervous system was greatly deranged, and in which the use of musk liberated, as it were, the chief disease from these accidental complications, and restored it to its simple state. The same effect took place in two cases of confluent smallpox, which were at the commencement of the eruptive stage with delirium, jactitation, and convulsive movements. The medicine was prescribed in pills of three grains each, to be taken every hour."

Many writers describe with high eulogy the benefits of musk when *ataxic phenomena*, like those above described, occur in *pneumonia*. Believing, however, that these phenomena are rare as symptoms of simple pneumonia occurring in healthy persons, it became interesting to learn, as far as possible, under what circumstances the ataxic symptoms are said to have arisen. The cases examined by the author were contained in a paper of M. Padioleau,[3] and in the work of MM. Trous-

[1] The Works, &c., 1838, i. 633.

[2] Rev. Méd., Juill. 1843, p. 334.

[3] Bull. de Thérap., xvii. 265.

seau and Pidoux. It appears that depletory and sedative measures were adopted to a frightful extent. In the first case of Mr. Padioleau the patient was bled "several" times; in the second, four; and in the third case, six or seven times, while leeching, antimony, and blisters were also employed. In the remaining cases it is said that depletion was carried "as far as possible;" that the ataxia supervened "suddenly after venesection;" that bleeding was performed "several times;" that "under the influence of antiphlogistics and antimonials the nervous susceptibility increased, and a violent and ataxic delirium supervened;" and that, "after the most energetic use of the antiphlogistic, contro-stimulant, and revulsive treatment, the delirium increased frightfully." It may be added, that one of these cases was of a man attacked with pneumonia while drunk, yet he was bled and had tartar emetic given him. M. Pidoux remarks that "the gravity of the nervous symptoms were not fully explicable by the severity of the local lesion;" they are readily explicable by the character of the treatment applied to a drunken man. Indeed, in the whole number of cases there is not one in which the ataxic symptoms did not clearly depend upon the unwarrantable use made of depletory and sedative measures. These, then, are not fitting examples of the power of musk to cure that ataxia which arises from natural causes; nourishment, wine, and opium would perhaps, probably indeed, have triumphed quite as readily over symptoms which were the natural fruits of injudicious treatment. The general testimony of medical writers is, however, favorable to the virtues of musk in ataxic pneumonia and other inflammations of the same type; and it perhaps would be as available in this state when it occurs spontaneously through the violence of the disease, or, what is more probable, from the constitution of the patient, as when it is indirectly generated by an unwisely perturbating treatment. There remains a still purer form of ataxia in which the benefits of musk are not problematical; a form in which typhoid symptoms do not exist, but those rather of febrile delirium, and which are only to be distinguished from the latter by the absence of sthenic fever of a high grade. It is thus described by the authors last quoted: "It is purely nervous and maniacal. The brain is in a state of violent excitement, the patients are agitated, insist upon getting up, and rave with furious activity, precisely as if they were under excitement from alcohol. Indeed this sort of delirium is apt to break out in the pneumonia of drunkards." Musk will generally control these symptoms. So, too, will opium, either alone or in conjunction with musk, or with Hoffmann's anodyne, or with alcoholic stimulants prudently administered.

In various *spasmodic affections* musk has been successfully employed. In convulsive *hiccup* it is mentioned favorably by Whytt and by Wall. The latter states that two persons laboring under subsultus tendinum, extreme anxiety and want of sleep occasioned by the *bite of a mad dog* were perfectly relieved by two doses of musk of sixteen grains each. Dr. Huck relates a case of recovery from *traumatic tetanus*,[1] in which musk formed the main element of the treatment. Cullen states that he "once had a gentleman affected with *spasm of the pharynx* preventing deglutition and almost respiration. This, when other remedies had failed, was relieved by the use of musk, which often showed its power; for the disease continued to recur at times for some years after, and was only obviated or relieved by the use of the musk." Dr. Owen relates a case of *hysterical convulsions* which was cured by this remedy.[2] The patient, a young lady of seventeen, received a slight electrical shock, and a few hours afterwards experienced similar sensations to those she had received from the Leyden jar. After occurring at intervals for several months, and gradually growing stronger, they at last assumed the form of strong hysterical paroxysms. A variety of antispasmodics, including musk as well as tonics, were employed unavailingly, when at last musk alone, in doses of half a drachm repeated every four hours, was prescribed, and the paroxysms at once began to abate. As often as the use of the medicine was suspended, the fits returned, but less violently, and they were again arrested when it was renewed. The cure was completed by the use of chalybeate waters. In *spasmodic croup* musk is highly recommended by many German writers, who furnish satisfactory evidence of its curative powers; but it has no greater virtues and probably, indeed, less, than emetics and revulsives in this affection, and is a far less accessible and manageable remedy. M. Salathé, of Bordeaux, claims to have cured all but two of twenty-four cases of *spasm of the glottis* in infants, by the use of musk.[3] But when it is remembered that the disease so called is in reality a symptom of various pathological conditions, some of which are trivial, and others mortal, we should greatly err in expecting to cure it uniformly by this or any other remedy. The report of M. Salathé is valuable in one respect, however; it proves the virtues of musk in purely nervous cases of the disease. In *spasmodic coughs*, *vomiting*, *colic*, *chorea*, &c., this medicine has been more or less eulogized by various authors, but on reviewing the evidence on which their opinions rest, it is difficult to accept them unreservedly.

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[1] Med. Obs. and Inq., iii. 330.

[2] Ibid., 183.

[3] Bull. de Thérap., l. 330.

All that can be credited is that in these affections musk may be employed as a palliative of moderate efficacy. In proportion as the nervous element of the disease is predominant, may good be anticipated from its use, especially in those cases where the inflammatory element is in a like proportion weak.

In *retrocedent gout* the powers of musk are vouched for by Cullen. One of his patients was frequently attacked by this disease, affecting the stomach, the lungs, and particularly the head with violent headache and delirium. Many of these paroxysms were very suddenly relieved by large doses of musk, repeated at short intervals.[1]

Administration and Dose.—Musk is usually administered in the form of *pill* or *emulsion*, and in doses of ten grains and upwards, repeated every two or three hours. To children it may be given in the form of enema. The *tincture* of musk may be employed as an adjuvant to the preceding forms of administering the medicine; but the quantity of this preparation required to represent the average dose of musk would contain too much alcohol to be frequently repeated.

CAMPHORA.—Camphor.

Description.—The camphor of commerce is procured from *Laurus camphora* or *C. officinarum*, and the *Dryobalanops camphora*, both of which trees grow in China and the adjacent islands. Camphor is, however, a widely diffused product of the vegetable kingdom. Millot defines it to be an organic product of several plants, which is distinguished by being solid, flexible, white, translucent, of a peculiar odor, and an acrid taste, which leaves a sense of coolness in the mouth, and is extremely volatile.

When small fragments of camphor are thrown upon water, mercury, or wine, they assume a circular, and often at the same time a rotary, motion. If a cylinder of this substance is floated vertically to half its depth in water, it becomes corroded, and is at last completely severed at the surface of the water. The former of these curious experiments has been explained by attributing the described motions to the reaction of the emanations of the camphor against the surrounding water.[2]

Camphor is insoluble in alkaline solutions, and is very slightly soluble in water; but is perfectly so in alcohol, ether, oils, and acids. Its sp. gr. is 0.9857.

Medical History.—Camphor was introduced into medicine by the

[1] Mat. Med., ii. 381.

[2] Dieu, op. cit., iii. 596.

Arabian physicians, who have also left us the earliest description of its virtues. Serapion is the ancient authority from whom the fullest account of this drug is derived. According to him, it is applicable to inflammations, vertigo, and cholera, is anaphrodisiac, induces premature whiteness of the hair, and arrests hemorrhages. Other Arabian authorities state that in large doses it causes indigestion, is an astringent of the bowels, and produces impotence.[1] The last-named quality is celebrated in a distich of the Salernian school—"Camphora per nares, castrat odore mares."

In modern times camphor has been ranked among the most useful remedies. Its vogue has, however, greatly declined during the present century, in consequence, it may be presumed, of the controversies concerning its action which divided the medical world; for while several of the most eminent authorities regarded it as a sedative, others, of no less distinction, maintained it to be a stimulant. As too often happens on such occasions, the contending parties were more zealous in refuting one another than anxious to establish the truth concerning the subject of their dispute.

ACTION. *On Plants.*—Withered plants revive with remarkable quickness in camphor-water, but ultimately perish under its influence. Cut portions, according to Göppert and Miguet, become brown and dry more or less quickly, according to the course of their vessels and their structure. Plants that secrete a milky fluid lose this faculty, and such as have a motory power are paralyzed. Plants sprinkled with camphor are speedily and certainly killed, and the color of their flowers is changed by it. Only to the lowest class of the vegetable kingdom is camphor innocuous; mould will even form in glasses that contain it, and animal and vegetable substances moistened with a solution of camphor grow mouldy as readily as if water was employed alone. Camphor does not interfere with the germination of seeds.[2]

On Animals.—Menghini found that the effluvium of camphor is fatal to many of the articulata, when they are inclosed with this substance in a glass vessel with a paper cover, pierced with holes so as to admit the air. Beetles, bedbugs, ants, wasps, fleas, spiders, and lice are sensibly affected by its emanations, which ultimately destroy them. According to the same experimenter, birds, such as sparrows, swallows, chickens, pigeons, &c., are all more or less acted upon; some of them are seized with epileptiform convulsions, others with a sort of intoxication or madness, and still others fall into a state of stupor, or give signs of distress, with stertorous breathing, hiccup,

[1] ADAMS, Comment. on Paul. Æginet., iii. 427.

[2] STRUMPF, i. 710.

or frothing at the mouth, while in some cases a purgative, emetic, or diuretic action is manifested. Most frequently the death of the animals speedily follows these symptoms; and, on dissecting them, various signs of inflammation are detected in the meninges, lungs, heart, and intestines, and the blood is in some instances fluid, but in others coagulated. Monro produced sluggishness, syncope, and a marked slowness of the heart's movements, when camphor was given to frogs, either by the mouth or applied to the skin. Carminati placed frogs under glasses having a capacity of four cubic inches, along with a piece of camphor weighing three drachms, and at the expiration of fifteen or twenty minutes the animals became agitated, breathed laboriously, and died convulsed.[1]

Camphor is very generally fatal to the intestinal entozoa of man. One of the most familiar uses of this substance is to prevent the attacks of moths upon woollen fabrics, by sprinkling it amongst them, or by inclosing them in chests made of camphor-wood. This well-known fact appears not to harmonize with the statement made by numerous authors, that camphor does not act injuriously on the *tineæ* that destroy wool.

Experiments upon dogs and other animals have been made by numerous observers, whose results are comprised in the following summary. Five or ten minutes after a dog has taken from one and a half to two drachms of camphor, dissolved in oil, the animal grows restless, foams at the mouth, makes violent efforts at swallowing, his gait is unsteady, and he soon lies down; but shortly afterwards, and as if aroused by an electric shock, he starts up, vomits, or attempts to do so, and again lies down. These acts occupy about a quarter of an hour. He then begins to tremble, and is convulsed, throwing his head backwards; his movements grow disordered; he whines, and tries to escape; his throat becomes obstructed with frothy mucus; his eyes are generally fixed, and the pupils dilated. The breathing meanwhile is anxious, and the pulse feeble. This convulsive state is generally followed by repose, during which the heart beats more feebly and less frequently, while the nose is cold and the whole body trembles. Another and more violent convulsive paroxysm follows, which is again succeeded by an interval of repose; but the spasms are speedily renewed, respiration grows more labored, and the animal dies. During the progress of these phenomena, vomiting, with a discharge of urine and fæces, generally takes place. Their duration is usually from two to three hours; but if they do not terminate fatally, the animal speedily reco-

[1] Dieu, loc. cit.; Murray, App. Med., iii. 474.

vers. When solid camphor is administered, the animal shows greater signs of suffering; he drinks greedily, and his pulse becomes quicker, but death ensues at a much later period than in the experiments previously described; not usually, indeed, for many days, and then not from direct poisoning, as when the camphor is administered in oily solution, but indirectly from inflammation of the stomach. This organ is found on dissection to be extremely vascular, and softened or ulcerated. No other cadaveric changes have been observed which serve to illustrate the cause of death.[1] The odor of camphor is detected in all the fluids and secretions after death; the heart is found distended, and its lining membrane, as well as that of the bladder, and the membranes of the nervous centres, are stained by the dark and fluid blood. Scudery found vivid traces of inflammation in the genito-urinary apparatus of a dog which had been poisoned with camphor, and had suffered severely from strangury during the progress of the experiment. Tiedemann and Gmelin could not recognize the smell of camphor either in the chyle or in the urine, but all observers have detected it in the expired breath.

When camphor is given in small doses to horses, oxen, sheep, &c., it is said to quicken the pulse and cause general excitement, and blood drawn from a vein flows more strongly and is redder than before the experiment. Larger doses, according to Moiroud, develop exalted sensibility and induce convulsions; and yet larger quantities produce a still greater degree of morbid sensibility, frequency of the pulse, convulsive paroxysms, and at last insensibility and an apoplectic condition.

The only conclusions which seem to be fairly deducible from the foregoing facts relative to the mode of action of camphor are these: 1st, that in *poisonous* doses it destroys life in the lower animals by depressing the vital actions of the system; and, 2d, that in *moderate* doses it acts as a stimulant to the nervous and circulatory systems. Some experiments of Scudery have been adduced by Dieu[2] to prove that camphor and opium are antagonistic. The experiments, indeed, showed that the poisonous effects of camphor are moderated by opium. But the assumed interpretation of this fact could be sustained only by showing that the dose of the latter agent, if administered alone, would have been sufficient to produce the poisonous effects of opium. For otherwise it is only what might have been expected, that a moderate or stimulant dose of opium would tend to counteract an excessive or sedative dose of camphor; just as a small quantity of alcohol

[1] Dieu, loc. cit.; Murray, App. Med., iii. 474. [2] Loc. cit.

will moderate the secondary effects of an overdose of the same agent. So Scudery himself found that rabbits withstand for a long time the influence of poisonous doses of camphor dissolved in alcohol. No two agents can be considered antagonistic which do not produce opposite effects when given in the same relative doses. But the diverse action of small and of large doses of camphor will be more fully illustrated in the sequel.

On Man.—Local Action. When camphor is rubbed into the unbroken skin, it produces a sensation of heat or burning, but seldom causes inflammation. It excites severe pain, however, when applied to the denuded cutis. The local action of camphor on mucous membranes is more decided. A piece held in the mouth for half an hour excites redness, heat, swelling, and pain,[1] and if retained there long enough, would probably also ulcerate the surface with which it is in contact, as it is known to do when it acts upon the gastric mucous membrane. When powdered camphor is sprinkled upon indolent and unhealthy ulcers, it produces a contraction of the tissues and hastens the cure. *The local operation, therefore, of camphor on healthy parts is that of a stimulant and irritant.*

Constitutional Action. A diversity of opinion regarding the operation of camphor has long prevailed in the medical profession, a diversity quite as great as in the case of opium, and which would probably have engendered no less hostility and bitterness between the opposite advocates, were not the utility of the former medicine so far inferior. Like opium, camphor is held to be a stimulant by one party and proclaimed as a sedative by another, and examples without number are cited by each to demonstrate its own thesis. This conflict of opinion seems susceptible of harmony, if, instead of accepting the deductions of authors as the elements of a judgment, the grounds of those deductions are themselves analyzed; for then it appears that, as in the case of opium, alcohol, and various other agents, the action of camphor varies with its dose, and further, that in certain doses its primary and secondary effects are of an opposite character. These statements will be more readily appreciated after a review has been taken of the facts upon which alone it is possible to base an enlightened and impartial judgment.

One of the earliest illustrations of this subject is furnished by Hoffmann.[2] The patient was a hypochondriac, to whom *two scruples* of camphor dissolved in oil were administered by mistake for spermaceti. Hardly was the dose taken, when the patient was seized with vertigo,

[1] Trousseau and Pidoux, op. cit., ii. 214. [2] Consult. et Respon. Med., cas. xix.

his extremities grew cold, and his countenance pale; his pulse was small and very slow; there was præcordial distress, and a cold sweat broke out upon the forehead; the mind became disturbed, and the patient laughed loudly at one moment, and the next was depressed with a dread of dying. Volatile and stimulating liquids held to his nose increased the intoxication; the patient's limbs seemed weary, and when he boasted of his strength, he staggered in walking. In the course of two hours be began to come to himself, but was feeble and relaxed; a copious perspiration with a warm skin and frequent pulse followed, and he enjoyed a good night's rest.

Whyte relates the case of a gentleman who, in order to know what effects a large dose of camphor would have, swallowed *half a drachm* dissolved in oil. His head became confused, he staggered as he walked, and a dark cloud seemed to come over his eyes, but upon going into the open air these symptoms began to abate, and in a few hours passed away.[1]

A very similar case is recorded by Griffin. *Two scruples* were taken, and caused, besides the burning sensation at the pit of the stomach, a lessened frequency of pulse, vertigo, intoxication, slight shivering and a pale countenance, staggering, and finally sleep.[2] The same writer states that he gave *half a drachm* to another person. The pulse did not change at first, but after the lapse of two hours there was nausea with giddiness and dimness of vision; then active vomiting, after which the pulse became frequent, small, and feeble, with general debility, which continued for some time, especially in the lower limbs. According to Callisen, this medicine given to persons laboring under a malignant bilious fever, in doses of from *ten grains to half a drachm* every third or fourth hour, and in some cases every hour, produced in all of them a marked subsidence of the heat and paleness of the surface, dimness of vision, frequent and oppressed breathing, a less frequent but an unequal and intermittent pulse, and occasionally rigors. But these symptoms, which arose suddenly, subsided rapidly, and did not last more than half an hour; they were followed by a stronger and more regular pulse, easy respiration, warmth and redness of the skin, and brightness of the eyes.[3] Pouteau also relates the case of a puerperal female who, in the course of half an hour, took *a drachm* of camphor to relieve the pains of colic. She was seized with a death-like coldness and paleness which lasted nearly an hour.[4]

One of the best related cases on record illustrative of the present

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[1] Observations, &c., 2d ed., p. 366.

[2] Murray, Apparat. iii. 479, and Griffin, loc. inf. cit.

[3] Ibid., p. 481.

[4] Ibid., p. 483.

subject, is that of Alexander, who in order to study the effects of camphor, took *two scruples* of it at a dose suspended in syrup.[1] He soon experienced an unusual lassitude and depression of spirits, accompanied with frequent yawnings and stretchings which stole upon him by degrees, till at the end of three-quarters of an hour they became extremely troublesome. His pulse had fallen from 77 to 67. "Soon after this," he continues, "my head grew so very giddy that it was with great difficulty I could walk across the room, when feeling myself, as I imagined, stifled, I imagined the fresh air would remove that symptom, and therefore opened the window and looked out; but everything in the street appeared to me in the utmost tumult and confusion; in which, imagining that I was involved, I felt myself in danger of losing my balance and tumbling from my position. I therefore staggered from the window to my bed, and having a book with me, read several passages of it; but had no distinct idea of any one sentence, and far less could I connect two or more of them together, so as to comprehend the meaning of the author. At last, being able to read no longer for the tumultuous motion which I perceived among the letters of the book, and finding it had no power to divert the attention of my mind from the uneasy sensations which disturbed me, I arose to see whether I could walk any better; but to my great mortification found my head more confused, and could scarcely walk any at all. I then returned to the bed, and, being a little thirsty, called for some mutton broth to drink. When the victuals were brought, I got out of bed again, and with no small reluctance swallowed a little of the broth, but could neither taste bread nor meat, on account of a nausea which, however, was not accompanied with any inclination to vomit. I now staggered again to bed, and took up the book I had left there, but could not read, as the letters on the book formed only a confused group of unsteady images. The confusion in my head now increased so much, attended with such a noise in the ears that all knowledge of what was present, as well as the memory of the past, was soon entirely lost in a state of insensibility; so that I was entirely ignorant of what I did till my senses began to return.

"Fortunately, about this time, one of my young gentlemen came into the room, who told me afterwards that I desired him to shut the windows, and then threw myself backward on the bed where I lay a few minutes very quiet, then started up, sat on the side of it, and made some efforts to vomit, but threw nothing up; then I flung myself back

[1] Experimental Essays, Lond. 1768, p. 128.

again with dreadful shrieks, fell into strong convulsions, foamed at the mouth, stared wildly, and endeavored to lay hold of and tear everything within my reach. This fit was succeeded by a calm, something similar to fainting, with this difference only, that my color was very florid. When Dr. Cullen soon after arrived, and felt my pulse, which beat one hundred in a minute, he ordered me to be blooded, but my natural antipathy against this operation made me obstinately refuse to comply. All this time no person knew anything of my having taken the camphor, nor did I recollect it myself, and though I was recovered so much as to know every one about me, I was entirely ignorant of my own actions, as well as of the place where I was.

"At this time, feeling myself very warm, I got out of bed, threw myself down on the floor, and thinking myself refreshed by the cold of it, called for some cold water, and bathed my hands and face in it. This refreshed me a little, and in some degree quieted a tremor which had seized on every part of my body. After drinking plentifully of warm water, I vomited; and, though more than three hours had passed since I had taken the camphor, the greater part of it was evacuated, undissolved, along with the water. While I was holding my head over the basin into which I was vomiting, the smell of the camphor arose very strong from it, and to this circumstance it was owing that I first recollected I had taken it, though I could give no distinct account of the time when or manner how.

"I mentioned before that I had not only lost all remembrance of my past actions, but also the knowledge of every present object, but now I began slowly to recover both; my business, my connections, and everything of the same nature, which I had entirely forgot, at their first occurrence startled my mind as if they were things I had never before been acquainted with; and, what is still more extraordinary, after I knew every one of my family, I did not recollect the use of any part of the furniture of my own room, and every object on which I cast my eyes appeared as strange and new to me as if I had only that moment begun my existence.

"Between eight and nine o'clock, feeling myself still very much confused, I went to bed, and soon after fell into a very calm and easy sleep, which continued till next morning with much less interruption than usual." No unpleasant symptoms remained on the following day, except great soreness and rigidity over the whole body.

This case, which is almost unique in the minute and complete detail of its phenomena, is also different from any other in the peculiar disturbance of the nervous system which it displays. Neither the term stimulation nor sedation expresses the character of the symptoms

taken in their aggregate, and such, indeed, was the judgment of Alexander himself concerning it. Nevertheless, if we set aside those of its phenomena which indicate neither an excitement nor a depression of the system, but their perversion merely, the remainder clearly demonstrate a diminished energy or tone in the circulatory and nervous systems and in their dependencies. Of such symptoms are these; depression of the pulse, lassitude, giddiness, accompanied with debility, fainting, &c. They were the primary effects of the medicine, and were followed ultimately by heat of skin, frequency of the pulse, and headache.

The well-known case of Cullen's patient should find a place here. She took *forty grains* of camphor, and became insensible; her pulse was very weak and small, her breathing hardly to be observed, and her whole body pale and cold.[1] Duteau relates that *one drachm* of camphor was given to a girl in a very severe colic. After taking it the pain soon became easier; but it brought on such an extreme cold over all her body as resembled death, and which could hardly be removed by the aid of warm clothes wrapt around her, and the internal use of wine.[2]

An instructive case was published by Wendt relative to a man who swallowed nearly four ounces of tincture of camphor containing more than *two drachms* of the latter substance, and who nevertheless recovered. Dieu, who cites this example, very plausibly attributes the safety of the patient to the stimulant effects of the alcohol in which the camphor was dissolved.

Trousseau performed some experiments in his own person for the purpose of elucidating the action of this medicine. After a dose of *ten grains* the pulse fell from 72 to 64, and then to 60; an acrid coldness was felt in the stomach, and at the expiration of an hour, although this symptom remained, there was a general sense of comfort. A dose of *twenty grains* produced the same but in a more marked degree. A third dose of *thirty-six grains* occasioned a still stronger sense of cold, which seemed to pervade the whole trunk, but was especially felt in the œsophagus and the stomach. At the end of half an hour the pulse fell from 72 to 60, and there was a slight sense of heaviness. "The anaphrodisiac action was unquestionable." At the expiration of two hours the sense of coolness in the bowels was no longer felt, but in its stead a slight degree of warmth. Three hours afterwards the condition was the same as before the experiment. In these trials of the medicine, and especially in the last, the reader will be struck by the ab-

[1] Mat. Med., ii. 295.

[2] ALEXANDER'S Essays, p. 141.

sence of several symptoms which occurred in all of the other cases in which so large a dose of camphor had been taken, viz., the coldness of the extremities, the confusion of mind, the vertigo, the weariness, and the debility. These and various alarming ataxic symptoms were produced in the person of Alexander by a dose of camphor only four grains larger than the last taken by M. Trousseau with such slight effect.

M. Aran reports a case[1] which goes still further to demonstrate the exceptional character of the symptoms described by M. Trousseau. The patient was a nervous and delicate female affected with neuralgia and various indefinite pains and sensations in different parts of her body. *Two scruples* of camphor suspended in water were given by enema. Hardly had two minutes elapsed when the patient complained of a faintness which seemed to threaten dissolution, and of a severe pain in the belly. Almost immediately afterwards she became insensible and was convulsed; the limbs were contorted, the head thrown backwards, the face purple, and the lips covered with foam. The fit lasted twelve minutes. Soon afterwards M. Aran found her in the condition described, and with the eyes half open, the pulse between 70 and 80, and extremely small, the extremities cold and livid, and the respiration suspended. The patient regained her consciousness on water being sprinkled on her face, but complained of pain in the abdomen and a sense of suffocation which lasted several hours. A purgative enema was administered and strong coffee prescribed, but very soon after, although she had meanwhile evacuated a portion of the camphorated enema, the former symptoms were renewed, and were mitigated by a stream of cold water falling upon the head. The coldness and insensibility persisting, the patient was placed in a warm bed and wine with canella administered. From this time reaction came on, the trunk grew warm and even hot, the pulse rose and became frequent (88–92), and in four hours after taking the camphor the only remaining symptoms were fever, injection of the face, heat of skin, and a sense of weariness and debility, which by the morrow were completely dissipated. The patient had no recollection whatever of the incidents of this attack.

Another example of the sedative effects of large doses of camphor is related by M. Orfila.[2] In this case a dose of *thirty grains* was administered in clyster to a man of nervous temperament. A few minutes afterwards the taste of the medicine was perceived in his throat, and within a quarter of an hour a sense of uneasiness and

[1] Bull. de Thérap., xli. 164.

[2] Toxicologie, ii. 643.

anxiety took possession of him. On rising to walk he seemed to move over the ground without touching it, and his step was wavering and tottering. His face was pale, his eyes haggard, and his features pinched. A slight sensation of coldness pervaded the whole surface of his body, and a sense of numbness the scalp and back of the neck. In some places the skin was cool and moist, the pulse was small and feeble, and there seemed to be a disposition to syncope, &c. Wine contributed greatly to his recovery.

The same author quotes from Schaaf the case of three children, to each of whom about *thirty grains* of camphor in powder were given. The first symptom observed was extreme paleness of the face with a fixed and stupid look; then followed delirium, thirst, vertigo, vomiting, convulsions, and insensibility. The skin was cool, pale, and moist. One of the children, a delicate and sickly infant eighteen months old, died from the effects of the poison. The only other case in which camphor was the cause of death, and in this instance, as in the last, by an indirect effect, is that of a woman four months gone with child, who took three drachms of camphor dissolved in brandy at a single dose. It produced the usual symptoms, followed by an abortion which proved fatal.[1]

On analyzing the cases of which the more important details are given above, there is found to be a remarkable agreement in their symptoms, the character, if not always the degree, of the disturbance being identical in all of them. The cases are thirteen in number, in nine of which the dose of camphor taken varied from two scruples to a drachm; in the remaining four it averaged about half a drachm. In nine, of which the condition of the nervous system is described, there were vertigo, faintness, confusion of ideas, and either delirium or insensibility, debility, staggering, and convulsions. The temperature of the body is described as cool in all of the cases in which its condition is mentioned; the face was pale and the pulse either infrequent or small and feeble. This striking uniformity in cases observed in places remote from one another leaves no doubt upon the mind as to the modus operandi of camphor given in doses of from twenty to sixty grains. The medicine in these doses is proved to be a direct and powerful sedative, but transient in its operation. This is its primary and principal quality; indirectly, and chiefly perhaps where there is an undue nervous susceptibility, it creates in addition ataxic pheno-

[1] Bull. de Thérap., lvi. 343. Other late examples of the toxical action of camphor will be found in Lancet, May, 1857, p. 475; Am. Journ. of Med. Sci., July, 1858, p. 284; Times and Gaz., Dec. 1858, p. 645.

mena; and, lastly, and indirectly also, these effects are followed by some degree of febrile reaction, which is also of brief duration. In no instance does camphor seem to have caused the death of a healthy person.

There are several cases upon record which may be regarded as transitional between those above described and those which are next to be considered—cases in which, although the total dose of camphor taken within a short time was large, yet the amount taken at any one moment was small. The first of these is the case of Dr. Eichhorn, related by himself.[1] He had powdered some camphor with sugar to relieve a cold in the head, and in the course of three hours took a teaspoonful from time to time without reflecting upon the quantity he was swallowing, but which was really about *two drachms*. He then went to bed somewhat alarmed lest he were poisoned, but for half an hour suffered no inconvenience. Presently, however, he began to feel warmer and warmer until he experienced a burning heat; his pulse grew very frequent, but there was no uneasiness in his head. He says: "I never felt better; never were my ideas more lively or clearer; it appeared as if my intellectual powers were increased, and certainly champagne never brought on a more pleasing intoxication. In this situation I passed about an hour and a half, when my skin began to grow moist; soon after my pulse became slower and I fell asleep. The next morning I awoke miserably weak, the sweat having penetrated to the lower side of the feather-bed, and my shirt and clothes were drenched."

The other example is reported by Dr. Reynolds,[2] of Brockville, Canada. "Mr. C., æt. 20, of a healthy constitution, and full habit, was standing in a shop where a druggist was breaking up cakes of camphor to put in bottles. He began to eat the crumbs of camphor, and unconsciously swallowed, bit by bit, probably *from one to two drachms* in the course of a few minutes." He suddenly experienced a degree of headache, and went out into the street, where he met a friend, to whom he proposed a rubber of whist. He felt unusually clear-headed; but soon after sitting down his gestures and conversation became very strange and wild. "Leaving the room suddenly, he retired to his bedroom adjoining, and returned to the no small astonishment of his friends, naked and dancing wildly about, and attempting to jump out of the window. His pulse was 180 and small; conjunctiva injected; pupil not much dilated, scarcely sensible to light; countenance pale and haggard; breathing hurried, and at times greatly labored; a

[1] Am. Journ. of Med. Sci., xi. 248. [2] Month. Journ. of Med. Sci., Sept. 1846.

frequent desire to make water, with some pain in the course of the spermatic vessels; urine quite clear, but having, as well as the perspiration, a strong odor of camphor; and a clammy sweat breaking out over the body." Opium was administered, which, of course, complicated the subsequent phenomena. The patient described the sensation while under the influence of camphor as "most exhilarating, but gradually becoming oppressive."

The contrast between the phenomena of these cases and the cases of the first series is very striking. When the medicine was taken in small doses frequently repeated, and during several hours, the effects were unequivocally stimulant, of an agreeable nature, and followed by little if any depression; but when nearly the same quantity of the drug was taken, and also in divided doses but within a much shorter time, the stimulant effects were also indeed predominant, but so active as to be almost violent, and were immediately followed by sedation and ataxic phenomena like those in the first series of cases.

There is still another case on record very closely resembling the one last narrated in its symptoms, but in which the whole dose of the medicine, *two scruples*, was taken at a single dose, and fasting. Purkinjé is its reporter.[1] The first effect of the medicine was to excite such a restlessness that the experimenter could not remain in bed. There was then a singular sense of lightness in the limbs. Sensibility to outward impressions seemed rather blunted. The attention could not be fixed. Ideas flowed through the mind in a swift and crowded stream, and the sense of personal identity was lost. These symptoms were temporarily relieved by vomiting, and for an hour the mind was applied to business. But the sense of sight was feeble and uncertain, while that of hearing retained impressions. At last, consciousness was lost, and a copious warm perspiration broke out. The experimenter had an injected countenance, and experienced some convulsive movements, and lay for half an hour breathing slowly. After awaking, he was for a long time unable to recognize the familiar persons and objects around him, but he experienced no exhaustion.

When an attempt is made to determine the action of *medicinal doses* of camphor upon the healthy system, a twofold difficulty presents itself; small doses have seldom been submitted to scrupulous experiment for the object in question, and the results of clinical observation cannot, in general, be legitimately invoked to demonstrate or even to illustrate the physiological mode of action of a medicine. Yet if the effects produced upon the sick should uniformly correspond with those

[1] Richter, op. cit., Suppl. Bd., p. 442.

produced by like doses upon healthy subjects, the mode of action deduced from the latter class of facts is rendered still more probable by inferences from the former.

The first series of experiments to be adduced is that instituted by Jörg.[1] To begin with the smallest dose, this observer employed a solution of one grain of camphor in eight drops of alcohol, of which the least quantity given was four drops: this same number was added on every repetition of the dose, until three and a half grains of camphor were given at once. In a second series, the first dose was four grains, and the last twelve grains. In a third, fourth, and fifth series the dose varied from one-half a grain to eight grains, and finally, in five concluding series the dose rose gradually from one-half a grain to five grains. The fractional doses are not reported to have exerted any distinct influenc, but a single grain did, in several instances, give rise to distinct phenomena which shadowed forth the more perfect effects of the larger doses. Not to dwell upon these in detail, it suffices to present the general conclusions to which the entire series of observations led. Jörg states them to be as follows: Camphor acts as a stimulant to the brain and intestinal canal, besides exciting the urinary and genital organs, the skin, and the vascular system. Hence it is indicated in diseases whose predominant symptom is debility, particularly where this state is maintained by atony of the intestinal canal. The opinion that camphor acts as a sedative on the organs of generation, and that therefore it is directly indicated in morbid excitement of these organs, is regarded by Jörg as belonging, probably, to the fabulous period of medicine. The reader will have seen that this is the appropriate action of the medicine in doses of thirty grains and upwards. Further proof, if necessary, might be adduced. Alibert cites the case of a nymphomaniac patient at St. Louis, whom he cured by a drachm of camphor, and Esquirol has successfully treated hysterical nymphomaniacs with the same remedy.[2] But these facts do not conflict with those of Jörg, and others which prove that camphor in small doses is an excitant of the generative organs.

According to Sundelin,[3] camphor in small doses raises the pulse, rendering it both fuller and more frequent, diffuses a sense of warmth from the stomach throughout the whole body, and augments the secernent action of the skin. This author seems clearly to have apprehended the conditions under which the apparently opposite actions of the drug are manifested, and which it is a main object of

[1] Materialien, &c., p. 230 et seq.

[2] Am. Journ. of Med. Sci., Jan. 1844, p. 190.

[3] Heilmittellehre, ii. 139.

this discussion to illustrate. "Small doses," he remarks, "demonstrate its stimulating qualities clearly, but as the quantity administered is greater, a condition is developed which at first sight seems to be the very opposite of excitement," and which the author attributes to congestion of the brain.

Purkinjé,[1] after taking a dose of *twelve grains*, in bed and fasting, experienced heartburn, a pleasant and moist warmth over the whole body, a general and agreeable excitement of the nervous system which was particularly distinct in the skin and muscles, a peculiar excitement of the brain, and above all a feeling of inebriation. These symptoms continued for an hour and a half, and were dissipated by the customary occupations of the day. They were not followed by any sense of lassitude.

Scudery[2] found that in a few minutes after taking from *ten to fifteen* grains of camphor, the pulse grew more frequent and tense, the cheeks became red, the skin dry, the head ached, the eyes were bright and sensitive to the light, and the genital organs were excited. The same results were obtained on five successive trials, and were confirmed by those of Pasquali and Mezzotti. Scudery afterwards took *a scruple* of camphor dissolved in an ounce of alcohol, and experienced the same kind of symptoms, but a much higher degree of excitement. The same experimenter took *two scruples* of camphor, and in a few minutes afterwards two drachms of nitre dissolved in water. At first the pulse fell, and there were nausea and chilliness, but in half an hour it rose again, and there was fulness of the head, with redness and heat of the face. Another dose of nitre like the first was then taken, which produced nausea, and at the same time dispelled the other symptoms. In the last of these experiments the sedation is attributed to the nitre alone, but was doubtless owing in part also to the large dose of camphor.

The general medicinal characteristic of camphor is, according to Sachs and Dulk,[3] that it excites the general sensibility, but in a particular manner the sensibility of the vascular system, and Murray declares that it is evidently stimulant. Vogt is of opinion that if we add the results of physiological experiment to those of clinical observation, no doubt can remain of the stimulant qualities of camphor. He thinks, indeed, that no other stimulant of the same class is comparable with it, and that in the extremest state of debility camphor is sometimes successful when all other medicines are fruitlessly employed. Cam-

[1] Richter, op. cit. Suppl. Bd., p. 442.

[2] Journ. des Progrès, xvii. 78.

[3] Handworterbuch, i. 674.

phor, says Richter,[1] evidently belongs to the class of oleo-ethereal medicines, and like these acts as a powerful stimulant. It is by far the strongest and most searching medicine of its class, from all the rest of which it is distinguished by its rapid, durable, and widespread action on the nervous system. When the powers of life are low, and the skin is moistened with a cold sweat, it is often the most efficient of remedies." Oesterlen, and also Neumann, contend for the excitant properties of camphor. The latter declares it to be diaphoretic and antispasmodic, and that, in fine, it is one of the most searching and active of stimulants. Mitscherlich infers from a review of numerous recorded experiments, that the sedation produced by very large doses of camphor depends upon its local action within the stomach, while the subsequent excitation is due to the absorption and circulation of its particles. Pereira affirms that in moderate doses it exhilarates and acts as a vascular excitant. Dr. Chapman is of opinion that "few medicines more unequivocally display their stimulant powers;" and Eberle[2] states that he has several times taken scruple doses of camphor, and found the pulse slightly increased in fulness, while he experienced giddiness and fulness about the head.

The following appear to be legitimate deductions from the whole of the inquiry which has now been made into the action of camphor on the healthy organism:—

1. The direct and primary action of large doses of camphor (℈j to ʒj) is a powerful but not a permanent *sedation* of the nervous and vascular systems, followed by ataxic phenomena, and remotely by slight and very transient febrile excitement.

2. The direct and primary action of small or medicinal doses (gr. j to gr. xv) of camphor, is to *stimulate* and *excite* the nervous and vascular systems, and through them the whole organism, but the excitement is of short duration, and is not followed by exhaustion or depression.

3. The influence of camphor upon the sexual organs is subordinate to its aforementioned modes of action.

4. The transient operation of this substance explains the high grade of excitement produced by small doses repeated in close succession.

The sedation by large, and the stimulation by small doses of camphor, together with the transient duration of its action, resemble the effects of ether and chloroform more nearly than those of any other medicine, and the analogy is more complete if we have regard to the anodyne qualities of camphor for which it has at all times been chiefly used. Its control over pain never amounts, however, to the produc-

[1] Op. cit., iii. 364.

[2] Materia Medica, &c., p. 345.

tion of anæsthesia, unless we accept as proof of the fact the experiments of Fonssagrives,[1] in which he produced complete insensibility to pain in animals by causing them to inhale air highly charged with the vapors of camphor. Some doubt, however, attaches to the interpretation of these experiments; for the apparent narcotism of the animals may have been due to a partial asphyxia. It will be seen in the sequel that the ordinary remedial effects of camphor can only be explained by admitting it to possess a stimulant power. Of all these effects the two most prominent and demonstrable are its control over asthenia and ataxia. The latter, when connected, as indeed it generally is, with prostration of the powers of life, is as real, if not as clear, a sign of debility as the purer form of this condition which is attended with, or which tends to, resolution of all the functions, and the medicine which raises the system out of its prostration and disorder is well entitled to be called a stimulant. This state is not inaptly illustrated by the familiar phenomena of delirium tremens, a disease in which there is excessive muscular and nervous action, and which apparently is one of equally excessive power. Yet the appearance of energy in its symptoms is deceptive, for, with all his violence, the patient is actually weak; he has a feeble pulse, and sinks at once under debilitating treatment. His tumultuous symptoms are, on the contrary, reduced to order most certainly and speedily by direct diffusible stimulants, the best of which is alcohol, and next to it opium. Even the very substance under consideration has long ago been vaunted as efficacious in the treatment of this disease.[2] If, therefore, there is reason to class camphor among sedative medicines on account of its effects in this and analogous conditions, alcohol must with no less propriety be placed there also. In truth, ataxia is usually connected with debility, and the agent which relieves it does so by imparting strength and tone to the disordered and weakened system, and is of right called a stimulant.

Remedial Employment.—If such difficulties as have been pointed out arise in determining the normal operation of camphor, the labor of surmounting them is nevertheless but light when compared with that of clearing up the inharmonious and contradictory statements which have been made respecting the remedial operation of this substance. The greater number of physicians appear to have employed it in accordance with a hypothetical notion of its operation rather than according to the conclusions of experience, and so generally to have combined other medicines with it in prescription, as manifestly to

[1] Archives Gén., 5ème sér., ix. 561.

[2] Goeden, On Delirium Tremens. Berlin, 1826.

render its alleged effects the expression of a prejudice, or else a compound result of which it is impossible to assign a proper share to the substance in question. Could we ascertain precisely how far camphor has contributed to the mitigation or cure of diseases, the nature of the diseased states it is fitted to remove, and in what doses it effects its purpose, the art of therapeutics would be perfected much more than by the most ingenious discussions concerning the manner in which it brings about these results.

Adynamic and Ataxic Fevers.—Of all the diseases in which the use of camphor has been found beneficial by the most eminent physicians, none stands so prominently forward as the class referred to; and if any other reasons than have been already adduced were required to demonstrate the stimulant qualities of the medicine, this agreement of testimony in regard to the point in question would be conclusive. One of the earliest authorities on the subject is Diemerbroeck,[1] who classes it along with the aromatics useful in the plague, and represents Mindererus as declaring it to be one of the most powerful of alexipharmics in this disease. Huxham, too, expresses himself thus:[2] "I think that in these putrid pestilential fevers nothing more certainly promotes diaphoresis than camphor, with this further advantage, that it by no means heats so much as volatile alkaline salts. It is, besides, vastly serviceable in quieting the erethism and bringing on composure of spirits when opiates fail. Indeed, when joined with an opiate, it is the most certain sudorific in nature." Pringle[3] appears to recommend camphor chiefly for the purpose of regulating disordered nervous action, for he sometimes directs it in conjunction with serpentaria and sometimes with nitre. Hildebrandt[4] regards camphor as the most effectual remedy in the nervous stage of typhus, by means of its powerful action on the debilitated vital forces, the nervous system in general, and the skin.

The stimulant character of this medicine may further be inferred from the opinions of several eminent authors of its use in *malignant fevers.* The emphatic sentence of Ettmüller is, "*Remedium in febribus malignis sine camphorâ est instar militis sine gladio.*" Of the same purport is Haller's description of a variolous epidemic in which all other medicines failed, and the mortality became general, when this physician resorted to camphor. He prescribed it in divided doses of about fifteen grains a day, given in solution; and under its use the hemorrhagic spots disappeared, as well as the alarming symptoms that ac-

[1] De Peste, lib. iii. cap. v.
[2] Essay on Fevers, p. 120.
[3] Diseases of the Army, pp. 135 and 267.
[4] Du Typhus, &c., Trad. de Gasc, p. 208.

companied them. Hoffmann also[1] speaks in like terms of the remedy, and employs this emphatic language: "We are of opinion that nature has produced no one substance more prompt and powerful in removing the malignant elements of disease; hence it deserves, and has a right, to be called the prince of alexipharmics." Richter asserts very precisely[2] that, "in general, it is useful in the last stages of such typhoid affections as were inflammatory at the outset, whenever it is important to maintain the activity of the skin and nervous system, to overcome their depression when the exhausted vascular system is unable to bring about critical discharges, and when, especially, irritability and sensibility are both unduly depressed. The signs of this condition are a small, weak, tremulous pulse, muscular debility, quiet delirium, floccitation, subsultus, a cool, dry, parchment-like skin, or a cold, sluggish, and moist integument." Joseph Frank enumerates[3] debility, softness, and diffluence of the pulse, without irregularity, coldness of the extremities, which are covered with a viscid perspiration, a livid countenance, and dark ecchymoses of the skin, as indications for the use of this remedy. Sachs, Sundelin, and Strumpf do but repeat the detail of symptoms above given as calling for the use of camphor, and Neumann only subjoins the necessity of combining an external with the internal use of the remedy when signs of gangrene display themselves, adding that under these circumstances camphor is the only remedy on which reliance can be placed. Burne[4] recommends it along with carbonate of ammonia and alcoholic stimulants when the temperature of the surface is below the natural standard, the belly tympanitic, and the powers of life at a low ebb. In his excellent history of the typhus epidemic which he observed at the Philadelphia Almshouse Hospital in 1836, and which the present writer had also the opportunity of studying, Dr. Gerhard observes: "Camphor was certainly among the most useful and powerful of our remedies. We used it largely in the severe cases, especially those in which the ataxic nervous symptoms were very marked, and we had no reason to repent of its employment. In general, there was a marked diminution of some of the most prominent and harassing symptoms. We gave the camphor in emulsion in doses of five grains every two hours, and in enema in doses of a scruple. The immediate effect was the lessening of the subsultus and tremors, for which it was chiefly administered, and sometimes the diminution of delirium. In some cases we possessed a complete control over the subsultus, which was immediately

[1] Op. cit., § xii.
[2] Op. cit., iii. 368.
[3] Pathol. Méd., i. 250.
[4] A Pract. Treatise on the Typhus, &c., p. 196.

checked by an injection containing a scruple of camphor. It would cease for some hours, but afterwards return with nearly its former severity. Still, camphor was a useful palliative, and, like most remedies of its class, acted as a useful balance-wheel in preserving the harmony of the system until the disease had passed through its natural course. The camphor frequently acted powerfully as an anodyne, when sleep had been interrupted by the previous disturbance of the nervous system."

Not to add unduly to the amount of testimony now produced, it need only be further remarked, that all of the authors who have had an opportunity of observing the operation of camphor in the treatment of low forms of continued fever, concur in recommending it as one of the most effectual means of combating adynamic and ataxic symptoms. Its control over the latter, no doubt induced an erroneous estimate of its mode of action. When the power of the remedy to allay disordered action of the muscular and nervous systems became apparent, it was, by some writers, inconsiderately inferred to possess intrinsic sedative qualities. The circumstance was too often overlooked by them, that the disorder in question was the consequence of impaired strength. Such a condition could only be relieved by stimulants, by medicines having the power of raising the depressed system to its natural level, and when this was once accomplished, either by camphor or by diffusible stimulants, the agitation was appeased.

Inflammatory Diseases.—Several of the writers who contend for the sedative properties of camphor, appeal to the authority of Hoffmann and other eminent physicians in support of their doctrine. But when the testimony of these witnesses is carefully sifted, it does nothing less than sustain the dogma in favor of which it is invoked. Without entering upon a critical and detailed examination of these alleged evidences, a single one may be adduced to illustrate their character. Hoffmann, for example, is quoted as contending for the usefulness of camphor in pleurisy, phrenitis, metritis, &c.; but this author expressly insists upon the union of nitre with camphor in these affections, regarding the combination as diaphoretic and sedative; and he emphatically states in the very same paragraph,[1] that he could not easily be persuaded to administer this substance alone, in inflammations of a high grade (*quibus maximus œstus junctus est*). But by the union of the two remedies, he conceived that while the one opened the pores, and the peccant humors (materiam vitiosam) were expelled by the

[1] Op. cit., § xvii.

other, a combination was obtained capable of producing a salutary crisis in the disease. A not dissimilar union exists in the well-known Dover's powder, which is, indeed, also used for the very purpose which Hoffmann had in view.

If other writers of authority counsel the use of camphor in the phlegmasiæ, their advice is carefully limited by an explanation of the peculiar conditions in which they conceive the medicine to be useful. It is when, as so often happens, and, for example, during epidemics, inflammatory diseases assume a typhoid type. Under no other conditions whatever, of these diseases, is there any reliable evidence of the utility of the medicine in small or ordinary doses. The affections which are generally alleged to have been rapidly subdued by its use are pleurisy, pneumonia, &c. But with the knowledge now possessed of these diseases, it is certain that the statements are groundless which attribute to camphor the power of curing them. The only exceptions to this judgment, are certain examples of acute pulmonary and other inflammations which seem indeed to have owed their speedy cure to the remedy under examination; but when the quantity of it employed is taken into consideration, the apparent discrepancy disappears; for it was no longer given in small or stimulant doses, but from two scruples to a drachm of it was administered in the twenty-four hours.[1] In such doses the sedative action of the medicine became developed.

Chronic Inflammation.—According to Richter camphor is useful in *chronic rheumatism*, especially when the nervous element of the disease is prominent, and when the affection is erratic, or threatens the internal organs. He directs it to be given in large doses, such as one or two drachms in the twenty-four hours. In *gout*, also, when the same element predominates, and towards the close of the attack, Richter considers this medicine peculiarly adapted to perfect the cure. He also recommends it in combination with opium, as an effectual sudorific. In fact, this formula is well suited to fill the same place in the treatment of asthenic affections which the Dover's powder holds in that of purely inflammatory diseases.

Spasmodic Affections.—Several authors ascribe a curative power to camphor, in *whooping-cough*, obstinate *hiccup*, *chorea*, and even *epilepsy*. Sundelin states it to be useful in the two last-named affections when they arise from the suppression of cutaneous eruptions, or from the metastasis of rheumatism. Berends recommends it in those cases of epilepsy in which the paroxysms occur at night, and directs one or two grains to be taken at bedtime. The efficacy of such a prescrip-

[1] *E. g.* Giacomini, loc. cit.

tion may very well be doubted. Other affections, such as *nervous headache*, nervous *palpitation of the heart*, *spasmodic dysphagia* affecting susceptible persons, are stated by several authors to be amenable to camphor. But in this class of disorders, the original and principal affection on which the minor ones depend must not be lost sight of, for against this main source of the morbid phenomena, camphor may prove ineffectual. When the affection is inflammatory in its nature, the medicine, as Mitscherlich observes, is more hurtful than useful, unless, indeed, the erethism have its starting point in the sexual organs. Camphor has been used with advantage as *an antidote to strychnia*. In several cases reported by Dr. Arnett[1] and Dr. Pritchard,[2] it acted with such promptness when the symptoms were most violent, as to leave no doubt of its efficacy.

Affections of the Sexual Organs.—In *satyriasis*, *furor uterinus*, and *hysteria libidinosa*, camphor is, according to Richter, a capital remedy. "If no inflammatory symptoms exist, or if these have been allayed by depletion, the medicine ought to be given in heroic doses, or, if there be vascular excitement at the same time, it should be conjoined with nitre. In one case it was successfully given in drachm doses four times a day. Müller cured an irrepressible venereal desire and excessive priapism in a clergyman, by prescribing camphor in ascending doses, until a drachm was taken daily. Richter successfully employed large doses of the medicine for a patient affected with sleep-walking and priapism, and who had formerly been addicted to onanism, and experienced convulsive attacks under the excitement of sexual lust. When persons who cannot be weaned from the habit of self-pollution, and are threatened with spasmodic attacks, or with the consumptive wasting peculiar to such cases, camphor should be administered, and that not in too small doses. If, however, its use be too long persisted in, there is danger of emasculating the patient."[3] Schneider speaks of a stout and healthy youth of nineteen, who had been piously and virtuously brought up, but who became suddenly enamored of his stepmother, and whose lust grew so furious that his testicles swelled, and the flow of semen interfered with his urination. He was soon completely cured by the internal and external use of camphor.[4] Alibert relates the case of a woman, twenty-eight years of age, who thoroughly subdued a violent paroxysm of sexual passion by taking a drachm of camphor. On two previous occasions, she had used the medicine with equal success. The following example of the

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[1] Charleston Med. Journ., xii. 86.
[2] Lancet, April, 1857, p. 422.
[3] Op. cit., iii. 372.
[4] Ibid., Suppl. Bd., 444.

same effect is presented by Eberle.[1] "I was consulted by an elderly married man, of rigidly moral habits. He informed me that he suffered very much from painful erections, and an incessant propensity to venery. He was naturally of a gloomy disposition, which was much increased by his complaint. I ordered him camphor, in two grain doses, to be taken three times a day. In a week he returned and told me he was almost entirely relieved; and by a further continuance with the remedy he was completely rid of his tormenting complaint." According to Vogt, camphor displays a peculiar efficacy in the erythematous irritation of the genito-urinary organs which cantharides provoke, and which has a strong tendency to run into gangrene. It is perhaps mischievous in pure sthenic inflammation of the same parts; but Latham has reported several cases of its efficacy in relieving retention of urine produced by an exacerbation of chronic disease of the neck of the bladder, and one in which this symptom was produced by cold. He found frictions of the thighs with a camphorated liniment the most efficient method of using the remedy.[2]

On the whole, the cases adduced under this head confirm the conclusion already arrived at by physiological experiment, and show that large doses of camphor are sedative to morbid as well as to the normal action of the sexual apparatus. One or two cases, it is true, seem to prove that this power may be exerted even by ordinary medicinal doses. They might perhaps be explained in accordance with the general doctrine; but, not to appear unduly solicitous to harmonize completely phenomena which are not thoroughly known, the cases referred to may for the present be arranged in that vast class of medical facts, the exceptional.

Mental Disorders.—According to Murray,[3] camphor has been used in *mania* and *melancholy* since the time of Paracelsus. Ettmüller, Sennert, Kinneir, Werlhof, Berger, Rosenstein, and Whytt are quoted among others by the same author as having successfully treated insanity by this medicine. Their cases generally belonged to the maniacal form of the disease, and large doses of the medicine (℈j to ʒj) were administered. In some instances it proved injurious by exciting patients who were previously quiet, or by rendering the maniacal still more violent. Murray puts no faith in the symptoms relied upon by Avenbrugger as indications for the use of camphor, and which are summarily these: A shrivelled state of the genitals, retracted testicles, and comparative coldness of these parts. Other observers have been equally unsuccessful in meeting with these signs.

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[1] Therap., p. 349. [2] Med. Communications, ii. 138. [3] Apparat. Med., iii. 499.

Cullen relates a case of furious mania in which, after largely employing antiphlogistics, he prescribed camphor, at first in doses of five grains three times a day, but which were subsequently increased. No perceptible change was observed until two scruples were taken at each dose, when the patient grew calmer. At last the medicine was given in drachm doses, and the attack was entirely cured. Cullen, however, did not find it equally successful in other instances. Reil holds camphor to be particularly indicated when the countenance is pale, the extremities cold, the breathing sluggish, and the pulse slow; and he directs it to be given in five grain doses four times a day until a scruple is taken at each dose. He thinks, however, that it too often disappoints.[1] Berndt has recommended it in large doses for *puerperal mania*, having found it successful after a fruitless employment of antiphlogistics, of ether, and of stimulants. He prescribed it in large doses. Since the introduction by Pinel of moral influences into the treatment of insanity, less attention has been given to the purely medicinal remedies which were earlier in vogue, and little can be drawn from the vast stores of recently published experience to illustrate the present subject. When used at all amongst the insane by practitioners of the present day, it has been to palliate nervous agitation, and thus indirectly to induce sleep.

Camphor has been extensively employed as an *anthelmintic*. Brera, one of the highest authorities on the subject, says: "I have always used it with the greatest success, and I cannot too strongly recommend its use to physicians in worm complaints."[2] Moscati, indeed, gives it the preference over all other vermifuges. It is thought to be not less efficacious when administered by the rectum than by the mouth, for its effluvium readily pervades the whole intestinal canal. The former is the preferable mode of prescribing it against ascarides.

In *gangrena senilis* camphor has some reputation. Sachs relates a case in which the disease was arrested by five-grain doses given every two hours, and many other writers offer similar testimony. Several recommend the simultaneous application of finely-powdered camphor to the affected parts. Richter speaks of this medicine as one of the most effectual amongst diffusible stimulants in *narcotic poisoning*, and a like opinion was entertained by Lassone, Hallé, and Murray. Camphor is also very generally employed to *prevent strangury* from blisters of cantharides, by mixing it with the ointment of the latter when it is applied, or moistening the surface of the blister with the tincture, and also to subdue this symptom after it has arisen. The production

[1] Richter, op. cit., iii. 376. [2] On Verminous Diseases, trans. by Coffin, p. 199.

of strangury by blisters is, however, so uncertain that the prophylactic power of camphor, under the circumstances alluded to, may fairly be questioned. But that it greatly relieves this painful symptom, when it is administered internally and in large doses, is proved by abundant and incontestable evidence. It is almost equally certain that it prevents or moderates *priapism* in *gonorrhœa*, for those who have had the largest experience in the treatment of venereal affections testify most positively to the fact.

External Uses.—Camphor is employed in almost all painful affections of the interior of the body. Its use in *gangrene* has already been alluded to. It is not less useful in *scorbutic* and *herpetic sores*, and, in fact, all sorts of ulcers that are maintained by a depressed or depraved condition of the system. In such cases the medicine should be applied in substance, and in a very fine powder. When the skin around wounds and abrasions assumes an *erysipelatous* action, no remedy is more prompt than bathing the part with spirits of camphor. The *suggillations* caused by surgical apparatus, or by the pressure of the bed when patients are obliged to maintain the same position for a long time, *ecchymoses* from violence, and almost every variety of painful swelling, including particularly such as are caused by *sprains*, are everywhere treated by camphor dissolved in oil or in alcohol, applied either by friction or by means of compresses saturated with the latter solution. It is not less frequently resorted to as an embrocation in *chronic rheumatism* and in *glandular swellings*. Spirits of camphor are very successfully employed to suspend the *secretion of milk* after parturition, and the oily solution may be applied by friction to disperse the mammary engorgements incident to this period. Camphor dissolved in ether or chloroform, or even in alcohol, and applied on cotton within the cavity of carious teeth, mitigates materially the pain of *toothache*. It is also used externally to relieve *chordee*. Twenty or thirty grains are sprinkled upon a poultice, which is applied to the perineum. Snuffing the emanations from a piece of camphor is said to arrest commencing *coryza*. It is advantageously incorporated in the ointments or other applications made to cutaneous affections when there is painful itching or burning of the affected part. Maury asserts that a camphorated liniment composed of one drachm of camphor to an ounce of oil is a most excellent remedy for the cure of *scabies*,[1] and Mr. Wilson[2] says: "In young children and in families, when the odor of sulphur is made a point of serious objection, I have found camphor dissolved in oil answer every purpose of eradicating the disease."

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[1] EBERLE, loc. cit.

[2] Diseases of the Skin, p. 247.

CONTRAINDICATIONS.—Active congestion and sthenic inflammation, of whatever organ, forbid the use of camphor, but especially do they so when the brain or the stomach is the seat of the morbid condition or process.

ADMINISTRATION, &C.—Camphor may be given in substance, after being pulverized with a little alcohol, but the emulsion is preferable. This is made by rubbing up camphor with loaf-sugar, gum-Arabic, and water; the suspension will be rendered more complete and permanent by the addition of a little myrrh. Most of the officinal preparations of camphor for internal use (as camphor-water) are too feeble except for very slight ailments, such as nervous and hysterical excitability; and the tincture, except in small doses, is too stimulating to the circulation. The last-named and various other solutions of camphor in alcohol and oil are used almost exclusively as external applications.

To obtain the *stimulant* effects of camphor, it must be given in doses of from *two* to *five* grains, at intervals of from one to three hours; or, if the prostration and derangement of the nervous system are marked, from *ten* to *fifteen* grains may be administered every three, four, or five hours. But the *sedative* action of this substance, which is so valuable in cases of high nervous excitement, can only be procured by doses of twenty grains and upwards. The last-named quantity will rarely suffice, and the dose must be gradually increased until some decided mitigation or exasperation of the symptoms shows that the object is attained, or is unattainable by this means.

ÆTHER SULPHURICUS.—SULPHURIC ETHER.

DESCRIPTION.—Sulphuric ether is prepared by distilling alcohol with sulphuric acid. Alcohol is the hydrated oxide of ethyle, and, on the addition to it of sulphuric acid, which has a strong affinity for water, it parts with this element, and an impure oxide of ethyle is obtained. This is purified by redistillation with a solution of potassa for the removal of sulphurous acid, and by agitation with water for the extraction of alcohol. Sulphuric ether is a clear, colorless liquid, of the sp. gr. 0.715 when quite pure. It boils at 96° F., and the specific gravity of its vapor is 2.565. It has a strong, penetrating, and at first not unpleasant smell, but it ultimately becomes nauseous and irritating. Its taste is hot, like that of alcohol, but is more acrid. It is very volatile, and produces so much cold by its evaporation as to

reduce to zero the mercury of a thermometer, the bulb of which is kept moistened by it. It is also very inflammable, and its vapor, mixed with air, is explosive; hence great care should be taken in using it near an artificial light.

HISTORY.—The writings of Raymond Lulli contain perhaps the earliest account of a liquid obtained by the reaction of sulphuric acid with alcohol; but the word *ether*, which was subsequently used to designate every penetrating vaporizable substance, including highly rectified alcohol, is not mentioned there. Basil Valentine describes its mode of preparation and physical qualities, which are further set forth by Valerius Cordus (1544), Boyle, Willis, and others. It seems to have been first called ether (*spiritus æthereus*) by Froben, a German chemist, in 1730. V. Cordus extolled his *oleum vitrioli dulce*, given in doses of a few drops on sugar or with water, as a remedy in the plague, and for various spasmodic symptoms, for moderating the expectoration in pulmonary complaints, and for alleviating the pain of biliary, renal, and vesical calculi. From the time of Hoffmann it came into general use as a remedy, or at least a palliative, in various spasmodic and painful diseases, and a well-known mixture of sulphuric ether and alcohol still bears the name of Hoffmann's anodyne. The introduction of sulphuric ether as an anæsthetic agent will be noticed in a separate article.

ACTION. *On Plants and Insects.*—Plants exposed to the contact of sulphuric ether, or its vapor, grow darker in color, and if the exposure be long continued, and in a confined space—as under a bell-glass, for example—they turn brown, and the irritability of their stamina is lost. According to Heyden, insects are rapidly benumbed by ethereal vapor, without changing their appearance. Beetles are immediately killed by it.[1] Butterflies exposed to its emanations, and apparently destroyed by them, will sometimes revive after the lapse of several hours, and seem to regain their original vigor.

On Quadrupeds.—In moderate quantities, ether excites in warm-blooded animals a lively and fugitive animation, and excitement of the circulation like that produced by alcohol, oppressed breathing, disturbance of the nervous system, and complete insensibility, which passes away without further mischief; but if the dose be increased, the last-named symptom passes into asphyxia, and sooner or later into paralysis and death. On dissection of the animals that have perished from this cause, an ethereal odor can be detected in the abdominal and thoracic cavities.

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[1] STRUMPF, op. cit., i. 996.

Orfila introduced about half an ounce of sulphuric ether into a dog's stomach, and tied the œsophagus. In five minutes the animal was seized with vertigo, and soon lost his power of standing up. There was no convulsion, and the senses seemed perfect. At the expiration of fifteen minutes the dog became insensible, and his limbs grew flaccid. In an hour he had partially recovered, but continued to reel and totter in walking. Soon afterwards he again fell down, and remained insensible for two hours, when he died. The gastric mucous membrane was found, on dissection, of a dark-red color, and the other coats were vividly injected. Black and partially coagulated blood filled the heart, and the lungs were gorged with liquid blood.[1] The experiments of Mitscherlich gave analogous results. A drachm of sulphuric ether was thrown into the stomach of a large rabbit. The animal became almost immediately insensible, breathed laboriously, and could not stand upright. It died, without spasm, in fourteen minutes. The muscular contractility of the intestines was found to be feeble. The mucous membrane of the stomach and small intestine was very much inflamed. When from four to eight drachms of ether were employed in the experiment, the animal perished in less than five minutes from distension of the abdomen and suffocation.[2] According to Brodie's experiments, five or six drachms administered to a horse produced a state of lethargy, and completely destroyed irritability.

On Man.—Ether has a peculiar smell and a sweetish taste. It momentarily stimulates the olfactory nerves and the brain. When swallowed, it excites a sense of heat in the stomach, which seems to spread itself from thence over the whole abdomen. Applied to the skin, and allowed to evaporate, it does so very rapidly, and produces a marked degree of cold; but if it is maintained in contact with this surface, it soon occasions heat and redness. The same effects are produced by its application to mucous membranes, but with the addition that it is rapidly absorbed, and produces the phenomena which will be described under the head of *Anæsthesia*.

M. Trousseau thus describes the effects upon himself of a drachm and a half of sulphuric ether taken at a single dose: "There was a singular and sudden attack of suffocation, a feeling of such penetrating and intense cold and heat that the chaos of sensations defied analysis. It was very difficult to swallow the liquid, and as it descended the œsophagus a rather lively heat was felt in this tube and afterwards in the stomach. After the peculiar smell and taste of the fluid ceased to

[1] Toxicologie, ii. 688.

[2] Lehrbuch, ii. 348.

be perceived, the symptoms were like those caused by alcohol, but more superficial. The senses were indeed suddenly and actively excited, and a trifling vertigo was followed by such an obtuseness of the senses as might be produced by the intervention of a thin veil between their organs and external objects. To these symptoms may be added a slight muddiness of the eye, and an erratic and not unpleasant prickling of the extremities, which ceased in an hour, and was followed by a decided sense of comfort, a wholesome refreshment, and an extraordinary appetite."[1]

The phenomena described by other observers are essentially such as have been enumerated. Thus, according to Giacomini, when taken internally and in moderate doses, it gives rise to a sense of heat, in the mouth first, and then in the œsophagus and stomach, which is followed by an agreeable coolness in the throat. One seems to breathe more easily, the skin grows warm, red, and moist, the pulse stronger and fuller. The brain is sometimes slightly excited, the distension of the stomach causes oppression which, however, is soon relieved by eructations. In larger doses, ether produces a species of intoxication with numbness of the limbs, which soon passes off.[2] The system readily becomes accustomed to the impression of sulphuric ether. Lafontaine states that a dropsical patient who had swallowed a bottle of ether and urinated profusely in consequence, took twenty-six ounces of this liquid in the course of three weeks, and finally got well. Christison mentions a man who for several years took nearly two ounces of it daily. Richter was in the habit of prescribing it in half-ounce doses, and Frank seldom gave less than an ounce a day.

Remedial Employment. *Nervous Disorders.*—In *tetanus*, when opium has been carried to the limits of prudence, its action is maintained and heightened by ether. After the battle of Austerlitz it was very successful in arresting tetanic symptoms in the wounded. It is used in every form of *syncope* and apparent death to stimulate the vital powers, and is especially indicated in purely nervous swooning. It is hardly less so in fainting from loss of blood. *Nervous headache*, which generally shows itself as hemicrania or in the more limited form of supra-orbital neuralgia (brow ague), is often relieved very promptly by a small dose of ether, particularly when the attack depends upon depressing mental emotions. A flushed face and throbbing temples are no contraindications to its use. These signs of vascular excitement are fallacious, as is proved by the coldness of the hands and feet, which generally accompany them, and sometimes also by the feeble-

[1] Op. cit., ii. 244.

[2] Op. cit., p. 58.

ness and infrequency of the pulse at the wrist. Many cases of *flatulent colic*, *spasmodic vomiting*, *hiccup*, and even the paroxysms of *spasmodic asthma*, are promptly relieved by this medicine. These and other painful affections, including the so-called *hepatic* and *renal colic*, are more promptly and certainly assuaged by the inhalation of ether, as will be more fully described in the sequel.

But the most useful of all the applications of ether to the class of diseases under review, is presented by *hysteria*, in certain of its phases which have been admirably pointed out by M. Trousseau.[1] The more superficial these affections are, and the more uncertain, recent, and sudden in their attacks, the stronger is the control of ether over them. Like the greater part of diseases *sine materiâ*, hysteria is undefined, irregular, and entirely destitute of that orderly development which distinguishes the phlegmasiæ, for example. Its characteristic is that whether one, or two, or the whole train of its phenomena appear, the disease is still essentially present. The accomplished observer divines its presence even from observing that the patient yawns and sobs or sighs without any definite or adequate reason; he detects it in the mere palpitations of the heart, with which the bosom of young girls seems to heave and swell; in a momentary dysphagia, which appears to be caused by a shifting meteorism of the abdomen, a flatulence that suddenly arises and seems to struggle for an escape from the throat; in a spasmodic hiccup, an agitation that seems involuntary and which is accompanied with restlessness and deep sighs; in all of those symptoms which, when united and completely developed, constitute the *fit of hysteria*. All of these symptoms, and in proportion as they are recent and uncombined, yield as if by magic to ether. But even a high degree of them does not render ether inopportune. Again, in the male sex there are certain phenomena essentially of the same nature; such, for instance, are flatulence, and palpitations of the heart. Some persons, too, of a nervous temperament are liable to sudden and partial congestions which are often observed to occur as the consequence of hemorrhage. These, which have already been referred to, are usually amenable to the influence of ether. M. Trousseau presents an illustration of the power of ether over the nervous element in a mixed nervous and inflammatory disease. A child with croup had had the operation of tracheotomy performed, and was in an unusual state of agitation with frightful orthopnœa, yet a teaspoonful of syrup of ether from time to time procured rest and sleep for the little sufferer, and not once only, but on several successive occasions until death came to its relief.

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[1] Op. cit., ii. 245.

An interesting case is reported by Laffont, of *puerperal mania* occurring in several successive confinements, and in each instance arrested by enemata of sulphuric ether.[1]

In Typhous Affections, &c.—Sulphuric ether has been frequently employed in the several grades and varieties of typhus; and in these forms of disease, there is indeed hardly any contraindication to its use, for it may be resorted to even when the typhus state is complicated with inflammation, with febrile eruptions, foulness of the primæ viæ, or functional nervous disorders. But, as its influence, however salutary, endures but for a brief period, it is rather to be regarded as providing an opportunity for administering remedies of more permanent influence, than as curative in itself. Its ephemeral stimulation is also beneficially invoked on those occasions, which occur so frequently in typhoid affections, when some undue exertion, some excessive evacuation, or some other depressing cause, momentarily threatens to extinguish life. These qualities fit it, in a remarkable manner, to be associated with more permanent stimulants, and with tonics; by its means the latter medicines seem to gain a stronger hold upon the system, and to exert their peculiar powers with more permanent effect. M. Trousseau[2] speaks of a somewhat similar employment of ether in cholera asphyxia. He administered it in doses of a dessertspoonful every hour, along with ice and some slightly stimulating drink, infusion of mint, for instance, and suspended its use whenever the pulse began to be felt at the wrist, and some warmth returned to the skin. This moderate degree of stimulation was, according to M. T., the cause of the gentle reactions which took place in his cases, and which were sufficient for cure, but generally free from those intercurrent inflammations of bad type which destroyed so many persons in the same disease.

As an Anthelmintic.—Systematic writers generally ascribe anthelmintic powers to sulphuric ether, and refer particularly to the reports of Bourdier, who succeeded in relieving twelve out of fifteen persons afflicted with *tapeworm*. But a reference to his cases shows that a very trifling share of the result can be claimed for ether, since it was administered along with one of the most certain destroyers of the parasite in question, viz., male fern. It may, indeed, form a convenient solvent of the active principle of this plant, and in that way, at least, increase its powers.

About the close of the last century, equal parts of sulphuric ether and oil of turpentine were recommended by Durande, of Dijon, as a

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[1] Bull. de Thérap., liv. 331.

[2] Op. cit., ii. 249.

specific for *biliary calculi*. On account of the offensive taste of the compound, Duparcque substituted castor-oil for the oil of turpentine, in a mixture which contained fifteen parts of the former to one of sulphuric ether. Many and eminent physicians have attested the efficacy of both formulæ. Experiments with gall-stones show that these bodies are but very slightly soluble in either of the above mixtures; indeed, so far as relates to sulphuric ether, it could act as a solvent only of the fatty portion of the calculus (cholesterin), even were this body plunged in a bath of it. How far such a concretion would dissolve under the influence of the small proportion of ether which might reach it through the circulation, may be imagined.[1] Nevertheless, many cases of biliary calculus have been cured by one or the other of the above preparations of ether, probably more by relieving the pain and spasm which the irritation of gall-stones occasions,[2] than by the solvent operation of the remedy. The latter is, however, maintained to be real by M. Barth.[3]

Sulphuric ether has sometimes been employed as an *antidote* to *narcotic poisons*, and especially the poisonous *mushroom*. The Italian school of Rasori attach great importance to the powers of ether in cases of poisoning by narcotic and contro-stimulant substances in general, in which class they include digitalis, nux vomica, the salts of lead, mercury, antimony, and zinc, squill, &c. They allege, also, that it arrests diarrhœa, caused by an abuse of purgatives of the drastic sort, as well as the profuse sweats that are produced by excessive depletion, and by sedative medicines, such as antimony, &c.

External Use.—Sulphuric ether is very commonly employed, and with great advantage, as an external application either to expel the blood from an inflamed or swollen part, or to mitigate local pain. Some of the most familiar examples of its use are the following: It is applied to the forehead on a very thin compress so as to favor its rapid and complete evaporation, for otherwise the skin becomes irritated by the liquid. This application is very frequently resorted to in attacks of *nervous headache*, of neuralgia of the frontal nerves, and in diseases attended with *delirium*, and undue heat of head. A similar application has been recommended in superficial burns. For the two last purposes mentioned it is, however, scarcely comparable to cold water, and its success in the other cases is probably due rather to the anæsthetic properties of the fluid than to the cold produced by its

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[1] Compare Henoch, Unterleibskrankheiten, ii. 254; Fauconneau-Dufresne, Mal. du Foie, p. 357.

[2] Budd, Dis. of the Liver, p. 297.

[3] Abeille, Méd., xi. 79.

evaporation. In simple *neuralgia*, particularly of the nerves of the head, its anodyne may be usefully combined with its revulsive effects by applying it on small compresses covered with some solid substance, immediately over the points where the painful nerve emerges from its bony canal, or where it in any other way becomes superficial. These are always the points at which, as shown by M. Valleix, the morbid sensibility of the nerve is most easily detected.

The volatile and refrigerant quality of ether has been successfully employed to favor the reduction of *strangulated hernia*. As the strangulation depends, not upon the imaginary spasm which is generally invoked to explain it, for spasm in a tendinous structure is impossible, but upon the influx of fluids into the protruded bowel which is then unable to return into the abdomen, it is evident that whatever tends to contract the tissues of the hernial tumor will be favorable to its reduction. Ether does this when dropped upon the tumor and allowed to evaporate. It acts as ice would do, but with less risk of congealing the protruded bowel.

There is no more certain remedy for *toothache* when it affects a tooth occupied by a carious cavity, than filling the latter with cotton soaked in ether, or still better in an ethereal solution of camphor. Itard recommended ethereal vapor to be thrown into the auditory canal for the relief of *otalgia* and of *tinnitus aurium*,[1] a practice which was imitated, in 1841, by Mr. Neill, of Liverpool, who, however, administered the vapor by the Eustachian tube,[2] and by M. Délioux, in 1853, who employed the original method of Itard.[3] Mackenzie speaks of ethereal vapors directed against the eyes in amaurosis from irritation or debility,[4] and we may add that we have found them of essential service in morbid sensibility of the retina produced by over-exertion of the eye. Inhalation of ether has long been employed as a remedy to recover persons from *fainting fits*, to palliate *hysterical attacks*, and subdue *nervous agitation*. But it was also long ago recommended in more serious ailments. Pinel and Pearson both used it in *spasmodic croup*, and Currie in *asthma*. Pearson even asserted its usefulness in *consumption*, for he found it to diffuse an agreeable coolness throughout the chest, to alleviate oppression and cough, to lessen expectoration and hectic fever, and even to promote the cicatrization of tuberculous cavities. It might certainly be used to some extent as a substitute for the opiates it is customary to prescribe in phthisis, and which too often act mischievously by impairing the appetite and digestion.

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[1] Mal. de l'Oreille, ii. 25.
[2] On the Cure of Cataract, &c., 1848, p. 197.
[3] Bull. de Thérap., lxiv. 529.
[4] Dis. of the Eye, 1835, p. 962.

Administration.—A fluidrachm is the average dose of sulphuric ether. It may be given upon sugar, or a syrup may be formed by repeatedly agitating the excipient with sulphuric ether, and removing the excess of the latter. It may also be incorporated in aqueous and other mixtures by being first rubbed with spermaceti, in the proportion of two grains of this substance to a fluidrachm of ether.

Spiritus Ætheris Sulphurici Compositus.—Compound Spirit of Sulphuric Ether; Hoffmann's Anodyne.

According to the British and American Pharmacopœias, this liquid consists of sulphuric ether, eight fluidounces, alcohol sixteen fluidounces, and ethereal oil three fluidrachms. The influence of the last named ingredient of the preparation is probably to increase its sedative action on the nervous system. It is less volatile than ether, has a burning, yet agreeable taste, and the odor of ethereal oil. In its properties it bears a close resemblance to sulphuric ether, but is more stimulating to the vascular system, and its action is more prolonged. It is also less apt to embarrass the digestive organs. It may be employed in all of the disorders for which ether has been recommended. In hysterical affections it is perhaps superior to that medicine. *Dose*, from half a fluidrachm to two fluidrachms.

ETHERIZATION.

History.—The discovery of the *anæsthetic*[1] properties of sulphuric ether is certainly one of the most remarkable of the present age. Whether we consider the novelty of its claims, the speed with which its fame spread throughout the civilized world, or the extravagant anticipations that were formed of its powers, it stands without example in the history of medicine. Nor is it less singular that so brilliant and sudden an apparition should have been almost as suddenly eclipsed by a substance still more potent than itself, and to the uses of which it pointed out the way. If the most valuable discoveries in the natural sciences, and above all in medicine, were usually the result of logical inferences from experience, a means of producing insensibility to pain would undoubtedly have been one of the first fruits of man's ingenuity and research. But such discoveries are very differently made. All, or nearly all of them, are the work of chance, or at least of an apparently fortuitous concurrence of circumstances such as human wit could never have alone created. So in the

[1] This term was proposed by Dr. O. W. Holmes, Nov. 21, 1846.

present instance the accidental concurrence of a man of science and a professional artisan, appear to have been the immediate and essential conditions for a discovery on the threshold of which investigators had been standing for more than half a century.

The power of various substances to produce insensibility had long ago been observed, and it is well known that in all ages various narcotic preparations were employed to blunt the sense of pain during the performance of surgical operations. The fumes of some of these were administered by inhalation. The late Dr. Snow, in his historical sketch of anæsthesia,[1] quotes a passage from the work of John Baptista Porta on Natural Magic, in which a certain volatile agent is thus described: "When it is applied to the nostrils of the sleeping person, he draws in the most subtile power of the vapor by smellings, and so blocks up the fortress of the senses that he is plunged into the most profound sleep, and cannot be roused without the greatest effort. After the sleep, no heaviness of the head remains." It is probable, as conjectured by Dr. Silvester,[2] and by Dr. Snow, that this agent was none other than sulphuric ether.

In 1803, Dr. Benjamin Rush, referring to a case in which a woman gave birth to a child unconsciously during an epileptic fit, remarks, "how far a medicine so powerful (if such can be found) as wholly to suspend the sensibility of the nerves without impairing their irritability, might succeed in destroying pain altogether, I know not."[3] Subsequently he says more explicitly, "I have expressed a hope, in another place, that a medicine would be discovered that should suspend sensibility altogether, and leave irritability, or the powers of motion unimpaired, and thereby destroy labor-pains altogether."[4] In this passage we have a literal anticipation of the effects of ether in parturition.

The first traces of the use of ether inhalations for medicinal purposes, seem to be contained in the writings of Dr. Richard Pearson, who, as early as 1795, recommended them for certain pulmonary affections, and especially for phthisis. He prescribed them either alone or combined with hemlock, and directed the vapor to be inspired from an open vessel, or through an inverted funnel, or from a handkerchief wetted with ether and held near the mouth and nose.[5] In Dr. Beddoe's work on "Factitious Airs, 1795–6," there is a letter from a patient of Dr. Thornton, describing the effects of the inhalation of ether employed for pulmonary catarrh. He says that it almost immediately relieved

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[1] Chloroform and other Anæsthetics. Lond. 1858, p. 12.

[2] Times and Gaz., Nov. 1857, p. 504.

[3] Med. Repository, vi. 30.

[4] Med. Inq. and Observ., 5th ed., iv. 221.

[5] Med. Facts and Observ., vii. 95.

the oppression and pain in the chest. On a second trial he inhaled two teaspoonfuls of ether which "gave immediate relief as before, and very soon after he fell asleep and had a good night's rest." In still another case, the fumes of burning ether were inhaled to palliate a painful affection of the breast.[1] In 1815, Nysten stated the inhalation of ether to be useful in certain chronic catarrhs with excessive secretion, for allaying convulsive cough, &c. He describes a bottle like the ordinary respirator, for the purpose of inhaling its vapor. In 1818, an anonymous communication appeared in the *Quarterly Journal of Science*, to the following effect. "When the vapor of ether, mixed with common air, is inhaled, it produces effects very similar to those occasioned by nitrous oxide." After describing the method of inhaling the vapor by introducing a tube into the upper part of a bottle containing ether, it is said "by the imprudent inspiration of ether a gentleman was thrown into a very lethargic condition, which continued with occasional periods of intermission for more than thirty hours, and a great depression of spirits; for many days the pulse was so much lowered that considerable fears were entertained for his life." In 1831,[2] we find recorded the case of a female who perished by sleeping in a room in which a large jar containing nitric ether had been broken. "She lay on her side, with her arms folded, the countenance and the posture composed, and the whole appearance that of one in a deep sleep." Two other cases, which terminated in recovery, after a prolonged state of lethargy, are referred to in the same journal. In the edition of his Materia Medica published in 1839, Dr. Pereira makes the following statement: "The vapor of ether is inhaled in spasmodic asthma, chronic catarrh, and dyspnœa, hooping-cough, and to relieve the effects caused by the accidental inhalation of chlorine gas." In a Treatise "On the Practical use of Inhalations in Diseases of the Throat and Chest, by John Harwood, M. D., &c.," of which a second edition was published in 1839, the inhalation of ether as an antispasmodic medicine in difficulty of breathing is recommended. This physician who devoted himself to the application of medicines by inhalation, and appears to have used in this manner every narcotic and antispasmodic medicine rather than ether, was upon the very verge of the discovery of "anæsthesia," but missed it by not venturing far enough in the use of ethereal vapors. "Although, when swallowed," he remarks, "the operation of ether is usually regarded as narcotic and anodyne, yet in inhalation, its sedative or antispasmodic influence appears liable to be overwhelmed

[1] Brit. and For. Med.-Chir. Rev., April, 1847, p. 549.
[2] Edinb. Med. and Surg. Journ., xxxv. 452.

by its stimulant properties." In March, 1846, M. Ducros addressed a paper to the French Academy of Sciences, in which he showed that sulphuric ether applied to the buccal cavity of the gallinaceæ produced immediate somnolence with closure of the eyes, erection of the feathers, &c.; and stated that when applied in like manner to the human subject, it was capable of arresting puerperal, hysterical, and epileptiform convulsions.[1]

The power of ethereal vapors to produce exhilarating effects, which closely resemble those of nitric oxide, is familiar to our countrymen, as having been long employed for this purpose in schools and colleges. It is remarkable that the insensibility to pain shown by many of the persons who thus inhaled it, should not have attracted more attention. For not unfrequently the experimenters became very violent while under the influence of the vapors, and sustained injuries to which they remained nevertheless insensible until after the return of their ordinary condition. The same thing was also observed in the popular exhibitions with nitric oxide.

On September 30, 1846, the first of the new series of experiments which demonstrated the anæsthetic powers of sulphuric ether, was performed by Mr. Morton, a dentist of the city of Boston, in the manner described below. On the 16th and 17th of October the first public use was made of ether by Drs. Warren and Hayward, in surgical operations at the Massachusetts General Hospital.

No sooner were these results known, and the credit of obtaining them awarded to Mr. Morton, than his claims to the distinction were contested by Dr. Charles T. Jackson, an eminent chemist and geologist of Boston. The latter, indeed, maintained that the knowledge of Mr. Morton respecting the anæsthetic properties of sulphuric ether, was wholly derived from himself, and he sustained his claim to a previous acquaintance with its virtues, by showing that as early as 1841–2 he had inspired ether to remove the painful effects of an accidental inhalation of chlorine gas. But, as has been seen, this quality of ether was already known, and had been published by Pereira. In Dr. Jackson's history of his own share in the discovery of the anæsthetic properties of this liquid, he states that after the experiment above referred to, "he felt prepared to recommend the trial of sulphuric ether vapor for the prevention of pain in surgical operations." But there is nothing to show that he mentioned the anæsthetic properties of ether to any one, until February 1846, when he recommended this liquid to one of his students, as a means of preventing pain in the operation of

[1] Abeille Méd., iii. 102.

extracting a tooth. But the ether was not used on this occasion, and does not seem to have been referred to again by Dr. Jackson, until late in September, 1846, when Mr. Morton applied to him for the loan of an India-rubber bag for the purpose, it was alleged, of calming a refractory patient, by causing her to believe that she inhaled from it something to assuage pain. Dr. Jackson discouraged this notion, and then spoke of the properties and the mode of using sulphuric ether, and advised Mr. Morton to employ it instead of attempting to play upon the patient's imagination.

How far these statements were novel to Mr. Morton, must forever remain uncertain. But that they were not altogether so, there is every reason to believe. It is proved by abundant evidence that, during at least two months before the date of this interview, Mr. Morton was in search of an agent to prevent or palliate the pain of dental operations, and that he was led to the inquiry by certain experiments of his former associate, Mr. Wells, a dentist of Hartford, Connecticut, who endeavored to make nitrous oxide gas available for the purpose, as Sir H. Davy had originally suggested. After abandoning his attempts with this gas, it is proved that during a part of the summer and the month of September, 1846, he was experimenting with sulphuric ether. But, from whatever cause, he does not appear to have been successful, until Dr. Jackson pointed out to him the proper mode of inhaling it.

Immediately after his interview with this gentleman, Mr. Morton returned home, and putting into practice the suggestions he had received, is said to have inhaled some ether from a handkerchief, and remained insensible for eight minutes. It is certain that on the evening of the same day (September 30, 1846), he administered ether to E. H. Frost. This person testifies, and his testimony is confirmed by two witnesses, that he applied to Mr. Morton while laboring under a most violent toothache, that Mr. M. "took out his pocket handkerchief, saturated it with a preparation of his, from which," says the deponent, "I breathed for about half a minute, and then was lost in sleep. In an instant more I awoke and saw my tooth lying on the floor. I did not experience the slightest pain whatever." *Thus the first operation ever rendered painless by ether, was performed by Mr. Morton on the 30th September*, 1846.

On the following day Mr. Morton called on Dr. Jackson and informed him of his success, and was advised to get the surgeons of the Massachusetts General Hospital to permit the use of the ether in that institution. Mr. Morton then waited upon Dr. Warren, who promised him an early opportunity of trying the experiment. Accordingly, on

the 16th of October, the ether was administered to a man on whom Dr. Warren was about to operate for a tumor of the face, and on the following day, to a female with a fatty tumor of the arm, which was removed by Dr. Hayward. In the first case the effect was not complete, but in the second, "the patient was insensible during the whole time, and was entirely unconscious." On the 7th of November, Mr. Morton administered the ether to a female patient at the Hospital, on whom Dr. Hayward performed the operation of amputation of the thigh; "it was entirely successful in preventing pain, the woman asserting that she had been wholly ignorant of the operation." Other operations were immediately afterwards performed under the same favorable circumstances, by Drs. Townsend, J. M. Warren, Parkman, H. J. Bigelow, and Pierson. Among them were two cases of reduction of dislocation of the humerus.

It was not long before news of the discovery crossed the Atlantic in letters written by Dr. Bigelow to Dr. Boot, of London,[1] and by Dr. Ware and Dr. Warren to Dr. Forbes.[2] In London, etherization was immediately used by Dr. Boot and Mr. Robinson in operations on the teeth on the 19th of December, and on the 21st of the same month Mr. Liston tried it with the most perfectly satisfactory results in a case of amputation of the thigh, and in another requiring evulsion of both sides of the great toe-nail.

The Parisian surgeons were not long in putting to the test the new method of preventing pain. On the 12th of January, 1847, M. Malgaigne reported to the Academy of Medicine the results of its use in several operations performed by him, including an amputation of the leg. Although his example was speedily followed by nearly all of the surgeons of France, the practice was at first denounced as hazardous by Magendie, Lallemand, Flourens, Roux, Velpeau, and other distinguished persons. They soon, however, yielded to the rapidly accumulating evidence in favor of the new method. On the 7th of the same month it was used at the Clinical Hospital of Madrid by Dr. Argumosa.

In Belgium, the ether was first applied by Bosch, of Brussels, at the same time that Malgaigne was employing it in Paris, and within a few days afterwards (Jan. 27th) Prof. Schuh, of Vienna, operated upon patients subjected to its influence. In Erlangen (by Prof. Heyfelder), in Leipsic, and Munich, it was directly afterwards resorted to, and on the 6th of February by Behrends in Berlin. Dieffenbach, in the last named place, and Chelius in Heidelberg, very soon adopted the new

[1] Lancet, Jan. 2, 1847.

[2] Brit. and For. Med.-Chir. Rev., xlv. 309.

method, but with greater reserve. In a word, the instances of its use multiplied so rapidly that it became impossible to note their peculiarities. The lowest as well as the highest class of physicians and surgeons employed the wonderful liquid, and sometimes with so little circumspection or knowledge of its properties as to cause alarming and even fatal effects. Its administration was on this account forbidden to all persons except physicians in one of the kingdoms of Germany.

While these events were in progress, and from one end of Europe to the other etherization was adopted by almost every surgeon of distinction, the practice made very slow progress in the country of its birth. Several weeks elapsed after the publication of Dr. Bigelow's paper before the subject was noticed by the medical press of the United States, and then it was in tones of doubt and incredulity, and it was not for several months that the practice became at all popular south of Boston. The first operation performed under the influence of ether in the New York Hospital was on February 13th, 1847.[1] This hesitation to accept the new discovery is in some degree attributable to the taint of charlatanism which at first attached to it; to the endeavor to preserve it as a secret; the title of "Letheon" with which the ether employed in the first operations was decorated; and to the disgraceful attempt of those who introduced it into surgical practice to obtain a patent-right for their discovery. But even after these obstacles were overcome, and this sordid conduct forgotten, there never was so general a use of this agent, or afterwards of chloroform, by American surgeons as by those of the old world, and we have consequently less cause than the medical profession of Europe to deplore the fatal results which must be set to the account of the latter at least of these anæsthetics.

Etherization of Animals.—Messrs. Cook and Taylor performed upon frogs, guinea-pigs, linnets, and rabbits some experiments, from which they drew the following description of the effects produced by inhaling ether.[2] "A feeling of discomfort indicated by a distressed look, glassy eye, and attempts to escape, is quickly followed by more rapid and powerful contractions of the heart, by increased rapidity of circulation throughout the whole vascular system, by deeper and laborious or by more frequent acts of inspiration, and an excited condition of the brain. Then the cerebral functions become oppressed, sensations and the power of motion become more and more impaired, the action of the limbs becomes irregular and wild, and the animal, reeling and staggering from side to side, eventually falls down as if

[1] Trans. Am. Med. Association for 1848.

[2] Lancet, June 19, 1847.

lifeless; but respiration still goes on, the capillary circulation is unusually active, and, although the muscular system generally is in a state of relaxation, the involuntary muscles seem preternaturally excited; both the urine and the fæces may be suddenly voided. This stage of complete insensibility is followed, after a time, by symptoms of congestion of the brain; the respiratory act becomes less frequent; the blood, of a dark blue color, stagnates in the capillaries; the extremities feel cold; the lips are blue and livid, and, if the animal be not speedily removed into the open air, respiration first stops, then the contractions of the heart become fainter and fainter; lastly, the peristaltic action of the intestinal tube ceases."

According to Gruby's experiments on various animals, the respiration at first becomes quickened and then labored. If the inhalation is still persisted in, death soon takes place. Relaxation of the muscles is a constant phenomenon. Sensibility is completely extinguished by ether, and death, when it occurs, seems to be caused by congestion of the brain and great viscera, and by paralysis of the respiratory muscles. Depletion restored dogs to consciousness even after they had ceased to breathe.[1]

M. Longet has furnished perhaps the best analysis and interpretation of the phenomena under consideration. Among his conclusions the following are the most important: 1. The inhalation of ether produces complete but temporary insensibility in the cerebro-spinal axis and in the nerves; 2. When a compound nerve is directly etherized it loses its sensibility in all of its trunk and branches beyond the point at which the ether is applied, but may nevertheless retain the function of voluntary motion; this statement is confirmed by Serres;[2] 3. Ether suspends completely but temporarily the reflex function of the spinal cord; 4. For some time after etherized animals have recovered their perception, sensibility is often temporarily augmented; 5. Insensibility always takes place before black blood can be obtained from the arteries; 6. The continued inspiration of ether after insensibility has taken place is almost certainly fatal; but if atmospheric air be mixed in due proportion with the ethereal vapors, the state of insensibility may be very much prolonged without danger to the animals (rabbits) employed; 7. Ether taken into the stomach in quantities sufficient to destroy life does not at any time produce anæsthesia.[3]

The experiments of M. Flourens[4] led to substantially the same conclusions. He found that in etherized animals *the loss of sensibility*

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[1] Canstatt's Jahrbuch, 1847, p. 159. [2] Arch. Gén. de Méd., 4ème sér., xiii. 433.
[3] Ibid., p. 375. [4] Ibid., p. 434.

precedes that of motility, but both are ultimately suspended; and yet the animal lives, because the automatic or excito-motory acts of respiration and of the heart continue. According to his views of the nervous system, *the cerebral lobes*, or the seat of intelligence, *first lose their power;* then the cerebellum, which presides over the *equilibrium in locomotion;* the medulla spinalis next loses its faculty of *sensation(?) and also of motion;* and finally the function of the *medulla oblongata* alone survives. When the last is overcome, death takes place. According to the physiologists now cited, the mode of death in question is not asphyxia, for that is only a negative loss of life, produced by the want of oxygen, but death is to be regarded as resulting positively and directly from the deleterious action of the ethereal vapor itself.

Ether, when taken into the *stomach* of animals, does not, according to Flourens and others, produce insensibility, but only intoxication. But a Russian observer, Pirogoff, declared that when ether is thrown into the rectum, it gives rise to the very same effects as when it is inhaled.[1] To insure its gradual and complete effect, the liquid should be injected very slowly, or be previously converted into vapor. Dupuy's experiments upon animals show that by this method loss of sensation is as soon produced as by inspiration, and no signs of asphyxia arise.

Several observers have examined the influence of ethereal respiration upon the condition of the venous blood and of the nervous tissue. In general, the arterial blood grows very dark soon after the commencement of insensibility; but, on the suspension of the etherization, it regains its usual color, and at the same time sensibility is restored. Lassaigne found that the clot of blood drawn soon after etherization is relatively smaller and firmer, and the serum augmented; and also that the blood has an unusually florid color, which it retains for several days. According to other experimenters, however,[2] the venous blood of etherized horses continues to be darker than natural during as many as seven days; it at the same time runs more freely, furnishes but little serum, and for the first three days smells strongly of ether. The breath of the animals may emit the same odor during five days. A goat's milk exhaled this smell for five days after the animal had breathed the vapor of ether. The flesh of animals slain during insensibility from ether retains its odor for many days, and indeed it cannot be wholly removed by roasting or boiling. It is an interesting fact that the inspired vapor of ether dissolves the fatty element of the cerebral substance. Bibra, and Harless, in Erlangen, found in the

[1] CANSTATT'S Jahrb., loc. cit.

[2] STRUMPF, loc. cit.

brain and spinal marrow of etherized animals a diminished proportion of fat, while an excess of this substance existed in the liver.

In animals killed during the first stage of etherization the lungs are found very much congested; in the second stage, when the respiratory act is more energetically and actively maintained by the aid of the abdominal muscles, an emphysematous condition of the margins of the lungs is sometimes produced, and sometimes also of the entire structure, to such a degree as to prevent the organs' collapsing when removed from the body.

Action of Ethereal Inhalation on Man.[1]—A glowing or burning sensation is first experienced in the posterior fauces and the larynx, with an increased discharge of saliva, a disposition to cough, oppression, and shortness of breath. These unpleasant feelings are of short duration. A general feeling of warmth succeeds; a sense of comfort and exhilaration diffuses itself over the whole body. The fingers and toes grow numb, and so, by degrees, does the entire cutaneous surface, in which is previously felt a prickling sensation like that of parts said to be "asleep." The patient is conscious of a momentarily increasing lightness and freedom of motion, all sense of weight vanishes, and the earth seems to reel under the feet. Taste and smell are the first of the special senses abolished, owing to the direct action of the ether upon their organs; hearing grows dull or perverted, and words and other sounds sometimes seem strangely loud, seeming as if echoed in an empty place, and rushing noises fill the ears. The sight in some cases becomes singularly clear, and the outlines of objects appear sharply defined; but sometimes it grows dim, or is mocked with extravagant illusions. Perversions of the senses often attend the commencement of etherization and the period between awaking and the complete return of consciousness. Of this sort is the sense of rapid flight through the air, of unearthly music, gorgeous spectacles, and magical phantasmagoria. The sense of smell is sometimes so far perverted that ammonia, for instance, has a grateful odor. Dizziness and a disposition to repose follow, and the skin may then be pricked or cut without producing much, or indeed any, pain. It is remarkable that although the sensibility to pain is abolished, the sense of touch may remain unimpaired. A patient may be conscious of the contact of external bodies—of surgical instruments, for example—and yet be wholly insensible to pain. Last of all, the remainder of the special senses are dulled or quite suspended, although

[1] The materials for the succeeding details are derived in the main from the treatises of Mitscherlich, Strumpf, Heyfelder, Lach, Velpeau, Nunnelly, Bigelow, Morton, and Snow, and from articles by various authors published in the medical journals.

it is not uncommon for the hearing to remain perfect during the whole process, especially if the patient make an effort to exercise it. But in general there is an absolute and complete insensibility to all external impressions, while the mind is filled with a rapid succession of ideas, which are for the most part of a lively description. Their character seems, however, to be determined very much by the natural disposition or the actual state of the patient's mind, just as the complexion of one's dreams is apt to be a reflection of his habitual cast of thought.

Such are the symptoms of which the patient himself is conscious. Another series of phenomena is presented to the observer. At the outset the pulse is generally quickened, but varies greatly in its characters; the breathing grows more rapid, the skin warm and moist, the pupils contracted, and the face assumes a livelier expression and color. Not infrequently more or less excitement or restlessness succeeds, and may amount even to delirium, with pugnacity. The particular form of excitement is, however, as various as that from alcohol. Some persons sing, and some lament; some weep, or moan, or sigh; some tremble, choke, or vomit; and many grow restless, and rave wildly. The latter symptoms are most apt to be presented in persons of an irritable, nervous, or hysterical constitution. The excitement may abate very suddenly—it does so, in most cases, very soon; the disposition to active movements ceases altogether; the limbs grow flaccid, the back bends, the chest sinks down; the speech grows hesitating, the ideas unconnected; the eyelids droop and quiver, the eyeballs are upturned, and the pupils usually dilated; the breathing is slow and deep; the pulse generally infrequent, small, and compressible, but sometimes it is quickened and irregular, and the heart acts in a corresponding manner; the skin is generally cool and moist; the features are sometimes purplish and sometimes pale, and quite dull and expressionless; sense and motion have ceased, muscular contractions can no longer be excited, and the patient lies in a trance-like sleep, which has so strong a likeness to death that few persons can observe it for the first time without alarm.

This state is of short duration (although it seems to the patient to have lasted a long time), and it vanishes almost instantaneously. Even when stupor is produced, it continues for a few moments only after the vapor ceases to be breathed. The patient opens his eyes, is amazed at what has happened to him, and at the short time he is told that he has been asleep; he endeavors to rise, and for some time his ideas are confused, and his sensations are remembered like those of a dream. Very commonly, too, he is excited, and laughs or weeps without motive. His sensibility is apt to be morbidly keen; the pulse becomes

fuller and more regular, and the respiration more frequent and natural. Hearing, smell, sight, taste, and feeling return in the order in which they have been named, but their perfect activity is very slowly regained. Indeed, there remains for some time a general sense of lassitude and weariness, as after severe fatigue. The gait is still tottering, there is a tendency to faintness, a general malaise, an unpleasant and enduring smell and taste of ether, and, for several days, all of the secretions exhale the same odor.

In some cases ethereal inhalation occasions its appropriate symptoms within a minute, and in others not for twenty minutes or longer. The duration, also, of these symptoms is unequal, varying from less than a minute to more than an hour. Heyfelder relates a case in which they lasted for several hours, but in general their duration is proportioned to the completeness and length of the process of inhalation. Persons are occasionally met with who seem to be wholly insusceptible to the action of ether, and some who can never be carried beyond the stage of excitement by its means. Some have even the power, by mere force of will, to lessen, if not entirely to prevent, its effects. These peculiarities resemble the more familiar ones of persons who seem incapable of intoxication by alcoholic drinks. Heyfelder arranges the diversities in the phenomena of etherization under the following heads: 1. Complete loss of sensibility and consciousness, which is not unfrequently conjoined with complete collapse. 2. A very marked diminution of sensibility, with an incomplete loss, or, on the other hand, a complete retention, of consciousness. 3. Excitement with imperfect consciousness. 4. Excitement with ordinary consciousness, or with ordinary or even exaggerated sensibility.

Etherized persons not unfrequently present very different phenomena from those which have been detailed. As already remarked, sensibility is not always destroyed. Some patients, too, show signs of extreme suffering during severe operations, and yet, on the return of consciousness, declare that they have experienced no pain, but that they had been dreaming, and they even affirm that their dreams were delightful.[1] Magendie has drawn attention to the erotic dreams of some females, and most practitioners who have employed ether have met with instances of the same sort.[2] "In some it has been evident, from the movements of the patients, that they were under the influence of the fully-developed venereal orgasm." Other patients awake as from a nightmare, and describe their visions and sensations

[1] Brierre de Boismont, Revue Méd., cii. 218.

[2] Compare Dr. Tyler Smith, Lancet, Mar. 27, 1847.

as having been extremely distressing; that they have suffered violence, been constrained to act against their will, &c. Some not only remember the pain they have seemed to suffer, but assert their sufferings to have been greater than if ether had not been employed.

A number of instances which serve to illustrate this subject are related in a paper on the "Psychical Effects of Ether Inhalation," by the late Dr. Moreton Stillé,[1] whose general conclusions may be appropriately quoted in this place as a summary of many things in the preceding pages.

"1. That the consciousness or perception of external objects and impressions is impaired in the early and lost in the final stage of etherization.

"2. That during the time the mind remains susceptible to external impressions at all, these reach it in a feeble or perverted manner.

"3. That the emotions, and especially those of an erotic character, are excited by the inhalation of ether.

"4. That voluntary muscular movement is not paralyzed until the state of perfect narcotism is produced, at which time, however, all outward consciousness is extinct.

"5. That the memory of what has passed during the state of etherization is either of events wholly unreal, or of real occurrences perverted from their actual nature.

"6. That there is reason to believe that the impressions left by the dreams occasioned by ether may remain permanently fixed in the memory with all the vividness of real events."

Dr. Henry Hartshorne, from another point of view, from a physiological analysis—that is, of the order of phenomena produced by anæsthetics—concludes that "*artificial acinesia*, or loss of motor power, *never occurs unless anæsthesia has preceded or accompanies it.*"[2]

In general, the after-effects of etherization are inconsiderable. Sometimes a pleasant exhilaration continues for several hours. On other occasions more or less distressing, and even alarming, symptoms present themselves. There is congestion of the brain or lungs, inexpressible anxiety, a frequent and thready pulse, stertorous breathing, convulsive restlessness or cataleptic rigidity with prolonged insensibility, and a variety of hysterical phenomena which are almost exclusively observed in female patients. Writers also enumerate among the consequences of etherization a temporary loss of memory, prolonged deafness, uncommon muscular weariness or exhaustion, dysury, various spasmodic phenomena and even tetanus and permanent epilepsy, unusual pain in

[1] Phila. Med. Exam., Dec. 1854, p. 730. [2] Trans. Phila. Coll. of Phys., Dec. 1854.

parts operated upon, secondary hemorrhage, slowness and irregularity of the reparative process, gangrene, phlebitis, and suppurative fever; and finally death, preceded by coma, convulsions, delirium, and general relaxation.[1] Much discussion has arisen as to how far these and similar phenomena have been owing to the use of ether. Many attribute them to an improper manner of employing the vapor, many to its bad quality, and many more to the peculiarities of the patient or of his disease. The last opinion is, we believe, in most cases the correct one.

In the commencement of the practice of etherization its dangers were stoutly denied by many of the most influential persons and organs of opinion. A writer in an English periodical[2] says: "We have been unable to discover, after the most extended inquiries, a single case in which the process certainly produced death, or left behind it serious consequences that were certainly attributable to it." Heyfelder, whose treatise was published about the same time, had not met with any fatal result or permanently injurious consequences;[3] and Dr. Snow's not less extensive experience during the same year, furnished him with no serious accident. "Except a headache," he remarks, "on one or two occasions, the only unpleasant effect that I have ever seen from the inhalation of ether, has been sickness and vomiting, which are only occasional results."[4] But a belief in the innocuousness of the process was not of long continuance. During the same year, 1847, M. Lach, in his work on ether, published *nine* cases in which this fluid was the immediate cause of death;[5] and about the same time the editor of the *Monthly Journal of Medical Sciences*[6] says "*fatal effects* have become multiplied," and he mentions five or six other cases in which death was more or less dependent upon ether. In one of these, ether was declared by a coroner's jury, to be the cause of death, and the surgeon himself concurred in the correctness of this verdict. Dr. P. F. Eve has also reported two cases, in one of which ether was the sole, and in the other the immediate, cause of death.[7]

Velpeau and others have attributed most of these instances of mischievous effects to the improper manner in which the ethereal vapor was administered, and it cannot be denied that the criticism is, to some extent, a just one. A portion of them also may justly be set to the

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[1] See a paper by J. Henry Clark, M. D., and one by Frederick D. Lente, M. D., in the New York Journ. of Med., 3d ser., i. 181, 354.

[2] Br. and For. Med. Rev., April, 1847.

[3] Die Versuche, &c., p. 75.

[4] On the Inhalation of the Vapor of Ether in Surgical Operations, 1847, p. 43.

[5] De l'Ether Sulphurique, et de son Action Physiologique, &c., p. 211.

[6] April, 1847, p. 799. For other cases, see Braithwaite's Retros. (Am. ed.), No. xv. p. 344.

[7] South. Med. and Surg. Journ., June, 1849.

account of the operation itself, which the several patients underwent, and to that shock to the constitution which is well known to be a source of fatal issues after operations performed, not only without the use of an anæsthetic agent, but in the absence of any influence whatever of a deleterious nature. Dr. Snow[1] admits but two deaths which have been recorded as occurring *during* the administration of ether, and he adds, "It is not probable that the death in either case was due to the ether," but in the one, from the want of admission of sufficient air to the lungs, and in the other from hemorrhage. In 1855, Dr. Hayward, of Boston, referring to one of the same cases, and reviewing the whole question, declared that "there is reason to doubt whether death has in a single instance been produced by it, when it has been properly administered."[2] If it be still objected that there are examples enough of death caused by this agent to prove its hurtfulness and to call for its banishment from practice, it may be replied that the number of such cases is altogether inconsiderable when compared with the almost innumerable instances in which ether has been administered by inhalation in every portion of the civilized world, not only without accident, but with manifest advantage to those who inhaled it. But, still further, it may now be positively asserted, that since the proper mode of its administration has been understood, that is, since care has been taken to admit a sufficient proportion of atmospheric air along with the ether into the patient's lungs, there is not one authenticated example of its having destroyed life. There is no active medicine but has occasionally had its victims, of whom some perished through its maladministration, and some through their peculiar susceptibility to its influence, yet no one thinks of banishing them from practice for such a cause. Not less unwise would it be to neglect the advantages of etherization on account of its rare, and it must be added, questionable mishaps.

The blood of etherized persons is, with few exceptions, more liquid and darker than natural, and has a small and loose clot; yet it flows but sluggishly from the veins. It smells strongly of ether, and contains a few crimped corpuscles or disks, which are said to assume polypoid forms; it also separates slowly and incompletely into a flat, loose, dark-colored clot, and a large proportion of dirty-brownish serum which exhales a strong smell of ether. The venous blood does not undergo its appropriate changes in the capillary vessels.

The bodies of those who die after having inhaled ether, continue for several days to emit a strong smell of this fluid from every cavity.

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[1] Chloroform and other Anæsthetics, 1858. [2] Surgical Reports, &c., p. 243.

The veins, and those of the nervous centres especially, are distended with dark and liquid blood. A thin and clear serosity is found in the cavity of the arachnoid. The heart is flabby, and its right cavities are distended with black blood. The upper portion of the lungs is œdematous, and the lower engorged with dark blood. The lining membrane of the mouth, pharynx and air passages is, for the most part, congested, and covered with mucus; the heart is flaccid and empty, the liver and kidneys are congested, the gall-bladder is distended with dark and liquid bile; and the bladder is filled with urine which smells strongly of ether.

USES. *In Surgical Operations.*—The general effects of ether having been sufficiently set forth in the preceding pages, it is needless to describe anew the phenomena observed during surgical operations performed on persons under its influence. It may be proper, however, to consider, in this place, the precise nature of its usefulness in surgery, and the limits to its employment which have been established by experience. Undoubtedly the pre-eminent value of etherization consists in its power of mitigating, and very often of completely annulling, the sense of pain. A subordinate value is that it removes the injurious influence of pain upon the ultimate issue of surgical operations. Were it true that the former of these qualities is the only one possessed by ether, it would still form one of the most precious resources of medical art. For pain is the one great evil of man's physical condition. The aim of his whole life is to shun it, and enjoy comfort in its stead. It is the grand hindrance to his exertions which it paralyzes, and to his progress which it retards. It is the perpetual obstacle to his well-being. It forces him to desist from seeking what he desires, and disturbs his enjoyment of what he already possesses. When he is overtaken by disease, or receives some injury that calls for surgical interference, the dread of pain leads him to put off an appeal to the proper remedy, until, perhaps, the chances of its success are reduced almost to nothing. And when, at last, he submits to the dreaded operation, his apprehension of its result depresses his vital power, and diminishes, if it does not entirely neutralize, the good he looked forward to enjoying. But anæsthesia strips the needful remedy of its terror, induces the patient to accept it while it may still be safely and successfully employed, and at the same time lessens the risk which, under the most favorable conditions of another sort, could not have been avoided.

Prof. Miller, of Edinburgh, enumerates the following among the advantages of anæsthesia in surgery, and, although his remarks refer especially to chloroform, they are equally applicable to ether. 1.

Anæsthesia permits the performance of operations otherwise inexpedient or impracticable; 2. It affords great relief to the operator as well as the patient; 3. It does not favor hemorrhage, but the reverse; 4. It not only annihilates pain during an operation, but probably diminishes it afterwards; 5. It is of much service in cases of *dislocation*, in the *examination of injuries*, the treatment of *irritable stricture*, in *sounding for stone*, in the *taxis for hernia*, and in saving the feelings of delicacy and modesty in women.[1]

It can no longer be doubted that anæsthesia does really diminish the chances of failure of surgical operations. Nearly all competent authorities agree that it does so. The fact has indeed been fully demonstrated by the statistical researches of Dr. Snow, Dr. Simpson, and others. Dr. Snow published the returns relating to this subject of three of the principal hospitals of London, which abundantly confirm the presumption that the want of apprehension and the freedom from pain of the patients tended in a decided manner to diminish mortality and promote recovery after surgical operations. But Dr. Simpson has furnished numerical data which leave no room for doubt upon the subject. Having first obtained authentic returns of the mortality after amputation of the thigh, leg, and arm in the principal British and Parisian hospitals, he finds upon comparing them together that, while 29 in 100 died under these amputations performed upon patients who were not etherized, only 23 in 100 of those operated upon in the anæsthetic state perished. Later statistics by this author give a still more flattering impression of the advantages of anæsthesia. He finds that, while in amputations of the thigh without ether the mortality is 44 in 100, the same operation is attended with a mortality of only 24 in 100 where ether is employed. It is unnecessary to carry these comparisons further. The entire experience of surgeons with etherization leads to the same result, and demonstrates the greatness of its value.

Almost every operation known to surgery has been repeatedly performed upon persons under the influence of ether. Experience has, however, shown to which among them it is most applicable, and to which it is unsuited. Those of the latter class are found to be much more numerous than was at first suspected. The contraindications to the use of ether are included in the following summary.

As has been intimated, the period of infancy and that of old age augment the risk to which etherization exposes the patient. And this is undoubtedly true in spite of the instances to the contrary which

[1] Surgical Experience of Chloroform, p. 26 et seq.

may be met with in medical annals. There are several examples of operations upon children within the year, and upon old men past four score, which have been completely successful; but these examples ought not to have the force of a rule, for the caution of surgeons has restrained them from a general employment of the method at the two extremes of life. Mr. Syme warns against administering ether to persons in a state of great weakness or exhaustion, and the counsel may be extended to apply to the weakness of infancy and the exhaustion of old age.

Almost all competent authorities unite in dissuading from the use of etherization when the patient is affected with diseases of the respiratory apparatus or affections of the brain, and where there is a tendency to hemorrhage. It is equally improper for operations in which the sensations of the patient furnish a guide to the surgeon's acts. Such is lithotrity. Operations upon the palate, uvula, tonsils, and trachea, for strangulated hernia, paracentesis for empyema, &c., are more safely and satisfactorily performed during the patient's consciousness, for in the first mentioned of these the blood may flow into his trachea and cause suffocation, and in the latter two his sensations should limit the continuance of the operation.

In certain cases also the voluntary muscular action of the patient is an important means of success; such are resection of the maxillæ, the removal of deep-seated tumors of the neck, excision of the cervix uteri and of internal hæmorrhoids, and also tenotomy. Anæsthesia is contraindicated in operations in which it is important that the patient remain perfectly quiet, as in tying aneurismal arteries, all cases of ophthalmic surgery, operations for hare-lip, for strangulated hernia, for vesico-vaginal fistula, &c.; and, finally, in very brief operations, such as the extraction of teeth, the opening of abscesses, &c., the use of ether is hardly warrantable except in cases of great timidity on the patient's part.[1]

These limitations to the extravagant predictions of the early advocates of etherization may be extended by the remark which Velpeau[2] was one of the first to make, viz., that this condition is not by any means so favorable to the action of the surgeon as is popularly imagined. This eminent surgeon denies that an operator can feel himself as much at ease with a patient under the influence of ether as with one who retains his sensibility. For, as he knows that the process involves some danger, he is apt to be in haste to finish his work, and the thought almost necessarily distracts him; and, as

[1] Compare Strumpf, Lach, Syme, et al.

[2] Bull. de Thérap., xxxviii. 334.

already intimated, the patient is unable to aid him by a change of position and by performing a variety of acts which greatly facilitate the several steps of the operation under ordinary circumstances.

In Midwifery.—Sulphuric ether was first used to relieve the pains of childbirth on the 19th of January, 1847, by Prof. Simpson, of Edinburgh.[1] The subject of the trial was a woman of extremely narrow pelvis. In a previous labor the fœtus had to be removed piecemeal, but on this occasion the child was, after version, born alive. It soon perished, however, but the mother, who remained unconscious during the whole process, recovered rapidly from its effects. The first case of anæsthetic midwifery in France took place on Jan. 30, 1847, under the care of M. Fournier-Deschamps, and on the 23d of the following month M. Dubois communicated to the Academy of Medicine his experience in the same field. Shortly afterwards, Siebold, of Göttingen, employed ether during labor. But so little progress had the use of this agent made in the United States that the first case of delivery under its use occurred in the practice of Dr. Keep, of Boston, on the 27th of April, in the year above mentioned.

Strange though it may now appear, the use of ether was at first strongly reprobated, both in England and in this country, upon the ground that it was sinful to prevent a suffering which had been laid as a punishment upon the mother of mankind and her daughters! The objection was produced in so many quarters as to be thought worthy of refutation by good and learned men. At this day it can only be remembered as one of the hallucinations from which the wisest of mankind are not at all times nor wholly exempt.

The comparatively short space of time that elapsed between the general use of ether in obstetrics, and the adoption of chloroform in its place, renders it unnecessary to detail minutely the results obtained by the former agent. As Prof. Simpson set the example of employing anæsthesia in midwifery, so was he the first to furnish an analysis of the results obtained by its use.[2] These may now be briefly described along with the conclusions of other competent authorities upon the same subject, including those of Dubois,[3] Chailly,[4] Roux,[5] Siebold,[6] Protheroe Smith,[7] and Channing.[8]

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[1] Month. Journ. of Med. Sci., vii. 639.

[2] Month. Journ. of Med. Sci., vii. 795.

[3] Abeille Méd., iv. 82.

[4] Ibid., iv. 100.

[5] Ranking's Abstract, vi. 264.

[6] Ueber die Anwendung der Schwefel-Æther Dämpfe in der Geburtshülfe. Göttingen, 1847.

[7] Lancet, May 1, 1847.

[8] A Treatise on Etherization in Childbirth. Boston, 1848.

All observers agree with Simpson "that the inhalation of ether procures for the patient a more or less perfect immunity from the conscious pain and suffering attendant upon labor." And the authorities are equally unanimous in stating the opinion that "in difficult labor it is incumbent upon us to exhibit the ether both for the sake of the mother and the child."

It has been objected by Siebold that ethereal inhalations suspend the pains of labor, and thus injuriously prolong the process. But this opinion seems to have been founded upon limited observation. General experience demonstrates that a degree of etherization sufficient to prevent all suffering during the latter period of labor, may be maintained for a sufficient length of time without diminishing the expulsive efforts of the uterus and of the abdominal muscles. The condition produced is comparable to that which has repeatedly been witnessed in cases of coma and of paraplegia, where these efforts (depending on the excito-motory function of the spinal marrow) remained unimpaired, and labor was completed without the voluntary aid, or even the knowledge, of the patient. Analogous instances have also been observed of women taken in labor while drunk, and who have given birth to their offspring in a state of perfect unconsciousness. Dr. Simpson declares that etherization does not diminish the strength and regularity of the uterine contractions, unless a very deep state of insensibility is induced, and that in the latter case they resume their activity when the slighter degree of influence is returned to. Dubois, while admitting the occasional suspension of the pains, denies that it takes place frequently, and maintains that the full activity of the uterine and abdominal muscles is generally maintained. Dr. Channing states "that he has not met with a single case in which diminution or suspension of contraction has occurred which has differed from those in which these same things have happened without ether." And he subsequently declares, even more emphatically, that "so far from uterine contractions being diminished or suspended by ether, it is notorious that they are often increased in force and efficacy by inhalation." All observers are further agreed that the reflex action of the abdominal muscles is readily excited during inhalation, which does not in any degree hinder the contraction of the womb after delivery.

Etherization preserves the mother from the shock and exhaustion of the throes of labor, especially during its last stage, and this doubtless accounts for the more rapid recovery which follows instrumental as well as natural labor performed under this influence, than when ether has not been employed.

There is no evidence that etherization is injurious to the child. Dr.

Simpson has indeed known the heart of the fœtus to beat somewhat more rapidly when the mother has been kept long and fully etherized, but no evil consequences have ensued. Finally, it is pretty generally agreed that the soft parts of the mother are very sensibly relaxed during the process; the resistance of the *perineum* is lessened, and the passages are more freely lubricated by their proper secretion. Indeed no means of overcoming *rigidity of the os uteri* are so certain or so prompt as etherization.

It may be added that ether has been used successfully to combat *after-pains*, and that, according to some authorities, the secretion of milk is promoted by the fact of the patient having been delivered under the influence of this agent.

The following propositions laid down by Dr. Cotting, of Roxbury, Mass.,[1] appear to be a just summary of this important subject, and as such we recommend it to the reader.

I. That in ordinary cases of midwifery, while ether may be allowed in moderation when importunately demanded by the patient, it is quite as well, in the long run, to say the least, to let normal, uncomplicated labors proceed uninterfered with.

II. That in painful, laborious, or complicated labors, and in cases of great tenderness or great rigidity of the organs, of extraordinary susceptibility to pain, and where there is great nervous irritability, or undue apprehension of danger, ether, if favorably received, should be used to the extent of overcoming the abnormal condition and suffering.

III. That in cases requiring manual or instrumental interference, ether should be used to the same extent, and upon the same general principles as in other operations involving pain and danger to the patient.

IV. That in puerperal convulsions, especially in those having the character of uræmic eclampsia, ether should be given as soon as there are indications of an approaching fit, and be continued, if seemingly efficacious until the paroxysm has subsided, and quiet sleep is induced; or until other medicine, if desirable, can be swallowed, care being taken to allow a sufficiently large quantity of pure air, and not to continue the ether if coma supervene.

V. That as all volatile anæsthetics yet tried, except ether, have been known to cause severe accidents, and even instant death, though given with the greatest care by experienced practitioners, and this, too, before any considerable quantity had been inhaled; ether only should be used as an anæsthetic in midwifery.

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[1] Bost. Med. and Surg. Journ., Dec. 1858, p. 372.

It is very remarkable that while a certain number of deaths ...ere surgical operations have been set to the account of etheriz... attending does not seem to be a single instance on record of thi... perhaps be attributed to the less favorable condition... general health in which patients under the hands of the ...geon are generally found, in consequence of previous exhau...ng disease, or the shock of an injury recently sustained.

Various Diseases.—On comparing the several reports that have been published concerning the employment of ether in disease, it is evident that two classes of affections have been almost exclusively benefited by it. These are painful and convulsive affections, in which the symptoms arise from a derangement of one or the other of the two great functions of the nervous system, sensation and motion.

Neuralgia. Numerous cases are recorded which show that the inhalation of ether is one of the most prompt and efficient palliatives of this painful malady, and that occasionally it seems to contribute to a permanent cure. Relief is obtained by a degree of etherization short of insensibility, and which may be prolonged, if necessary, for several hours. The inhalation of ether, in conjunction with the local application of chloroform, or even of sulphuric ether itself, is now, it may be presumed, almost universal in the treatment of this affection.

Tetanus. Reichert was, perhaps, the first to record a case of idiopathic tetanus in which inhalations of ether produced a speedy and perfect cure.[1] Other examples of traumatic tetanus cured by this remedy, are reported by Mr. Hawkesworth,[2] by Mr. Hopgood,[3] by Mr. G. H. Smith,[4] and Dr. Theobald, of Baltimore.[5] In the last example, the control of ethereal vapor over very severe tetanic convulsions, is fully illustrated by the progress of the patient's improvement, which was irregular and interrupted in the same degree as the administration of the remedy. In all of these cases the effect of the ether was immediate and decided. Indeed, in several of them it evidently saved the patient's life in spite of the incongruous and somewhat harsh treatment employed at the same time.

Hysteria. Nothing so distinctly moderates the paroxysms of this disease as the inhalation of ether. Some observers have indeed found the spasms to be aggravated by a certain degree of etherization, but there is no doubt that in these instances too small a quantity of the vapor was employed. A persistence in using it would undoubtedly

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[1] Canstatt, op. cit., 1847, p. 164.
[2] Ranking's Abstract (Am. ed.), v. 341.
[3] Ibid., vii. 36.
[4] Lancet, Dec. 1849.
[5] Am. Journ. of Med. Sci., N. S., xv. 96.

that put an end to the fit. It is no argument against this use of ether that sometimes excites in healthy persons spasms of an hysterical type. The fact that when duly administered, it arrests such spasms is the only proper ground on which to base its remedial application in the present case.

Puerperal Convulsions. Dr. Channing was the first to publish a case of its successful use in this affection,[1] but it does not appear to have been frequently employed. The general success which attends venesection in puerperal convulsions, proves them to depend upon something more than the simple element of perverted innervation, and to require, therefore, a compound treatment. Perhaps after depletion ether would become appropriate. It was thus used in a case reported by Dr. Griscom, of Philadelphia.[2] The patient was plethoric and anasarcous. Two pints of blood were taken by cups and leeches from the head, and inhalations of ether commenced. After its exhibition the convulsions become less frequent and violent, and at the end of seventeen hours a living child was born. A similar instance occurred in the practice of Dr. N. J. Knight,[3] and under like circumstances, etherization is recommended by Dr. Cotting.

Infantile Convulsions. Dr. Knight also says: "To every case of teething convulsions in my practice for the last three years, I have administered the pure sulphuric ether, and immediate restoration has followed."

Whooping-Cough; Spasmodic Asthma. Dr. R. Willis states that he had used ether by inhalation in these diseases for several years before the discovery of its anæsthetic properties.[4] In *asthma*, he remarks, ether had long been familiarly employed, given by the mouth, but "I have for many years been aware of the fact that it is vastly more efficacious administered directly in vapor by the breath. . . . . A single short and difficult inspiration is hardly made before the effect is experienced; and I have occasionally seen the paroxysm ended in six or eight minutes, the respiration having in that brief interval become almost natural. It is not otherwise with *whooping-cough;* the paroxysms of coughing are positively cut short by using the ether when the fit is perceived to be coming on. So effectual have I seen its immediate application, that I have found it necessary to suffer the patient to have an occasional fit of coughing to its natural termination, with a view of clearing the chest from accumulated mucus."

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[1] Dr. Channing, op. cit. [2] Trans. of Coll. of Physicians, March, 1856.
[3] Boston Med. and Surg. Journ., Feb. 1857, p. 33.
[4] Braithwaite's Retrospect (Am. ed.), 1847; xv. 103.

Delirium Tremens. Dr. Upham, of Boston, relates a violent case of this affection, which was arrested in full career by the inspiration of ether. In that form of it distinguished by great restlessness rather than violence, with a weak pulse, and cool extremities, the remedy might possibly be dangerous.

Mania. Ether has been repeatedly employed in this disease with the effect usually of palliating the paroxysms, and in some recent cases it has seemed to contribute to the cure. It has also proved useful in some of those distressing instances of active mania in which the patient continues to move incessantly without a moment's sleep for weeks at a time, by procuring sleep, and thereby abridging the period of excitement. In some cases of puerperal mania, it has seemed to cut short the disease at once.

Cerebro-spinal Meningitis. This terrible malady, of which delirium and tetanic symptoms are the most prominent characteristics, has been very beneficially modified by ether. It seems to have moderated the more violent symptoms, to have contributed materially to its cure, and, as shown by fatal cases occurring after its use, to have diminished the tendency of the disease to produce plastic exudation within the cerebro-spinal cavity.[1]

Dysmenorrhœa, &c. This affection, in which violent uterine spasms and excruciating pain are conjoined, presents one of the fittest occasions for employing ether. It unquestionably shortens the paroxysms while it moderates or completely annihilates their pain, and at the same time spares the patient that profound exhaustion which follows each attack, and, by its frequent renewal, undermines the general health. It is equally applicable to the relief of *after-pains.* The pain caused by *the passage of biliary and urinary calculi* through the excretory ducts of the liver and kidneys, has an analogous origin to that just described, and is even more severe. Yet it is completely under the control of ether, which keeps the patient in a state of comparative comfort, until the escape of the calculus relieves him entirely. If, moreover, the excretory ducts referred to are really capable of being thrown into spasm by the irritation within them, the ether, by relaxing this spasm, must render the passage of the calculus through them more rapid than it otherwise would be.

Some *feigned diseases,* those, at least, in which the body or limbs appear to be distorted, are readily discovered by etherizing the patient, and suspending for the time his volition. The fraud then becomes immediately apparent.

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[1] Canstatt, op. cit., 1847, p. 165.

ADMINISTRATION.—The ether to be used in inhalation must be perfectly pure—that is to say, free from any of the acid used in its preparation, as well as from uncombined alcohol. For this end it should be washed thoroughly with water, allowed to stand for a short time, then carefully decanted, and dried with chloride of calcium.

Etherization should never be employed after a full meal; for either vomiting will be induced, or else an unpleasant degree of fulness about the head and stomach remains after the operation. The position of the patient, while inhaling, should be that which will be most convenient for the subsequent action of the surgeon or accoucheur. All needful preparations should be made beforehand, so that the operation may be commenced immediately on the supervention of insensibility.

It is very important for success that the patient's attention be not diverted by any questions, or remarks made in his hearing. He should be particularly instructed in what manner to regulate his breathing, and be made to empty his lungs of air as far as possible before the first inspiration, which ought to be prolonged and full.

When etherization was first employed, an almost endless variety of apparatus was devised for the purpose of regulating the supply of vapor administered. But these were nearly all found to be cumbrous and inconvenient; and, as early as March, 1847, Dr. Smith, of Cheltenham, introduced the practice of using only a piece of sponge large enough to cover the mouth and nostrils. Prof. Syme, after experiencing much annoyance from different forms of inhaling apparatus, finally adopted the plan of placing the ether on a piece of sponge contained in a flask which was furnished with a mouth-piece and an aperture at the side to admit the air. With this apparatus, "the patients, instead of requiring a tedious and laborious respiration, frequently interrupted by cough, yielded almost immediately to the overwhelming and not unpleasing influence of the full ethereal stream." Dr. Simpson found that for surgical purposes, and when it is not necessary to keep up the etherization above five or ten minutes, the sponge is by far the best instrument. Mr. Morton also abandoned the use of any inhaler, and adopted the sponge after the manner described by Dr. Smith. This gentleman directs that, before being used, it should be well washed in lukewarm water, and then from half an ounce to an ounce of ether, or whatever quantity is necessary to saturate the interior of the sponge, should be poured upon it. This is the method preferred by Dr. Hayward, and the only one, so far as we know, employed in this country. According to Dr. Snow, the quantity of ether required to produce complete insensibility is usually from six drachms to one ounce in the adult, and in children in the same

proportion, according to their age. The quantity required to keep up insensibility during an operation is seldom greater than that which induced the state of etherization; but this statement has reference to the use of inhaling instruments, in which there is less waste than with the sponge. But by both methods the quantity consumed is far greater than when the patient respires from a shut cavity, as recommended by Porta.

Supposing a sponge to be employed, it is, when prepared as above directed, to be brought near enough to the patient's mouth and nostrils to prevent any air from entering either of these openings without being charged with a portion of ethereal vapor. If the patient coughs and strangles, the sponge may be brought up gradually to the face. But although this palliates the difficulty, it very needlessly prolongs the process. Dr. Channing states that in some persons there is so much dyspnœa and cough as to contraindicate the further use of the ether; or else they experience disagreeable sensations in the head, more or less severe distress, noises, flashes of light, tingling of the limbs and trunk, nausea, vomiting, &c. But all surgeons who have given due attention to the subject agree that the symptoms just mentioned, as well as those of excitement, are owing to a too gradual and imperfect inhalation of the ether. It is therefore desirable, for the patient's as well as the surgeon's sake, that the full effect of the ether should be obtained as rapidly as possible when an operation is to be performed. In natural labor the case is somewhat different. Here it is unnecessary to produce complete insensibility and unconsciousness. It is enough to diminish suffering, and this object can be gained without the risk of bringing on the unpleasant symptoms described above. If the patient is intelligent, she can regulate the degree of insensibility produced, by the severity of her pains, and call for, or herself employ, the ether when she feels that a pain is about to commence. In general it is unnecessary to administer the ether until the presenting portion of the child begins to distend the external parts. Cases of rigidity of the os uteri are exceptions to this rule.

It is not always easy to infer the existence of insensibility from the patient's appearance. But if the eyelids do not contract when the eyelashes are touched, if the breathing is decidedly automatic and somewhat stertorous, and the expression of the face indicates unconsciousness, the patient is in a fit state to be operated upon. Occasionally, before this stage, a spasmodic contraction of the respiratory muscles takes place, which threatens to produce asphyxia; the patient's face grows purplish, and he ceases to breathe. Under these circumstances it is advisable to suspend the inhalation until the breathing is

resumed. The state of unconsciousness, which may be regarded as the normal effect of etherization, must be prolonged by meeting every indication of returning sensibility with a renewed administration of ether, which need not usually be continued longer than a minute at a time. There is very seldom, according to Dr. Snow, any struggle as the patient returns from complete to partial unconsciousness; but if there should be, the ether must be given anew, and the patient kept motionless. In all cases, however, of surgical or obstetrical operation the care of the person who has charge of administering the ether should be given to maintaining the patient as little as possible beyond the point of complete insensibility. To do less than this, embarrasses the surgeon; to do more may endanger the patient.

The method of Pirogoff, which consists of injecting the vapor of ether, and ether itself, largely diluted with water, into the bowel, has been condemned by some who have used it, on the ground of its occasioning extreme flatulent distension of the abdomen. But many of those who have employed it to relieve painful internal maladies, such as neuralgia, spasm of the muscles of deglutition, lead colic, inflammatory pains of the joints, and cancer of the intestinal tube, report favorably of its anodyne and antispasmodic effects.[1]

Although we believe that the profession, in this country at least, is agreed to dispense with inhalers for the administration of anæsthetics, the reader may be interested in knowing the opinion and precepts of so competent an authority upon this subject as the late Dr. Snow.

He objected to inhalers of glass and sponge because they are indifferent conductors of caloric, and hence the evaporation of the ether is very much checked. He preferred the inhaler proposed by Mr. Jeffries for the inhalation of watery vapor,[2] and which consists of a plated copper box, to the lower surface of the lid of which is soldered a spiral volute which reaches nearly to the bottom of the box. There are two openings in the lid, the one communicating with the central, and the other, which is furnished with a tube, with the peripheral portion of the spiral cavity. If, now, ether be introduced into the box, and air be drawn from the tube, it is obtained highly charged with ethereal vapor, particularly if the box be prevented from getting cold, by being immersed in water of the temperature of the air—say at 50° or 60° F.

Dr. Snow advises the use of a face-piece connected with the inhaling-tube. This is a box made of sheet lead, extending from the bridge of the nose to the fossa of the chin, and to either cheek, and fitting

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[1] Canstatt, op. cit., 1849, p. 190. [2] Lond. Med. Gaz., xxix. 821.

closely to these parts. Its lower part is connected with the inhaler by means of a wide flexible tube, which, at its entrance into the mouth-piece, is protected by a valve opening towards its cavity. Its front surface also presents an aperture covered with a valve, which opens outward, and can also be turned aside. By this arrangement the atmospheric air can be mixed, in any required proportion, with the ethereal vapor, and the whole of the expired air escapes, instead of being forced back into the receptacle of the ether.

At the commencement of inhalation the outer valve is left entirely open, so as to admit the vapor of ether by degrees, and avoid the irritation which would otherwise arise. About thirty per cent. of vapor of ether in the inspired air is necessary, according to Dr. Snow, to produce insensibility in a convenient time; but this proportion must be gradually reached. The quantity of ether required to produce this effect in the adult is about a fluidounce when an apparatus like the above is used, but much more when the sponge or handkerchief is employed.

The subject of etherization may be concluded with an account of the method employed by Prof. Porta, of Pavia. According to the statements of those who have employed it systematically, it has these advantages over the more ordinary methods: it requires a far less quantity of ether, it seldom or never produces sickness or excitement, it brings on anæsthesia more rapidly, and leaves behind it much less unpleasant sensations than the more common methods. It is thus described:[1] "Close the nostrils with raw cotton. Then take a *pig's* bladder of medium size, soften and inflate it after enlarging its aperture sufficiently to receive the patient's mouth, and pour into it one or two tablespoonfuls of rectified ether. Apply the edges of the aperture carefully over the patient's mouth, and direct him to breathe freely. For twenty or thirty seconds no effect is produced; but, in from forty to fifty, signs of insensibility commence, and in about a minute it is complete. This state lasts from one to three minutes, and is maintained as long as may be necessary by applying the bladder anew. In more than two hundred experiments that I have made, I have repeatedly weighed the ether remaining after the production of complete anæsthesia, and found the original quantity diminished by no more than half a scruple.

"Although so small a quantity of ether is required to produce insensibility, it must reach the lungs in a certain degree of concentration, and hence the bladder should contain much more of it than will be

[1] Annales de Thérap., v. 60.

actually inspired. This is the capital point in administering ether. The unpleasant symptoms which have sometimes attended its use arise from its too copious dilution with atmospheric air, and thus, too, the process is unnecessarily prolonged. A difficulty in other methods is the use of too large a quantity of ether, which oppresses the breathing, but no such effect takes place in this one, when only a due proportion of the fluid is used. It is very important that the breathing of the patient should be regular and free, and therefore it is well to inspire his confidence by allowing himself to apply the bladder to his mouth until the commencement of insensibility requires that an assistant should take charge of it.

"In the long course of my experiments, the use of such a method as I have described has uniformly succeeded in producing the due effect in from fifty to eighty seconds, and always without any excitement, anxiety, or suffocation. If it is objected that a bladder of the size recommended is incapable of containing air enough for respiration, I reply that it results from actual trial that an ordinary pig's bladder contains air enough to sustain the respiration of an adult during from eighty to one hundred seconds, a much longer period than the average time of inhaling the ether. The highest praise that can be given to the method here recommended is, that it has, in my hands, succeeded uniformly and without difficulty or mischance of any sort, and that the patients return to consciousness directly after the operation, and without experiencing the slightest inconvenience."

CHLOROFORMUM.—Chloroform.

Description.—This substance is composed of two atoms of carbon, one atom of hydrogen, and three atoms of chlorine. Now the same proportions of carbon and hydrogen united with three atoms of *oxygen* constitute *formic acid.* They are hence supposed to form a basic compound, formyl, the union of which in the present case with chlorine was intended to be expressed by the term chloroform. To express the same idea more precisely, Liebig has named it perchloride of formyl.

Chloroform is a clear, limpid fluid, of sp. gr. 1.500; it is not inflammable, but its vapor burns with smoke and a green flame. It is very volatile, and boils at 141° F. It has a fragrant, fruit-like odor, and a sweet taste at first, which afterwards becomes burning and pungent. It is very slightly soluble in water, but is completely so in alcohol or ether. Dr. Snow states that it is soluble in 288 times its volume of water. It readily dissolves camphor, caoutchouc, gutta-percha, wax,

resin, iodine, and some other substances. Its drops are very small, eight of them on an average being equal to two minims. Its vapor is more than four times as heavy as atmospheric air, and more of it is taken up by the latter at a high than at a low temperature. Thus, 100 cubic inches of air at 40° F. will absorb only seven cubic inches of the vapor of chloroform, but at 90° F. it will absorb fifty-five inches. During the evaporation of chloroform cold is produced, but not so much as during the evaporation of ether.

The following account of the medical properties of chloroform is contained in the seventh edition of the *United States Dispensatory*, published in July, 1847, and consequently before Dr. Simpson's experiments, to be presently described: "It acts as a diffusible soothing stimulus *in the same manner as sulphuric ether*, but with this decided advantage, that when sufficiently diluted it possesses a bland, sweet taste, which renders its administration easy even to children. It has been used with advantage in asthma, spasmodic cough, the sore throat of scarlet fever, atonic quinsy, and other diseases in which a grateful and composing medicine is indicated. Professor Ives and Dr. N. B. Ives, of New Haven, speak favorably of its effects. The dose for an adult is a teaspoonful diluted with water. In affections characterized by difficult respiration *it may be used by inhalation*."

Through an earlier edition of the work just quoted it was in 1838–9 introduced into the medical practice of Liverpool by Mr. Waldie, an apothecary, and Dr. Formby, a physician, of that town, and by the former of these gentlemen it was, in the beginning of November, 1847, recommended to Dr. Simpson as a substitute for sulphuric ether.[1] Dr. S. was at that time endeavoring to discover, by experiments upon himself and several friends, some anæsthetic agent superior to ether. Upon inhaling chloroform, the party grew exhilarated, and several of them soon afterwards became insensible.[2] With joy, yet not wholly without apprehension, the conductor of the experiments hailed this sudden but complete disclosure of a power which was to connect his name forever with one of the most remarkable events in the history of medicine, and, after satisfying himself by renewed experiments of the reality of his discovery, he put it to a public test by rendering insensible a patient on whom Professor Miller was about to operate for necrosis of the radius. From this moment the use of chloroform as an anæsthetic agent spread rapidly over the world, and gradually supplanted sulphuric ether in the medical circles of Europe and in several parts of

[1] Lancet, 1847, ii. 687.

[2] Surgical Experience of Chloroform, by Prof. Miller, p. 10.

the United States. But it has never enjoyed in this country the excessive popularity it attained abroad, and until recently preserved.

HISTORY.—Chloroform was discovered in 1831, almost simultaneously by Mr. Guthrie, of Sackett's Harbor, N. Y., and by Soubeiran, of Paris. In an account of it published by the former in January, 1832, it is stated that "he had used the product very freely during the previous six months to the point of intoxication; that he had found it singularly grateful, producing promptly a lively flow of animal spirits and consequent loquacity, and leaving little of the depression consequent on the use of ardent spirits; that it promises much as a remedy in cases requiring a safe, quick, energetic, and palatable stimulus; and that for drinking it requires an equal weight of water."[1] In 1833, Dr. Black, of Bolton, Eng., spoke of it as a new remedy, "brought into use by our American brethren," and recommends it in spasmodic asthma and in adynamic states of the system. In 1834, Dumas determined its true elementary composition, and gave it the name of *chloroform*.

ACTION. *On Animals.*—In an essay published by Dr. Glover in 1842, it is stated, among the effects of chloroform upon the lower animals, that the lungs become congested and the spinal cord loses its sensibility.[2] In 1847, M. Flourens, while experimenting on the different varieties of ether, found that "an animal subjected to the inhalation of chloroform became completely *etherized*," and the posterior roots of the spinal nerves were found insensible, and several of the anterior roots had lost their function.[3] According to Gruby,[4] the arterial blood is as red after the inhalation of chloroform as before it, perhaps even redder, and the venous blood has a brighter color than the arterial blood naturally possesses. But this assertion is contradicted by nearly all other experimenters. Amussat,[5] for example, showed by very carefully conducted experiments that when a vein and an artery in an animal's limb are exposed so as to exhibit their contrasted hues, and chloroform is then administered, the latter vessel begins to darken as soon as the animal's sensibility declines, and finally approaches the vein in color. The blood also which jets from it on being punctured has the aspect of venous blood. But the instant inhalation is suspended the natural color of the fluid returns. This rapid restoration to its normal condition explains perhaps why some experimenters have supposed the blood to remain unchanged during anæsthesia.

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[1] Lancet, 1847, ii. 631, from Silliman's Journal for Jan. 1832.

[2] Ibid.

[3] Revue Médicale, ciii. 442.

[4] Lancet, 1848, i. 396.

[5] Revue Médicale, civ. 125.

Duméril and Demarquay found that anæsthesia caused the temperature of animals subjected to it to fall several degrees; but this seems to have resulted only from the prolonged action of chloroform or ether.

The influence of individual susceptibilities, of the dose, and of the mode of administration, has been very clearly illustrated by Mr. Nunneley's experiments.[1] Under circumstances as nearly alike as possible, the effects were by no means identical, and even in the same animal they were far more decided at one time than another. The intensity of the effects appeared to depend upon *the quantity of chloroform inhaled in a given time.* Thus, a small quantity suddenly and quickly inhaled for a short space of time will produce, not only more rapid and decided, but also far more dangerous effects than a larger quantity will do if taken more slowly, and consequently in a less concentrated form. A high temperature, which insures a speedy conversion of the chloroform into vapor, produces anæsthesia very rapidly and decidedly, and for a longer time. Consequently, whatever increases unduly the volume of the vapor inspired increases also the danger of the inhalation.

Prof. Simpson and Mr. Nunneley found that in the lower orders of animated creatures, such as fish, frogs, snails, and certain insects, it was easy to produce a local anæsthesia. In many instances, too, the local effect was followed by general insensibility, a result which doubtless depended upon the active absorbent power of the integuments of these animals. But local anæsthesia is not so easily produced in the larger mammiferæ, and hence in man the advantages of this method are restricted to cases in which the cautery is applied, or some other superficial operation is performed. In Mr. Nunneley's experiments on frogs and toads, their limbs which had been subjected to the vapor of chloroform were excised piecemeal without the animals betraying any signs of pain. An inferior degree of insensibility was produced in the limbs of rabbits and dogs by prolonged immersion in the vapor of chloroform.

On Man.—Locally, and when its evaporation is prevented, chloroform acts as an irritant, and even promptly vesicates the skin. At the same time, it diminishes the sensibility of the part to external impressions. But the latter effect is very transient, while the former is of considerable duration. The vapor of chloroform, however, may be used to produce local anæsthetic effects without greatly irritating the part to which it is applied.

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[1] Trans. Prov. Med. and Surg. Assoc., xvi. 312.

Taken internally in the liquid form, it produces a sense of heat in the stomach, and a diffusive warmth resembling in some degree that which is caused by alcohol. According to Dr. Henry Hartshorne, "a fluidrachm of chloroform, taken by the stomach, is not more than equal, in soporific effect, to thirty or thirty-five drops of laudanum,"[1] and a dose of seventy-five drops blunts the general sensibility, as well as the special senses, produces drowsiness, and reduces the pulse two beats in a minute.[2] This action on the pulse is not observed when chloroform is inhaled, nor was such an effect very marked in any of the following cases of poisoning by its internal use.

Mr. Dean has reported the case of a lady weakened by a miscarriage, and subject to spasmodic attacks, who nearly lost her life from taking half an ounce of pure chloroform. She was seen within five minutes afterwards. The symptoms presented were as follows: General convulsions, total insensibility, dilated pupils, trismus, slightly flushed face, a full and rather oppressed pulse, and foaming at the mouth. After the stomach was emptied, brandy was administered with evident advantage, and, although several relapses occurred, the lady finally recovered. The action of the heart during the attack was singularly feeble and irregular, "one moment slow and labored, every third beat prolonged, at the next, small, quick, and fluttering, and then a prolonged stop.[3]

A case closely analogous to this has also been reported. The patient was a female, twenty-one years of age, who had swallowed two ounces of pure chloroform. She was found within twenty minutes afterwards in a deep stupor, the pupils contracted, respiration regular, pulse 70, soft, and full; the face not congested. External irritants were applied; the stomach pump used; and brandy and ammonia given. The respiration then became slow and stertorous, the pulse fell, and the face was livid. Galvanic shocks were employed, and continued for two hours, with stimulating enemata, and heat to the limbs. The respiration fell to two in a minute; the pulse at the wrist was almost imperceptible. The remedies were persevered in, and reaction gradually took place. In five or six hours from the commencement consciousness returned. On the following day there was thirst, nausea, pain in the abdomen and in the lumbar region, and frequent and very bloody stools. In about a week recovery was complete.[4]

Dr. Lawson, U. S. A., has reported the case of a man who also took

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[1] Am. Journ. of Med. Sci., Jan., 1854, p. 113.
[2] Ibid., Oct. 1848, p. 353.
[3] Times and Gaz., Dec. 1857, p. 615.
[4] Annuaire de Thérap., xviii. 55.

two ounces of chloroform, and presented essentially the same symptoms as those in the above narrative. They were, however, less grave.[1]

It is believed that there is no case on record of death from the poisonous, as distinguished from the *irritant*, action of chloroform taken internally. In 1852, at Edinburgh, a robust man, in a state of intoxication from alcohol, swallowed an ounce or two of chloroform from a vial containing eight ounces of this liquid. The remainder was nearly all spilled upon the floor. Several hours afterwards, probably six or eight, he was found insensible, breathing stertorously, his face livid, his pupils dilated, and his pulse at 60, full and soft. Evacuant and stimulant remedies were employed, and his consciousness fully returned. He now began to suffer from gastric irritation, vomiting all ingesta, and to complain of symptoms affecting the air-passages. In about thirty-six hours he died of suffocation. On examination of his body, the mucous membrane of the pharynx, larynx, and trachea, was of a crimson-red color, and in the trachea it was covered with patches of a soft, yellowish, purulent exudation, and the bronchi to their extremities, were filled with a dirty-gray, purulent fluid. The cause of death was evidently an inflammation of the air-passages excited by the irritant action of chloroform.[2]

Dr. Junius Williams has reported the following case: An intemperate female, while intoxicated, swallowed an ounce and a half of chloroform. For a few minutes she was elated, singing and dancing, and then fell insensible. Her breathing was stertorous, pulse feeble and rather slow, pupils contracted and fixed. She remained insensible for ten hours, then complained of burning in the fauces, œsophagus, and stomach. Vomiting and purging of an offensive fluid succeeded, with burning pain at the epigastrium. The thirst was insatiable; pulse 100. In thirty-six hours she died suddenly, with a congested state of the face, and liquid filling her mouth and nostrils. The mucous membrane of the stomach was found softened, and reddened in streaks. The blood was fluid. There were no other lesions.[3]

In another case, reported by Dr. Bain, a female swallowed a wine-glassful of chloroform mixed with water. Four hours and a half afterwards she lay insensible, the countenance pale, the pupils contracted, and but slightly influenced by light, the pulse 84, and moderately full, total insensibility of every part; breathing abdominal, no stertor. Vomiting was produced by the stomach-pump, and stimulants

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[1] Am. Journ. of Med. Sci., Oct. 1857, p. 367.

[2] Month. Journ. Med. Sci., v. 77.

[3] Philadelphia Med. Exam., Nov. 1856, p. 659.

applied to the skin. In eleven hours consciousness had returned, and with it great complaint of gastric distress. Death from gastritis took place on the eighth day. The mucous membrane of the stomach was red, softened, and eroded, especially near the cardia, and ulceration was found near the pylorus. The lungs, heart, and œsophagus, were healthy.[1]

The phenomena produced by inhaling chloroform do not differ essentially from those that ether occasions, but they are more strongly marked. The stage of excitement seldom occurs during the inhalation of chloroform for surgical purposes, and is always extremely brief. In some of the experiments of Dr. Hughes Bennett, laughter and extravagant gayety and humorous gesticulations, accompanied with sensations of a highly pleasurable description, were produced by small doses of the vapor, symptoms, in fact, identical with those which the inhalation of nitrous oxide gas has rendered familiar. Like this agent, also, chloroform sometimes develops, in persons of the coarser sort, a furious pugnacity. But whatever tendency to such manifestations may exist under the first impression of chloroform, as commonly employed, it is speedily and completely subdued by the rapid encroachment of the anæsthetic state. The gradation of the symptoms has been accurately dscribed by Simpson, Snow, and many others. After the first two or three full inspirations, a feeling of warmth and excitation is experienced, radiating from the chest to the extremities, followed by whirring noises in the ears, a sensation of vibratory thrilling and benumbing throughout the body; with, at times, a rapid loss of sensation and of motion, and, at last, of consciousness. In the first part of this stage sensibility may be blunted while consciousness remains, particularly if the vapor be inhaled very gradually. For the greater number of minor operations, and for obstetric practice, unless when it is intended to arrest powerful uterine action, the degree of anæsthesia produced at this stage is sufficient. So complete may the loss of sensation be, without the consciousness being impaired, that, as Dr. Snow states, he has seen a child unconsciously handling its toys all the time that the operation of lithotomy was performed on it. Commonly, however, the use of the knife occasions expressions indicative of pain, which are either not remembered, or are recollected as having occurred in a dream. It is certain, says Dr. Snow, that chloroform may prevent pain in two ways, either by rendering the mind unconscious of external impressions, or by removing the sensibility to these impressions, that is, by a true anæsthetic action, but usually, and always when

[1] Lancet, April, 1859, p. 400.

breathed in a full dose, it acts in both ways at once. The patient sometimes supposes that he remembers all the particulars of the operation, although he did not feel the pain, but on questioning him it is usually found that it is a dream which he remembers, and not the actual facts.

During the full anæsthetic sleep produced by chloroform, sometimes no mental action goes on, or at least is remembered; in many others the mind is active, as in dreams. The respiration is usually at first soporose, or, as Meinel describes it, quicker and fuller at first, then slower, and at last almost suspended;[1] the pupil is sometimes natural, in other cases slightly contracted, in others again dilated; the pulse is usually increased both in force and frequency at first, and afterwards falls, nearly, or quite, to its normal rate; even if the vapor is exhibited very long, and in very powerful doses, the pulse seldom becomes weaker or falls below the natural standard; the muscles of voluntary motion are in general relaxed; more rarely cataleptic; still more rarely rigidly contracted, as happens also occasionally with ether.[2] This phenomenon is most usual in active and robust persons. In females, spinal symptoms are most apt to occur, the unconsciousness being sometimes accompanied by sighs, sobs, partial rigidity of the arms, more or less excitement, and a group of phenomena usually denominated hysterical.[3]

The extensive and careful experiments of Mr. Nunneley led him to a singular conclusion in regard to the *modus operandi* of chloroform. From the possibility of producing local anæsthesia, and from the more rapid action of the vapor through the lungs than through the stomach, Mr. Nunneley concludes that the primary and direct action of the vapor is upon the nerves. He appears to believe that the anæsthetic influence is propagated through these organs, whereas it is conclusively proven by his own experiments, taken in connection with those that demonstrate the rapid entrance of anæsthetic vapors into the bloodvessels, that it is through these channels that vapors are brought into contact with nervous trunks and centres. A very conclusive experiment upon this subject was performed by M. Coze, of Strasburg. He states that a limb can be protected from the influence of chloroform during its inhalation, by merely compressing the main artery that supplies the limb. Immediately on removing the pressure, and restoring the circulation, the limb becomes insensible.[4]

The superiority of chloroform over ether, as a rapid and effectual anæsthetic, caused the latter agent to be in a great measure abandoned by surgeons and accoucheurs in Europe; but the fatal consequences

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[1] Canstatt, op. cit., 1849, p. 184.
[2] Month. Journ. of Med. Sci., viii. 416.
[3] Dr. Bennett, ibid., p. 540.
[4] Annuaire de Thérap., 1850, p. 39.

which so often resulted from the employment of chloroform gave a shock to the conscience of the profession, which has led, it may be hoped, to the more circumspect use of it. Indeed, unless it could be shown that the use of chloroform is necessary in surgery, it is difficult to conceive why it should continue to be employed so long as the means of preventing its fatal effects remain unknown, or are merely conjectural.

As early as 1850 not less than forty-eight cases of death from chloroform were published, and since that time the number has increased considerably. During 1852 sixteen fatal cases were published, of which eight occurred in the United States and six in Great Britain, and four of them after the simple operation of extracting a tooth. In 1853 Mr. Crisp collected forty-two cases of recorded deaths from this agent.[1] In February, 1857, Mr. Holmes gave fifty as the total number of deaths from chloroform in surgical operations;[2] since which time we have found eighteen similar cases published in the medical journals, and in a single one, for the first half of the year 1859, not less than seven cases are published.[3] Yet, at the time of Dr. Snow's death, in June, 1858, this gentleman stated the number of fatal cases at fifty. If we were to know of all which occurred without having been published, and in rural districts, as well as in towns where such events are eagerly seized upon by the agents of the press, we should have, in all probability, greatly to extend the melancholy catalogue. To give a single illustration of the correctness of this remark, M. Barrier states that five deaths from inhalations of chloroform have, to his knowledge, taken place at Lyons, and that *one* only has been published.[4]

It is true that of these cases a portion may be set to the account, in part at least, of other causes than chloroform inhalation, such as the debility, alarm, or diseased condition of the patients. Berend, indeed, who published the first collection to which reference is here made,[5] admits eleven cases only as direct and unequivocal instances of death by chloroform; but it seems impossible to deny the not less real, although less immediate, fatal influence of this agent in nearly all of the remaining examples. It is also true, as charged by Dr. Nunneley, that "even in those cases which have come to light, all sorts of explanations, and attempts to explain away the true cause of death, have often been attempted, rather than admit the fact of the person having been killed by chloroform."[6] But an examination of the published

[1] Lancet, June, 1853, p. 523.
[2] Ranking's Abstract (Am. ed.), xxv. 222.
[3] Times and Gazette, June, 1859.
[4] Lancet, Aug. 1857, p. 225.
[5] Chloroform Casuistik, Hannover, 1850.
[6] Op. cit., p. 319.

reports must convince any one that in very nearly all of them death was owing rather to some individual susceptibility to the action of the vapor than to the mode in which it was inhaled. The fatal consequences which have been alluded to seem to have made no permanent impression upon medical men. As one of the historians of the subject remarks, the effects of the agent were studied like those of an ordinary medicine; indications and contraindications were laid down, and rules given for its use; experiments on its physiological action and its mode of administration were performed. An exclamation of terror was no longer heard when patients perished suddenly under its inhalation, but the circumstances of the fatal event were discussed as subjects of scientific interest, and the causes of death sought for in the liquid itself, and in its relations to the living organism.[1] It is a doubly melancholy fact that a large proportion of deaths by chloroform have taken place, not during capital operations in which the administration of an anæsthetic was justified by the apprehension that the patient would sink under the shock of pain, but on occasions when the pain to be inflicted by the surgeon could only have been slight, or, if severe, was momentary. In the list of fifty cases published by Dr. Snow, there is not a single instance of a capital operation, and in twenty-four of them the patient perished before even the intended operation had been commenced. The very last example of fatal poisoning by chloroform inhalation, which presented itself as these sheets were preparing for the press, was one in which a healthy-looking girl of fifteen, affected with strabismus, died in the surgeon's hands when the operation was hardly begun.[2]

The causes of death are regarded very differently by different observers. Stanelli[3] maintains that asphyxia is the fatal agent, and may operate in either of several modes: 1. The vapor being administered in too concentrated a form, excludes the atmospheric air, or supersaturates the blood so that it no longer acts as a natural stimulus to the system, or else it occupies the place of the blood in the vessels, and so paralyzes the heart. 2. The system being overcharged with the vapor, its normal actions proceed imperfectly and irregularly, and death is the result. 3. The respiration is impeded by mucus at the entrance of the larynx, or else by a too close application of the respirator to the mouth and nose. It is chiefly upon the last of these propositions that Stanelli dwells, but it is of questionable soundness; for, as has been asked by Berend, is not mucus or saliva that has reached the

[1] Canstatt, 1851, p. 95. [2] Times and Gaz., June, 1859, p. 581.
[3] Was ist der Chloroformtod, &c.? Berlin, 1850.

glottis always swallowed? Why, if this be the cause of death, are not the fatal cases more numerous? and why, above all, is not this mechanical impediment found after death? To which objections may be added the more weighty one that the mode of death is seldom like that by suffocation, either in the rapidity with which it supervenes, or the symptoms which accompany it. A review of the fatal cases furnishes a very uniform result, and shows but few symptoms as precursors or concomitants of death. In a very small number more or less twitching of the muscles of the face and extremities, and in two or three instances spasmodic contraction of the muscles of the posterior part of the trunk, has been noticed; but, in general, the breathing grows feeble and infrequent, the pulse small and faint, and the face pale and cold. In a smaller proportion of cases the features are congested instead of pallid, and in these the respiration is more or less stertorous, and there is sometimes foam upon the lips. The former group of cases seems to indicate a direct poisonous action of the chloroform, while in the latter are *superadded* the effects of an exclusion of atmospheric air—the signs, in other words, of asphyxia.[1]

The condition which precedes, and is the cause of death by chloroform, is regarded by Mr. Snow as a paralysis of the heart. In nearly every fatal case, the right cavities of this organ are found distended with blood which has so impeded its action as to produce a more or less sudden, but always a rapid, extinction of life. Death, in fact, takes place by *syncope*, which is a sudden and complete loss of sense and motion, and may be produced by any cause which arrests the cardiac circulation; by emptiness of the heart on the one hand, or by its congestion on the other. From the symptoms observed in death by chloroform, and which are above described, it may be inferred that the former of these causes is less frequent than the latter. Dr. Glover is of opinion that the tetanic spasms in some cases, and epileptiform convulsions in others, show a direct poisonous action of the vapor upon the brain and the spinal cord.[2] But not only are the direct and immediate effects of chloroform of a pernicious tendency, they are so far cumulative as to betray their poisonous qualities even after inhalation has ceased. Dr. Snow observed the insensibility to increase for twenty seconds after the inhalation had been left off, and unless, therefore, extreme caution is observed in administering the vapor, a deadly dose of it may be given before any sign of danger is betrayed.

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[1] Consult also Gosselin, Arch. Gén. de Méd., 4ème sér., p. 385; Drs. Sibson and Snow, quoted in Am. Journ. of Med. Sci., July, 1849, pp. 274 and 278; Braithwaite's Retrospect (Am. ed.), xvii. 306; Robert, Bull. de l'Acad., xiv. 1091; Orfila, op. cit., ii. 714.

[2] Lancet, Nov. 1858, p. 469.

The above considerations furnish a reason why the use of chloroform as an anæsthetic should be avoided in those affections of the lungs which predispose to asphyxia, and in those conditions of the heart and blood which favor the production of syncope. The shock of severe accidents, mental excitement or depression, constitutional or accidental debility are, therefore, so many contra-indications to its use, but they present less serious obstacles to the employment of sulphuric ether. Dr. Warren presents, in a few words, the comparative merits, in surgery at least, of these two anæsthetics when he says, "Ether is generally safe; chloroform cannot be said to be safe in any case, . . . no practitioner can be reasonably assured in his own mind that it will not prove fatal the next time he employs it." But *if the consideration of danger be left out of the comparison*, there can be no question of the superiority of chloroform to ether as an anæsthetic. Its advantages may be thus summarily stated, after Speyer,[1] Simpson,[2] and others: 1. A less quantity of chloroform than of ether is requisite to produce the anæsthetic effect. 2. Its action is more rapid and complete, and generally more persistent. 3. Its influence is far more agreeable. 4. Considering the quantity used, it is much less expensive. 5. Its perfume is pleasanter, and less adherent to the clothing, &c. 6. It is much less inflammable, and may, therefore, be more safely employed by night. Unfortunately, the "consideration of danger" is that precisely which we are under the strongest obligations to regard. If a remedy is dangerous, we are morally bound not to use it, unless withholding it involves a greater danger still. If the degree of anæsthesia necessary for the due performance of the graver surgical operations is such as to imperil life, and that, too, without any possibility of our anticipating and guarding against the danger, the surgeon who employs it assumes a responsibility of life and death, for which neither his office nor the moral law affords him any license.

If we consider the minute precautions which are enforced by those who, like Dr. Snow, have had the largest experience in administering chloroform; the abandonment or rejection of it by a large number of the most experienced and judicious surgeons in the United States; the fact that the question of relinquishing it entirely has been proposed for discussion in the Surgical Society of Paris;[3] that, besides the absence of all outward sign to indicate whether the patient is fit or unfit for the use of chloroform—in some cases the fatal effect is produced by an exceedingly small dose—and that the danger bears no proportion at

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[1] Canstatt, op. cit., 1849, p. 184.

[2] Lancet, Nov. 20th, 1847, p. 549.

[3] Abeille Méd., xv. 102.

all, or if any, an inverse proportion, to the severity of the operation, it must be admitted that the question whether its use as an anæsthetic in surgery should be persisted in, is one of extreme gravity, and which it is more than probable will ultimately be decided in the negative. Meanwhile, it cannot be denied that chloroform has been administered hundreds of times, in almost every description of surgical operation, and, apart from the comparatively rare exceptions above noticed, without any evil result. Yet it is probable that ether would have secured all the advantages without any of the dangers which attach to chloroform.

Other consequences than fatal ones, but still seriously to be deprecated, have been observed to result from the use of chloroform. One of these is the circumstance that during the stage of excitement, or even of imperfect insensibility, it prompts to expressions and movements which betray sexual propensities, particularly in females; and although it has been alleged that such exhibitions have usually occurred in the case of dissolute individuals, the fact is not exclusively so. The objection, also, such as it is, applies with even greater force to ether than to chloroform. Still, it does not follow that, on this account, the benefits of the medicine should be withheld from the great mass of those to whom, on general grounds, it is appropriate. Sickness of the stomach has been observed in many instances after the inhalation of chloroform, but it has generally been produced when the vapor was exhibited immediately after a meal, or on the other hand, after long fasting. In the latter case it has, in some instances, been of considerable duration, and accompanied with more than usual depression. (*Snow.*) It may generally be checked by a little brandy and water, or an opiate. A more common but remote effect of chloroform is headache, with a sensation of giddiness, and excitement or general nervousness which has, in some cases, been perceived even for months after the inhalation. Dr. Happoldt has published the case of a person who, for the relief of asthma, inhaled chloroform to the extent of twenty ounces in forty hours. The attack was cured, but the sense of smell was abolished, and that of taste perverted. The bladder and rectum were paralyzed, the latter remaining torpid for several months. The sexual appetite was for many weeks abolished. In a second case by the same physician, four ounces of chloroform were inhaled. Consciousness was suspended for ten hours. For more than a month ordinary articles of food lost their proper savor; the sense of smell was for the same period nearly abolished, and the nostrils nearly closed by swelling of their lining membrane. As in the other case, the bladder and rectum were torpid, and erections of the

penis were impossible.[1] The most serious of the secondary consequences attributed to the inhalation of chloroform, is the production of insanity. Four or five cases of this nature are related by Dr. Webster, of London;[2] they all occurred, however, after parturition, and may, therefore, not without reason, be suspected of being ordinary examples of puerperal mania. The only case which affords any real grounds for the charge alluded to, is the following:—

A female, 20 years of age, inhaled chloroform for the purpose of having a tooth extracted. She recovered apparently from its influence, and walked home, the distance of a quarter of a mile. Her conversation was incoherent, and her gait unsteady. Soon after she lost both sense and motion, the skin was cold and pale, the respiration jerking, and the pulse feeble; no rigidity of the muscles. She came out of this state and then became "furiously insane." There was constipation and deficient urine. This condition lasted from a week to ten days, and then her usual health was restored.[3]

Uses. *In Surgery.*—Little need be added to what has been said under the head of ether, respecting the inhalation of chloroform in surgery, except to qualify the statements there made, by suggesting the necessity of greater caution in using the latter agent. Its advantages consist in the rapidity and durability of its influence, and the comparative absence it insures of those symptoms of excitement which hinder the surgeon in the execution of his duties.

In operations upon *infants and young children*, M. Guersent,[4] whose vast experience carries with it an acknowledged value, regards the employment of chloroform as of incalculable importance. By its means the resistance of the patient, which under ordinary circumstances, offers so serious an obstacle, is completely overcome, and the operation is performed with singular rapidity and ease. This is strikingly the case in operations for stone. Dr. Keith[5] considers that anæsthesia greatly augments the feasibility and success of *lithotrity* in young persons, and indeed renders it easy, when without this aid it would be impossible. Dr. Snow states that he administered chloroform in 155 cases of this operation, and 91 of *lithotomy*.

In respect to its usefulness in *ophthalmic surgery*, opinions are divided. Jüngken[6] regards it as eminently serviceable in persons of an irritable temperament; when the eyes have become morbidly sensitive to light, so that the lids and muscles of the ball contract spas-

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[1] Charleston Med. Journ., xi. 60. [2] Psychological Journal, iii. 269.
[3] Dr. E. H. Clarke, Boston Med. and Surg. Journ., Feb. 1855, p. 84.
[4] Bullet. de Thérap., xxxvi. 50. [5] Month. Journ. of Med. Sci., ix. 662.
[6] Annuaire de Thérap., 1852, p. 69.

modically; when the patient, from having been born blind, or from other causes is unable to control the movements of the organ; in infants and children, generally, for operations that involve the eyeball, or for the mere extraction of foreign bodies from the surface of the conjunctiva; in all long and painful operations on the eye, such as the extirpation of tumors, &c. As in several operations, the ball must be firmly fixed, it is necessary to counteract the mobility of the organ, which the anæsthetic state increases, by steadying the ball with the same finger which depresses the lower lid.

It is maintained, on the contrary, by several ophthalmic surgeons, and by Mr. Wilde, of Dublin,[1] amongst others, that anæsthesia impedes operations upon the eye because the active co-operation of the patient is thereby prevented. In that for strabismus, for instance, it cannot be known whether the contracted muscle is divided or not; in extraction of cataract the patient cannot give the globe of the eye a proper inclination, &c. Besides, according to Mr. W., there is danger of convulsions which must prevent all operation, and the slight degree of pain usually required to be inflicted, renders anæsthesia unnecessary. These objections do not, as will be seen, destroy the force of Jüngken's recommendations, which are addressed to cases of daily occurrence, less than to such as on account of the age, or the susceptibility of the patient, are surrounded with difficulties which impede the due performance of an operation, if they do not entirely prevent it. It is believed, however, that the preference of ophthalmic surgeons for chloroform is decided. Mr. H. Walton has pointed out its advantages in detail, and represents them as very great. The straining of the eye which has sometimes occurred during the vomiting which is apt to follow anæsthesia, he obviates by means of an appropriate pad and bandage over the affected organ.[2] Dr. Snow refers to a large number of cases in which this agent was employed in operations for cataract, *strabismus, extirpation of the eyeball, the removal of foreign bodies, entropion and ectropion.*

It is unnecessary to pursue any further a description of the different operations which have been performed with the assistance of chloroform. Suffice it to say that there is none in which it has not been invoked, from the most serious, such as lithotomy, amputation of the thigh, extirpation of tumors, plastic operations, and the reduction of dislocations, down to the most trivial, such as the extraction of teeth and tenotomy. Its advantages, as stated by its advocates, are that by preventing pain it renders many operations easy, as in children, which

[1] Canstatt, op. cit., 1849, p. 189. [2] Times and Gaz., Jan. 1855, p. 79.

were otherwise impracticable, either on account of the severity of the pain or its duration, and it induces many persons to submit to necessary surgical treatment with cheerfulness and tranquillity who would, under ordinary circumstances, have refused the interference of the surgeon altogether, or been seriously injured by the pain itself or the apprehension of it. How far it influences the rate of mortality after capital operations is a question still undecided, or rather which has been decided differently by different investigators. While Dr. Simpson, Dr. Snow, and Mr. Fenwick,[1] allege an increased success of the operations performed since the introduction of anæsthetic agents, which, however, they do not attribute solely to their influence, Dr. Arnott assigns "chloroform as the cause of the great increase of mortality after the severer operations, from its having proved itself a virulent poison by the numerous sudden deaths that have followed its administration, from the great and lasting prostration that is so often produced by it, and particularly from the frequent observation that this prostration and other allied symptoms have continued until the death of the patient."[2] Dr. Arnott maintains further that "an increase of mortality after amputation and lithotomy has occurred since the introduction of chloroform, to the extent of *twelve* per cent. as regards the first of these operations, and *twenty-four* as regards the other."[3] It thus appears that gentlemen of equal probity and sagacity are at issue in regard to a question of fact. The one party affirms and the other denies with equal emphasis and conviction. The clinical records of other countries than England do not throw any light upon this question, for the mortality attributed to chloroform elsewhere is so slight that in the whole of Europe Dr. Snow could discover but twelve cases against thirty-eight in the British possessions and the United States of death from this agent.

It is to be observed that in the continental countries of Europe the mode of administering chloroform differs from that which prevails in England in this, that the state of anæsthesia is less profound and complete, and therefore unattended with the same phenomena of narcotism. Even if an equal or a larger amount of the vapor is administered, its action is less concentrated and intense, and we consequently find that French and German surgeons dwell more upon its consecutive than its immediate dangers. Thus it is that M. Chassaignac speaks of these effects occurring from sixteen to forty-eight hours after the operation, the injury to the vital forces by the chloroform being so profound that

[1] Times and Gaz., 1857, ii. 539, 592, 641.
[2] Ibid., May, 1857, p. 495.
[3] Ibid., Jan. 1859, p. 55.

the patient is unable to recover from it. In the Crimean campaign, we are informed by Medical Inspector Dr. Scrive, that in no single instance of thousands of cases was the administration of the anæsthetic the cause of the least accident of a serious nature, but he attributes this immunity to the fact that it was never allowed to produce complete muscular resolution.[1] M. Baudens, also, in his account of the campaign in the East, asserts that, although chloroform had been employed thirty thousand times in the French army there, no fatal accident had ever resulted from its use. But Dr. Rizet, of the Chasseurs, denies this, and cites two cases that occurred under his own observation,[2] and Deputy Inspector-General Mouat, of the British army in the Crimea, charges it with being a cause of death under the same circumstances precisely as those pointed out by M. Chassaignac. "A peculiar state of nausea and depression," he remarks, "follows its use, in which perfect reaction is never thoroughly established, the desire for food never returns, and the patient sinks, as it were, stealthily, and dies from exhaustion in from twelve to twenty-four hours."[3] With these evidences of the primary and consecutive evils which chloroform may induce as an anæsthetic in the practice of surgery, we are justified in repeating the suggestion that its continued employment involves very serious considerations of a professional as well as of a moral nature.

In Midwifery.—The first cases of midwifery in which chloroform was employed were reported by Dr. Simpson[4] and Dr. Protheroe Smith.[5] Immediately afterwards its use became general in Great Britain. Some of the older obstetricians, however, opposed the new agent, and continue at the present time unfavorable to its use. Indeed, it is believed that the profession generally are much less addicted to its employment than was the case a few years ago. We shall take a survey of the facts and opinions which are recorded in reference to the use of chloroform during pregnancy and labor, and after confinement.

Chloroform has been administered by inhalation to allay the *vomiting of pregnancy*, which, it is well known, sometimes reaches an alarming and even a fatal degree. M. Cazeaux was, we believe, the first to make this application of the remedy, and to announce its complete success in a very desperate case.[6] By the stomach, chloroform has proved successful under these circumstances, as it has in several others of obstinate vomiting produced by various causes. The full narcotic effect of the vapor has been known to produce miscarriage.

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[1] La Campagne d'Orient, pp. 465 and 468.
[2] Times and Gaz., May, 1859, p. 485.
[3] Times and Gaz., Aug. 1856, p. 225.
[4] Lancet, Nov. 20, 1847.
[5] Ibid., Nov. 27, 1847.
[6] Abeille Méd., x. 183.

Such a case is related by Dr. L. G. Robinson as occurring in a robust lady, pregnant with her third child. She inhaled the chloroform for the relief of a slight toothache, but fell into a semi-conscious and anæsthetic state, in which labor commenced.[1]

During labor, chloroform, when propitious in its operation, diminishes or prevents all of those evil consequences which depend directly upon the patient's suffering. Among these one of the most formidable is *convulsions*. In so far as they depend upon the severity or the prolongation of uterine efforts, they may be with great certainty averted. The same may be said of the *exhaustion* produced by pain. It also occasionally happens that the sensibility of the generative organs is morbidly acute, so much so that the slightest manual interference on the part of the accoucheur, the progress of the child, or any instrumental manœuvres cannot be borne, or they give rise to extreme agitation, anguish, and exhaustion. Chloroform at once removes every obstacle to the free action of the medical attendant, and spares the patient incalculable distress.

The influence of chloroform upon the *uterine contractions* is not always the same, although it generally depends upon the dose that has been administered. Yet we are assured by some that the ordinary average dose sometimes suspends uterine action altogether,[2] while the greater number of physicians find that, in this dose, the anæsthetic tends rather to render irregular contractions regular without at all diminishing their energy, while it produces a general calmness and composure in the highest degree propitious. It is very true that when chloroform is first administered, especially to a patient who is apprehensive of its effects, her pains may cease or become irregular, as they might do under any mental impression. This is a phenomenon made familiar by daily experience. It is, however, true that, apart from such mental influences, a diminished expulsive effort is occasionally met with as the direct effect of the action of the vapor. Dr. Robert Lee has taken advantage of the fact to charge against chloroform that "it very manifestly slackens the uterine contractions, and in some cases puts a stop to them altogether.[3] This effect is admitted by Dr. Rigby, who, however, pronounces it to be very rare,[4] and by Spiegelberg, who asserts that no one has seen such effects when the anæsthetic has been properly administered. The voluntary activity of the abdominal forces, he contends, may disappear, but the involuntary action remains unimpaired.[5] This also is the view taken by Dr.

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[1] Edinb. Med. Journ., iii. 268. [2] Danyau, Bull. de Thérap., xlvi. 534.
[3] Lancet, Dec. 1853, p. 609; Times and Gaz., Sept. 1854, p. 260.
[4] Times and Gaz., Sept. 1858, p. 306. [5] Ibid., March, 1859, p. 244.

Murphy.[1] He calls attention to the double motive power of the uterus, the reflex and the ganglionic. The former of these may be suspended by the anæsthetic influence, but the periodical and expulsive uterine efforts, it is said, will continue under the action of the ganglionic system of nerves.

The practical fact is, however, well settled that the precise action of the vapor cannot always be anticipated. As Dr. Snow has observed, in some cases the chloroform even when very moderately employed, diminishes both the strength and the duration of the uterine contractions, and prolongs the interval between them. In other cases, the inhalation causes the uterine action to become stronger and more regular, by removing the excess of sensibility by which it had been interfered with. In some cases, also, says Dr. S., "the chloroform seems to act as a direct stimulant to the uterine contractions, increasing their force and frequency—a circumstance at which we need not be surprised, when we remember that both opium and brandy in moderate quantity often act in the same manner."[2] These different effects of a cause apparently the same must, we presume, be attributed to the unequal sensibility of different patients to the operation of chloroform, and still more to their intolerance of pain, whether this depend upon constitutional peculiarities, and particularly upon a high nervous excitability, or upon casual physical conditions, such as rigidity of the os uteri or other soft parts of the mother, or upon an undue development, positive or relative, of the child's head.

The influence of chloroform on the *sequelæ of natural labor* deserves to be considered in estimating the value of anæsthesia in obstetrics. It cannot be denied that of all pains the throes of childbirth are those from which recovery most speedily takes place. Nothing is more common among robust women of the laboring classes, than for the strength to be but moderately impaired, even by a severe labor. This is met with habitually when the labor has been short, however severe it may have been, and frequently after a protracted and painful parturition. But in females more delicately organized, or whose luxurious habits of life have induced a morbid susceptibility of the nervous system, the restoration of strength and comfort is often extremely tedious and uncertain. Under such circumstances, the employment of an anæsthetic is frequently of signal service, for it palliates, even when it does not neutralize, the effects of pain, and protects the system from that "shock" which in surgery is justly accounted one of the most formidable elements of every severe operation.

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[1] Lancet, Feb. 1856, p. 129; Chloroform in Childbirth, p. 17.

[2] Chloroform and other Anæsthetics, p. 324.

Dr. Robert Lee ranks *hemorrhage* among the evil effects of chloroform in labor, and Mr. Steele makes a similar statement, but adduces only a single case in its support.[1] Dr. Duncan advises that in cases where it is apprehended after an application of the forceps, the operation should be preceded by the administration of ergot,[2] and Dr. Rigby, without, however, a direct reference to this accident, but rather with a view to obtain the aid of the abdominal muscles in the expulsion of the child, advises that the operation of the anæsthetic should be partially suspended while the fœtus is passing through the external parts of the mother.[3] On the whole, we cannot learn from any source that uterine hemorrhage is more likely to occur after the administration of chloroform than when it has not been employed.

In some *obstetrical operations*, such as replacing the prolapsed cord, and the application of the forceps at the lower strait, the aid of chloroform is usually unnecessary; but it is recommended by the best authorities when craniotomy has to be performed, when the forceps are to be applied at the superior strait, and especially in the operation of turning, if the contractions of the uterus are sufficiently strong to interfere with its due performance. The delivery of the placenta retained by an hourglass contraction, is singularly facilitated by this agent.

Some years ago, Dr. E. W. Murphy published certain conclusions which we here insert in a somewhat abridged form, as expressing substantially the present state of opinion on this subject.

"1st. That chloroform does not impair the contractile power of the uterus, neither does it interfere with the action of the uterus, unless it be given in very large doses, or that the patient be highly susceptible of its influence.

"2d. That the full anæsthetic power of chloroform may be produced without paralyzing the uterus. The moment the chloroform is withdrawn, the uterine contractions instantly return with increased force and efficiency.

"3d. In every case where the patient had previously suffered agonizing pains, and her labor was making an unfavorable progress, chloroform has produced a most salutary change in restoring the proper action of the uterus.

"4th. Those effects that indicate want of power in the uterus, viz., great protraction of labor, hemorrhage, retained placenta, &c., have not been proved to be the results of chloroform.

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[1] Liverpool Med.-Chir. Journ., No. III. p. 45. [2] Edinb. Med. Journ., ii. 803.
[3] Times and Gaz., Sept. 1858, p. 307.

"5th. That degree of the etherization which removes the intensity of pain without interfering with consciousness, does not interrupt the action of the uterus.

"6th. The safety of the child *is not* hazarded by the administration of chloroform."[1]

The third of these propositions may be still further extended. When pains are rendered inefficient by the prolonged suffering of the patient, or by any mental impression, such as fear, anxiety, or impatience, the inhalation of chloroform calms the nervous agitation, refreshes the strength, and restores the contractions of the womb to their normal rhythm, while it augments their energy.

It may now be remarked that there is not a single case on record of death, *during* parturition, from chloroform administered by a competent practitioner of medicine. Two cases are, however, published in which females died while inhaling chloroform administered in the absence of the physician, and without his knowledge or consent.[2] In both, death took place before delivery, and appears to have been sudden. In a third instance, the patient obtained possession of about two ounces of chloroform, which she inhaled by *herself*, in the course of twelve hours. There appears to have been uterine inertia. At the expiration of the period mentioned, there was "a cold sweat, cold extremities, oppressed and wheezing respiration, receding pulse, and vacant glare." *Consciousness was perfect.* External and internal stimulants were employed, but without improvement. At this period instrumental delivery was resorted to, "and in ten minutes the anxious mother was a corpse."[3] A very similar case to this is reported by Dr. Ramsbotham. Chloroform had been administered in the ordinary manner, the child was born, and the patient appeared comfortable. At the end of an hour and a half, however, *distressing dyspnœa* came on; this was followed by convulsions, and almost immediate death.[4] An instance of the same description is recorded by Dr. Murphy, who maintains that in it, as well as the one last referred to, chloroform was foreign to the fatal result.[5] Now, as dyspnœa was a prominent symptom in every instance, and one which does not characterize any accident of the puerperal state which could have existed in all of the three cases before us, we are constrained to see in them examples of one of the modes in which chloroform destroys life.

These illustrations would be sufficient to show that chloroform in

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[1] Month. Journ. of Med. Sci., ix. 1247.

[2] Times and Gaz., April, 1855, p. 361; ibid., Nov. 1858, p. 465.

[3] Am. Journ. of Med. Sci., April, 1854, p. 552.

[4] Obstetric Medicine and Surgery, p. 169.

[5] Op. cit., p. 62.

parturient cases is not, as some of its foremost advocates would have us believe, almost, if not entirely, free from danger; "a most dangerous fallacy," as Dr. McClintock, of Dublin, remarks, "and one that would invariably lead to disastrous consequences, if generally acted on." But besides these fatal cases there are others which convey a serious, if not so solemn a warning. A woman in the Dublin Lying-in Hospital was in her first labor; the os uteri was unyielding, and there was much general irritability. For an hour chloroform was administered in very small quantities, which produced neither anæsthesia nor sleep. About a drachm of it was then poured upon a cup-shaped sponge, which was reapplied to the patient's mouth. Hardly had she taken three or four inspirations when "a change came over her countenance; the eyeballs turned up, the pulse left the wrist, respiration was suspended, and some froth collected at the angles of the mouth." The sponge was instantly withdrawn, the circulation of fresh air promoted, the face and chest were aspersed with cold water, and ammonia was applied to the nostrils.[1] The woman recovered, but every one will agree with Dr. McClintock that "had she been in non-professional hands, her life would have been lost." It cannot, moreover, be doubted that other cases of the same nature, in public, and still more in private, practice, have occurred without having been announced through the press.

Not, however, to conceal any fact which may influence the decision of the question of anæsthesia in childbirth, it is proper to add one or two general statements in favor of its employment. Dr. Snow refers to but one case in which it destroyed life, the first of those above referred to, and to none at all of those in which life appeared to be in danger.[2] Dr. Williamson, of the Royal Infirmary, Aberdeen, writing in 1858, states that since the introduction of chloroform he had been on the look-out for a record of a fatal case resulting from its administration in midwifery, and that hitherto his search had been a fruitless one.[3] Still more recently we find Dr. Spiegelberg declaring to the Berlin Medical Society that as yet no case of death had occurred from its obstetrical employment, and the correctness of his statement was not impugned.[4]

If, as there is reason to believe, we are not acquainted with all of the cases in which the life of parturient females has been sacrificed to chloroform, nor of those in which this agent has placed such persons in imminent danger of death, it is still more probable that its minor

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[1] Dublin Quart. Journ., Aug. 1855, p. 192.

[2] Op. cit., p. 328.

[3] Times and Gazette, Oct. 1858, p. 379.

[4] Ibid., Mar. 1859, p. 244.

mischiefs may have been unrecognized, even where they have not been purposely concealed. If there is some exaggeration, there is also much truth, in the statements of Dr. Robert Lee, who enumerates as the evils produced by chloroform in midwifery, "exhaustion, hemorrhage, fever and inflammation, and cerebral disturbance." Seventeen cases are published by him in some detail. In the first and second of them, he remarks, "the contractions of the uterus were arrested by the chloroform, and delivery was completed by craniotomy. Insanity and great disturbance of the functions of the brain followed its use in seven cases; it became necessary to deliver with the forceps in five cases; dangerous or fatal peritonitis or phlebitis ensued after the exhibition of chloroform in four cases. Epilepsy followed in one, and dangerous fits of syncope in another case." In his comment upon this distressing statement, Dr. Lee remarks: "Much reflection on the physiological effects and observation of the pathological mischief of chloroform leave no doubt on my mind that it ought to be altogether expelled from the practice of midwifery. There are no circumstances in which it can be with utility, none in which it can be with safety, employed."[1] With the data before him which are contained in this article, the reader will be enabled to judge for himself how far, if at all, the denunciations of Dr. Lee are founded upon the results of experience, the sole permanent and reliable basis of opinion in such a case as the present.

In Various Diseases.—A case of *continued fever* is related[2] in which, when the patient seemed exhausted by delirium and loss of sleep, the inhalation of chloroform was resorted to, and produced tranquillity and refreshing slumber, from which the disease took a favorable turn, and ended in recovery.

Several cases of *tertian intermittent* are reported by M. Délioux, in which a recurrence of the paroxysms was evidently prevented by chloroform, given internally by the mouth a short time before the period of their expected return.[3] Dr. Dalton, of Ohio, states that he has used it successfully to prevent the development of congestive intermittent fever, by administering one or two drachms in a little camphor-water, with half a grain of sulphate of morphia. In "quite a number of cases" of simple intermittent he found that it promptly arrested the disease.[4]

Wucherer has even recommended the inhalation of chloroform in *pneumonia*. According to him, it relieves the stitch in the side sooner

[1] Times and Gazette, Sept. 1854, p. 257. [2] Lancet, 1848, p. 119.
[3] Archives Gén., 4ème sér., xxiii. 51. [4] Phila. Med. Exam., Apr. 1856, p. 252.

than any other means, particularly if, in robust persons, and when the disease is extensive, venesection has been premised. The cough and oppression are immediately palliated. The inhalation should be employed three or four times a day, and eight or ten drops consumed on each occasion. The same physician has used chloroform with advantage in *whooping-cough* and in several forms of *bronchitis*.[1] Clemens[2] not only confirms the preceding statements, but also extends them. He is of opinion that chloroform both palliates the cough and excitement, and directly favors the resolution of the extravasated fibrin, and prevents the deposit of more; so that it appears to stand in the stead of ordinary antiphlogistic remedies for the disease. Under its use the sputa retain their viscid and tenacious character throughout the attack. The pulse also loses in a remarkable degree its frequency and hardness. To produce such results, repeated inhalations are necessary—as often as from two to twelve times in twenty-four hours—and each time a drachm of chloroform is consumed in the course of fifteen or twenty minutes. In 1852 it was stated by Dr. Simpson that upwards of two hundred cases of pneumonia had been treated by Baumgärtner, Helbing, Schmidt, Varrentrapp, and others, with chloroform, and that the aggregate mortality was only 4¼ per cent.[3] More recently Hutawa has also written favorably of its use in this disease.[4] It does not appear that in the class of diseases now under notice any great extension has been given to the practice recommended by the writers just quoted, nor is it likely to be generally adopted in pneumonia, at least if its administration demand such incessant attention as Dr. Clemens prescribes. Yet there can be no doubt that in various pulmonary affections it might serve as a valuable palliative, without being open to the objections which attach to the free exhibition of opiate medicines. It was mentioned above that chloroform had been used in *whooping-cough*. Originally proposed by Dr. Simpson, it has since been employed by other physicians in cases of the disease affecting persons old enough to anticipate the paroxysm, or rather to cut short its development, by inhalations of this vapor. Dr. Churchill has reported several examples of its prompt and decided curative power.[5] A favorable report of its effects has also been published by Dr. Pape.[6]

Diseases of the Nervous System. It has already been mentioned that chloroform was first used medicinally in 1832 by Drs. Ives, of New Haven, to palliate affections of a spasmodic type. They found that it

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[1] Canstatt's Jahrb., 1849, p. 190. [2] Ibid., 1851, p. 99.
[3] Month. Journal, Jan. 1852, p. 43. [4] Times and Gaz., May, 1855, p. 499.
[5] Month. Journ. of Med. Sci., Aug. 1853, p. 180.
[6] Bull. de Thérap., l. 231.

afforded very decided relief in *asthma*. Sometimes they employed it by inhalation, and its effects, according to them, were pleasant, as well as palliative of the cough, and heat of skin, if any existed. More recent experience has shown chloroform to be one of the most certain and prompt among the remedies for *spasmodic asthma*. It usually procures sleep for the patient, and at the same time puts an end to the attack.[1] Care must be taken, however, not to confound this affection with the paroxysmal dyspnœa which often attends emphysema of the lungs, for in the latter case a bronchitic inflammation or congestion is present, which the vapor of chloroform might seriously aggravate.

One of the most decidedly useful agencies of chloroform is its control over the spasms of *tetanus*, in which it far excels all the narcotics that have been used. Under its influence the muscles relax, the patient regains the control of his limbs, and generally falls into a sound and refreshing sleep, from which he awakes with the symptoms very much modified, if not entirely removed. The numerous cases of success which have attested its efficacy, both when used alone from the commencement, and when given at an advanced period of the attack, after the failure of other means, seem to entitle it to the first rank among the means of combating this dangerous malady.[2] This disease was first treated with chloroform in 1848, by Prof. Forget, of Strasbourg. The case was one of the idiopathic form, and recovered.[3] In the same form it was afterwards used successfully by Baudon,[4] Hergott,[5] and, in a case of trismus, by Harding.[6] Cures of the severest cases of the traumatic form of this disease have been accomplished by Bargigly,[7] Gorré,[8] Fessenmeyer,[9] Dusche,[10] Busquet,[11] Molnar,[12] and Paulus.[13] Putégnat has published four cases in which chloroform was unavailing. Three of them were of the traumatic, and one of the idiopathic form, but the vapor was not resorted to until very late in the attack.[14] A case under the care of Grisolle was cured by opium, after chloroform had induced alarming insensibility;[15] and two instances of a fatal issue are recorded by Dr. Snow, in spite of the administration of chloroform.

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[1] R. B. Todd, Lond. Med. Gaz., 1850, p. 1003.

[2] Lancet, June, 1848; Trans. Am. Med. Assoc., 1849, '50, '51; Am. Journ. of Med. Sci., Jan. 1853.

[3] Bull. de Thérap., xxxv. 289.

[4] Ibid., xli. 120.

[5] Ibid., xxxvi. 173.

[6] Lancet, Dec. 1853, p. 546.

[7] Bull. de Thérap., xliv. 43.

[8] Ibid., p. 172.

[9] Ibid., xlix. 236.

[10] Times and Gaz., Jan. 1855, p. 15.

[11] Bull. de Thérap., li. 90.

[12] Boston Med. and Surg. Journ., May, 1858, p. 318.

[13] Abeille Méd., xv. 193.

[14] Bull. de Thérap., xliv. 188.

[15] Ibid., liii. 46.

But the one was a case of severe burn, and the other of sloughing of the integuments.[1] This analysis, therefore, fully sustains the opinion above expressed of the value of chloroform in tetanus.

In *chorea*, the inhalation of chloroform serves as an auxiliary, at least, to other treatment. Its advantages, indeed, are marked, for in numerous cases in which other remedies were conjoined, the improvement began or became more rapid from the time when the chloroform was administered. It should be employed daily, and the patient kept under its influence for half an hour or more at a time. Evidences of its value have been published in England by Marsh, and in France by Fuster, Géry,[2] Bouvier,[3] and Bouchard.[4]

As might have been surmised, the trials made of chloroform inhalations in *insanity* do not lead to the conviction that they exert a curative power over the idiopathic form of this disease. As a palliative of excitement chloroform may nevertheless be advantageously employed in maniacal cases, and in the active forms of melancholia with a suicidal tendency. In some cases of hypochondriasis connected with gastric derangement its administration by the stomach is stated by Dr. Osborne to have done good.[5] In *puerperal mania* it has been productive of more decided and permanent benefits, and occasionally of cure.

Delirium Tremens. The more active forms of this malady, those in which excitement and violence predominate, are said to offer the clearest indications for the use of chloroform. But it is also asserted to be useful in subduing delirious excitement, whether proceeding either from the primary or the secondary operation of alcohol. On examining the reports which have been published of cases in which this remedy was used, it becomes evident that large doses of opium or morphia were also administered;[6] and although in some instances, when these remedies proved inoperative, chloroform inhalations appear to have produced sleep, which issued in recovery, yet it is no less evident that it also occasioned such a degree of narcotism or of syncope as appeared frequently to threaten, if it sometimes did not actually destroy, life. The action of the vapor of chloroform, when freely given, resembles too closely that of opium in excess, to render it desirable in the treatment of a disease which it is now well proven to be more certainly and safely cured by alcoholic stimulants.

Chloroform is probably more serviceable in this affection when it is

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[1] Op. cit., p. 335.
[2] Bull. de Thérap., xlviii. 193.
[3] Ibid., p. 321.
[4] Ibid., xlix. 29.
[5] Dublin Quart. Journ., Nov. 1853, p. 463.
[6] Am. Journ. of Med. Sci., Oct. 1856, p. 368; Ibid., April, 1857, p. 317; Lancet, Oct. 1858, p. 449.

administered by the stomach. It was originally employed by Dr. S. H. Pratt, of Baltimore, who gave it in drachm doses; first, in a case marked by exhaustion, debility, subsultus, and incoherence; and subsequently associated with Hoffmann's anodyne and tincture of valerian, in one of maniacal violence. In both it procured sleep, which ushered in convalescence.[1] Afterwards it was successfully used by Mr. Butcher,[2] and Drs. Neligan and Corrigan, of Dublin,[3] in every instance quieting excitement and disposing to sleep. Several instances also are recorded in which its administration by the stomach produced the happiest effects, but in these the active or sthenic stage of the disease had passed by, and a general stimulant was called for by the presence of asthenic and ataxic phenomena.

If an opinion may be based on the result of a single case of *angina pectoris*, chloroform seems destined to furnish a far more valuable palliative for this distressing malady than any which has hitherto been tried. The case alluded to is recorded at length by M. Carrière,[4] and presented an aggravated example of the disease. All of the most usual remedies were employed fruitlessly. The inhalation of ether and subsequently of chloroform at once mitigated the paroxysms, then caused their total cessation, and was the means of restoring to health the patient who was rapidly sinking under anxiety and pain.

Neuralgia, which may always be palliated by this remedy, is sometimes permanently cured by its use.[5] The latter result is, however, a very unusual one. There is no pain so intense as that of neuralgia in its highest degree, and hence it requires for its relief the full anæsthetic power of chloroform. A case of death from this treatment is recorded by Dr. Snow. Externally, chloroform is a valuable palliative of neuralgic and *rheumatic* pains, especially in the muscular form of the latter disease.

One of the most valuable applications of anæsthesia is to *diseases of the eye*. Sulphuric ether, it has been seen, was originally applied in this manner, and now the inhalation of chloroform is constantly used to relieve the spasmodic action of the muscles of the eye, and especially of the orbicularis, which prevents a due inspection of the organ, and the proper application to it of remedial agents. Repeated use of anæsthesia has also been found permanently to modify the sensibility of the eye in strumous ophthalmia and other affections attended with *photophobia*.[6]

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[1] Am. Journ. of Med. Sci., Jan. 1852, p. 142.

[2] Dublin Quart. Journ., Aug. 1852, p. 227. [3] Dublin Hosp. Gaz., Nov. 1854.

[4] Bull. de Thérap., xliii. 145. [5] Barrier, Bull. de Thérap., xxxv. 540.

[6] Mackenzie, Med.-Chir. Trans., xl. 175; Thorp, Dublin Quart. Journ., Aug. 1857, p. 106.

Chloroform is nowhere more valuable than when administered for the relief of *puerperal convulsions*. The earliest mention of its successful use that we are acquainted with, was by Mr. Fearn,[1] Dr. Gros,[2] and Dr. R. B. Todd, who, however, states that he refers to cases occurring in the practice of others.[3] In this country, illustrations of its efficacy have been published by Drs. Van Buren,[4] Knight, Cotting, Casey,[5] and others. In his excellent essay on "Uræmic Convulsions," Dr. Braun writes as follows: "The chief object to be attained is to diminish as much as possible the reflex excitability, to weaken the paroxysms, in order to diminish the dangers, and to gain time for entering upon a rational treatment. In this respect, we have observed results from chloroform narcotism which have surpassed all expectations. In uræmic eclampsia, the chloroform narcotism is to be induced instantly when indications of an impending paroxysm show themselves—as great restlessness, increasing rigidity of the muscles of the arms, expiry of the interval between former paroxysms, fixity of expression, or tossing hither and thither. The narcotism is to be kept up until the premonitory symptoms of the paroxysm disappear and quiet sleep follows; a result generally attained in one minute. But if it be not possible to cut short the paroxysm, then the chloroform inhalation is not to be kept up during the convulsive attacks and the comatose condition, in order to let an abundant supply of fresh atmospheric air reach the lungs. The chloroform inhalation moderates the imminently dangerous cramps of the muscles of the neck, epiglottis, and tongue, and may be continued even during a persistent trismus, when no medicines can be introduced into the stomach, and when loud mucous râles indicate the development of œdema of the lungs. In sixteen cases of eclampsia occurring in succession, which I treated with chloroform and acids [benzoic, citric, or tartaric], complete recovery always took place."[6] In the opinion of Dr. Channing, of Boston, since chloroform came into use eclampsia is as manageable a disease as any of the puerperal state, provided it be treated by inhalations of that agent alone, or combined with ether. Dr. Storer, also, expresses a high estimate of its efficacy,[7] Macario found the attacks arrested by it in two cases,[8] and accounts of its success in Australia have been

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[1] Lond. Med. Gaz., Feb. 1848, p. 235. [2] Bull. de Thérap., Jan. 1849, p. 27.

[3] Lond. Med. Gaz., May, 1849, p. 845. Several other cases, occurring in 1849 and 1850, are mentioned in the Lond. Journ. of Med., ii. 988.

[4] Am. Journ. of Med. Sci., July, 1853, p. 283.

[5] Boston Med. and Surg. Journ., April and June, 1857, pp. 33, 61, 177.

[6] Edinburgh Med. Journ., ii. 1123.

[7] Boston Med. and Surg. Journ., March, 1857, p. 122.

[8] Annuaire de Thérap., 1855, p. 49.

published by Dr. Tracy.[1] In fact, in almost every part of the civilized world a nearly unanimous verdict has been pronounced in its favor.

This remedy has proved itself scarcely less efficient in the treatment of *infantile convulsions*, which, as it is well known, are generally excited by the irritation of undigested food, of the growing teeth, &c. The first, and one of the most interesting of the published cases of this nature occurred in the practice of Dr. Simpson. The patient was but ten days old when the convulsions began, and they continued to increase in severity in spite of various opiate and antispasmodic medicines, and external stimulants, until eighteen days had elapsed, when the strength failing, and laryngismus and dyspnœa occurring towards the end of each fit, chloroform was administered by inhalation. Immediately there was a suspension of the fits, which, however, returned when the anæsthetic was withdrawn. This was reapplied and administered so as to keep the patient asleep for thirty-six hours, with the exception of short intervals necessary for its nursing. No other convulsions occurred, and complete recovery took place.[2] A case almost identical with this is reported by Mr. Williams, of Manchester. The patient was ten days old, and was sixty hours under the influence of chloroform, during which time sixteen ounces of the liquid were consumed.[3] In convulsions from *dentition* the remedy has proved equally efficient, and that not only by inhalation as shown by the cases of Collins,[4] Marotte,[5] who used it by the stomach as well as in vapor, and Bowe,[6] who gave it in the former manner only, in the case of a child seventeen months old, who had been subject to convulsive attacks since the age of five months. Dr. G. H. Fox reports a case of convulsions in a child of five years completely and promptly arrested by inhalations of chloroform.[7] Administered in both manners chloroform has been found successful as an antidote to the poisonous effects of *strychnia*.[8] Like ether, it has sometimes been used with advantage to detect *simulated diseases*, in cases of *hysterical rigidity* and *contraction of the joints*. The agonizing pains of *colica pictonum* are generally relieved very promptly by chloroform taken in the form either of liquid or vapor;[9] the same may be said of *biliary and nephritic colic*, *dysmenorrhœa*, *spasmodic stricture*, and indeed of all painful dis-

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[1] Braithwaite's Retrospect (Am. ed.), xxxviii. 227.

[2] Edinb. Month. Journ., Jan. 1852, p. 40.

[3] Lancet, June, 1853, p. 535.

[4] Times and Gaz., April, 1853, p. 380.

[5] Bull. de Thérap., xlviii. 337.

[6] Times and Gaz., Sept. 1853, p. 323.

[7] Boston Med. and Surg. Journ., Feb. 1858, p. 456.

[8] Am. Journ. of Med. Sci., April, 1850, p. 546; Times and Gaz., April, 1854, p. 316.

[9] Aran, Bull. de Thérap., xlii. 296; liv. 74.

orders whatever, but particularly of those in which pain constitutes the most urgent symptom. It is unnecessary to enter into any details regarding these, since the instances under the head of *Ether* might all be repeated here.

Topical Application.—Chloroform, when applied to the integuments, exerts the double action of a counter-irritant and an anodyne; hence there is hardly any painful affection unconnected with inflammation that it is not adapted to remove or mitigate by its topical action. *Neuralgia*, *muscular rheumatism*, the pain of *exostoses*, nervous *headache*, and even *articular rheumatism*, are signally benefited by its use.[1] In the last-named affection the vesicant action of the liquid is an obstacle to its frequent application, and has led to the employment by some physicians of "chloruretted hydrochloric ether,"[2] which, without irritating the skin, destroys its sensibility in a few minutes, and affects, it is stated, even the subcutaneous parts.

Mr. Higginson reports having used chloroform with success as a local application to the *perineum* during its painful distension by the child's head in parturition, and to the sacrum with the effect of lessening the severity of the pains. He also applied this agent to the os uteri of a patient suffering from very severe *dysmenorrhœa* by means of a sponge placed in a curved glass speculum, which was introduced into the vagina. The pain almost immediately abated. Dr. Watson reports similar good effects in *swelled testicle* and spinal neuralgia, and also in preparing parts to which the actual or *potential cautery*, or the *moxa*, is to be applied, or in which an incision is to be made for opening an abscess.[3]

Applied upon cotton to painful cavities in *teeth*, it almost immediately relieves the pain, and when rubbed upon the gum around a tooth, it materially lessens the suffering caused by the operation of extraction. To be most effectually employed in *neuralgia*, a few drops of chloroform should be poured upon a small disk of woollen cloth and applied over the superficial portions of the affected nerve, evaporation being prevented by covering the cloth with a piece of money. In this case the counter-irritant and anæsthetic properties of the liquid unite to afford relief. In mild neuralgic and non-inflammatory rheumatism, colic, tonsillitis, and spasmodic croup, pleurodynia, and lumbago,[4] a mixture of chloroform and olive oil, to which camphor or

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[1] Laroque, Bull. de Thérap., xxxvi. 210.

[2] Aran, Arch. Gén. de Méd., 4ème sér., xxv. 245.

[3] Am. Journ. of Med. Sci., April, 1849, p. 528.

[4] Martin Solon, Bull. de Thérap., xl. 199; Moreau, Am. Journ. of Med. Sci., Jan. 1840, p. 187.

ammonia may be added, forms a very efficacious liniment that may be employed for its gentle revulsive and anodyne effects. It may be used by friction or applied upon flannel or cotton wadding over the affected part. To children and delicate females this method is particularly adapted.

An ingenious and useful application of chloroform is that proposed by Dr. Hardy, of Dublin, who contrived an apparatus by means of which the vapor of this liquid can be thrown from a tube and directed upon the affected part. It was originally designed for relieving pain in diseases of the neck of the *uterus*,[1] but was subsequently applied to the treatment of various local pains, in *hæmorrhoids*, *irritable bladder*, *irritable wounds*, *anthrax*, *gout*, *rheumatism*,[2] and *neuralgia*.[3] It has also been found efficient in relieving the *buzzing in the ears* which, in some cases of deafness, forms a very constant and distressing annoyance. As mentioned elsewhere, the vapor of sulphuric ether has been used for this purpose, and Marc d'Espine injected liquid ether into the middle ear.[4] In 1854, Mr. Weatherford entirely relieved a case of the sort by the use of chloroform vapor[5] applied to the auditory canal, and subsequently Dr. Bonnafont made use of a very simple but ingenious pump for throwing the vapor into the Eustachian tube.[6] It is important to be remarked that in all of these cases of the local application of chloroform vapor its beneficial effects were not limited to its primary impression. In every case after this had subsided the pain returned in a mitigated degree, and generally by repeated applications of the anæsthetic was entirely removed.

ADMINISTRATION.—The importance of using only the purest chloroform is insisted upon by all writers on the use of this liquid for anæsthetic purposes. It should have a sp. gr. of 1.480. When pure, it does not, according to Mialhe, vesicate but only redden the skin or mucous membranes, but the addition to it of a little anhydrous alcohol renders it actively caustic. Hence the necessity of employing the purest only for inhalation. To ascertain its quality, a few drops of the suspected liquid should be allowed to fall into a test-glass half full of water, which retains its transparency if the chloroform is pure, but becomes slightly opalescent if it contains alcohol.[7]

None but the most thoroughly washed chloroform should be used for inhalation. The difference between the effects of the pure and the impure vapor is very striking, as may be judged of from the following

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[1] Dublin Quart. Journ., Nov. 1853, p. 306.
[2] RANKING'S Abstract, Am. ed., xxi. 120.
[3] Lancet, Dec. 1855, p. 201.
[4] Archives Gén., 4ème sér., xxviii. 422.
[5] Times and Gaz., June, 1854, p. 618.
[6] Bull. de Thérap., xlviii. 185.
[7] Abeille Méd., v. 16.

statement of Prof. Miller:[1] "When impure, irritation seems to be produced in the air-passages; the patient coughs and is unwilling to inspire the vapor; when becoming stupid, muscular excitement is apt to be troublesome, and a tendency to talk may be very marked; after recovery there is sickness, probably vomiting, and the nausea is likely to prove of prolonged duration. Pure chloroform, on the contrary, does not irritate the air-passages, and is much less likely to cause vomiting; the patient breathes it readily, sometimes greedily, enjoying its fragrance and sweetness very much; muscular excitement does not always occur, and, when it does, proves both manageable and transient; the patient seldom speaks or attempts to do so before the stupor; this arrives speedily and is of a less apoplectic look; emergence is calm; and all disagreeable consequences are of rare occurrence."

There is much difference of opinion in regard to the proper mode of exhibiting chloroform, some insisting upon the necessity of a well-contrived inhaler for the purpose, while the greater number prefer the simple method of using a handkerchief, sponge, or some analogous body upon which the requisite quantity of the liquid has been poured. The former method is advocated chiefly by Dr. Snow, whose experience and skill entitle his opinion upon this subject to peculiar weight. Dr. S. indeed shows that in nearly all fatal cases of chloroform inhalation (37 out of 50) no instrument for the purpose was employed, and this fact would be decisive of the justness of his views were it not that an incomparably greater number of persons are subjected to the influence of chloroform without the inhaler than with it. The former category might therefore very well contain a greater number of fatal cases than the latter without the excess being chargeable to the mode of inhalation. Increasing familiarity, also, with the effects of chloroform and the habit of administering it appear to have augmented the preponderance of opinion in favor of the simpler method, which seems to be equally efficient with the other, quite as safe when skilfully applied, and free from the objection that exists to the use of any apparatus whatever that can be prudently dispensed with.

At a meeting of the French Academy of Medicine, held in July, 1857, this question was discussed, and, with a single exception, all the surgeons present condemned the use of mechanical contrivances for the administration of chloroform vapor.[2]

In relation to the substance from which chloroform should be inhaled, general opinion appears to have settled down in favor of the

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[1] Surgical Experience of Chloroform, p. 15.

[2] Bull. de l'Acad., xxii. 1088.

simplest and most convenient, a handkerchief, sponge, or piece of cotton so shaped as to present a concavity capable of extending beyond the mouth and nostrils of the patient. A funnel-shaped sponge, sufficiently porous to permit the air to pass freely through it, is one of the most convenient respirators that can be used. The sponge should be occasionally washed in alcohol and then in water to free it from the impurities that are apt to accumulate in its meshes.

The quantity of chloroform employed will depend upon the degree of anæsthesia sought to be induced, and the length of time it must be maintained. In severe surgical operations from one to four fluidrachms may be poured upon the inhaler at once, but for less serious occasions, and for ordinary cases of midwifery, in which it is sufficient to produce insensibility to pain without unconsciousness, a less quantity than that mentioned will suffice, after the primary inhalation. It is a great error to suppose that in natural labor, and for the performance of minor operations, it is always necessary to put the patients to sleep. As Dr. Rigby has remarked, "a patient may be kept quite sufficiently under the influence of chloroform, for any length of time, and yet be able to hear and answer questions, and thus we frequently hear a patient remark, 'I know I have a pain, and yet I do not feel it.'" Yet it is probable that such cases are not the most numerous. Towards the close of labor, when the pains are most severe, they can very seldom be neutralized without a state of unconsciousness being induced. The administration of the vapor can be commenced at any stage of labor, but except in cases of shorter duration than the average, it is not desirable to use it before the os uteri is fully dilated, and the expulsive pains have commenced. In those cases, however, in which the "grinding pains" which attend the first stage of labor are very severe, chloroform may be employed to palliate them. The application of the chloroform may be renewed as often as the natural state of the patient is about to return. According to Dr. Simpson, about an ounce of chloroform will in this manner be consumed in the course of an hour. The quantity administered during any one pain should never exceed a very few minims, but in the course of a protracted labor, from four to six ounces may sometimes be required; and in one case attended by Dr. Snow, seventeen fluidounces of chloroform were used with the inhaler, which would produce as much effect as three or four pounds inhaled from a handkerchief.

It may be useful here to recall the several degrees or stages of anæsthesia distinguished by Dr. Snow and others, through which a patient passes while under the influence of chloroform. In the *first* stage a partial loss of sensibility exists, but the consciousness remains unim-

paired. In the *second* stage there is more or less wandering of the mind, with increasing insensibility. In the *third* there is unconsciousness, with perhaps some muscular contraction, and complete anæsthesia to all but the severest irritants. In the *fourth* there is entire muscular relaxation and some stertor. The severest operations are often performed during the last stage, but not with sufficient safety; for it is separated by a very narrow line from the *fifth* stage in which the respiration becomes impeded, and death is imminent. The proper degree of narcotism for the severer operations is the *third*, or at furthest the commencement of the fourth stage here described. It must be borne in mind that these stages are not separated by defined limits, and therefore when the stage of excitement is passed, and the patient remains quiet, and particularly when the margin of the eyelid can be touched without its causing winking, or but slightly if at all, any operation can be performed without exciting pain. As the effects of the vapor, unless very much diluted, continue to increase for about twenty seconds after the inhalation of it is discontinued, it is advisable when the patient is nearly insensible now and then to intermit its application for two or three inspirations.

But a good deal of tact is necessary in many cases to cause the patient to inhale the vapor regularly and efficiently. He naturally feels some apprehension which still further embarrasses his movements. Everything around him should be calm and free from hurry or confusion. He should lie upon his back, if possible, with the head slightly raised, so that the vapor may by its gravity flow towards his mouth and nose, and the sponge or inhaler should not at first be brought too closely to his face, lest it cause by its sudden impression suffocation or alarm. But as soon as the inhalation proceeds tranquilly and regularly, the holder should be more closely applied, and as much of the vapor as possible administered in the shortest time, so as to prevent or render only momentary the stage of excitement. If spasms, difficulty of breathing, or congestion of the face, occur, the process must be suspended until the respiration grows regular once more. If there is excitement, startings, or exclamations, and *provided that the pulse and the respiration remain natural*,[1] the quantity administered may be increased, after which the signs of relaxation generally manifest themselves, and the operation may be commenced. The condition of the pulse, and especially of the breathing, is to be most carefully watched, for if they become feeble and irregular danger is imminent; while, on the contrary, they maintain a normal rhythm the safety of the patient

[1] Sédillot, Bull. de Thérap., xli. 312; and Warren, op. cit., p. 48.

is assured. The most reliable test of the presence of the degree of anæsthesia suited to the performance of painful operations, is the excitability of the eyelids. As long as they contract on being touched, the proper degree of insensibility has not been attained. This sign loses something of its value in hysterical persons in whom there is sometimes no winking on touching the eyelids, even when unconsciousness is scarcely induced.

A condition important to be noted is one approaching asphyxia, and produced by the chloroform having been inhaled more rapidly than it could be absorbed. The face grows livid, and the breathing is wholly suspended, or is abdominal only. The pulse is generally unaffected, and if care be taken to suspend the administration of the vapor, respiration resumes its natural rhythm.

Minor operations in surgery, and most of those called for in obstetrical practice, require no higher degree of anæsthesia than the second. Ordinary labor may generally be rendered almost painless even by the first degree described. Dr. Simpson, however, recommends that at first a large dose of chloroform should be administered so as to bring the female at once completely under its influence, and to prevent excitement. If the uterine contractions are temporarily suspended by this method they soon return again. After the first full dose, a few inhalations before or with each returning uterine contraction are generally sufficient. The state of anæsthesia should be made deeper as the child's head is passing the vulva.

The quantity of chloroform consumed in any one case may vary considerably, and if duly administered, may be very great without causing mischief. Stanelli states[1] that in an operation on a very delicate female, she was kept under the influence of the vapor for nearly an hour and a half, during which time about two ounces of chloroform were consumed, and yet the patient experienced no bad symptoms either during the operation or afterwards. The same author refers also to cases in which patients were kept insensible for more than two hours without any bad consequences, and quotes one from Christison, of a female who during labor consumed no less than eight ounces of chloroform, and was under its influence for thirteen hours. A still larger quantity was administered by Dr. Snow in a case referred to above.

ANTIDOTES.—There is no antidote, properly so called, to the poisonous effects of chloroform. When, therefore, the symptoms that betoken its dangerous effects present themselves, reliance must be had almost

[1] Op. cit., p. 30.

exclusively upon measures which are in their nature adapted to restore the two declining or suspended functions, respiration and circulation. This may sometimes be accomplished by dashing a small quantity of cold water upon the face and chest, at intervals compressing the thorax so as to imitate the respiratory act, especially in the manner recommended by Dr. Marshall Hall, and known as "prone and postural respiration," and also by endeavoring directly to inflate the lungs.[1] It has been suggested to employ oxygen for this purpose, but the suggestion is of no practical value. It is much better to force air into the lungs through the nostrils by means of a bellows, while the opposite nostril and the mouth are kept closed, and the larynx is pressed backward so as to obstruct the œsophagus. But artificial respiration is still better performed by the operator applying his own mouth over the patient's, while the precautions just pointed out are also observed. In this manner M. Ricord[2] saved several patients in whom life had become so nearly extinct that the pulse and respiration were both suspended. Dr. Snow correctly states that all the patients who are related to have been restored from a state of suspended animation, produced by an overdose of chloroform, have been resuscitated by artificial respiration, and it was only by this means that he succeeded in recovering animals poisoned by the vapor of this liquid. But it is to be borne in mind that nearly all of the cases which afforded time for the successful application of this remedy, were cases of asphyxia, or of poisoning beginning at the lungs. When the primary action of chloroform manifests itself upon the heart, death is sudden or very rapid, and no time is afforded for the use of stimuli, internal and external, upon which, in the other cases of syncope, our chief dependence must be placed.

In addition to these means there have been recommended electro-galvanism, with which shocks should be transmitted through the chest, friction and warm stimulating applications to the extremities, caustic ammonia, or, what is better, boiling water applied to the skin in a tumbler covered with a towel, and inverted upon the breast of the patient. These expedients have all succeeded in preventing death when it appeared to be inevitable. Of a portion, and even of the most efficient of them, it has been very judiciously remarked by Mr. Nunneley, that some will be disposed to regard them as very paltry and meagre, and not of a very energetic or hopeful character. But it is far better to employ such as may do little good, than to have recourse to those

[1] Bull. de Thérap., xlv. 129.

[2] Bull. de Thérap., xxxvii. 394.

which may do a great deal of harm, and to know how far our knowledge and power really extend, than to cloak ourselves in ignorant and meddlesome officiousness, lest our incapacity should be revealed.

Strong Chloric Ether.

This compound was introduced into the anæsthetic practice of Boston by Dr. Warren. It differs from the chloric ether of commerce, which Dr. W. alleges to be without any marked narcotic effects, and is made by taking "the first run when distilling chloroform, and redistilling from water containing an excess of lime."[1] It contains one-third of pure chloroform, and the remainder is nearly absolute alcohol. This last ingredient renders it extremely irritating to the skin.

The advantages of the compound over chloroform are thought to be that it is less dangerous to life, and the uniform absence of fatal consequences from its use, is certainly a recommendation not to be overlooked. But it can only acquire its superior safety by its dilution with alcohol. If the latter ingredient contribute any positive value to the compound, it must be by the addition of its exciting qualities. But these are certainly not such as to recommend it for anæsthetic purposes. Even supposing the influence of the alcohol to be purely negative, it must, in that case, operate as a diluent of the chloroform. But if a diluent for chloroform be sought, evidently none better can be found than atmospheric air. In other words, it would seem that all of the advantages claimed for strong chloric ether may be as readily and much more safely obtained by a proper dilution of chloroform with atmospheric air during its administration. The safety which, it must be acknowledged, has attended the use of strong chloric ether in the hands of its proposer and his colleagues, is no greater than can be claimed for sulphuric ether in places where skill, experience, and a due sense of responsibility have guided its administration.

SPIRITUS ÆTHERIS NITRICI.—Spirit of Nitric Ether; Sweet Spirit of Nitre.

Description.—The officinal spirit of nitric ether is formed by the mutual reactions of nitrate of potassa, sulphuric acid, and alcohol, and is a mixture in variable proportions of hyponitrous ether and alcohol.

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[1] Effects of Chloroform and Strong Chloric Ether as Narcotic Agents. 1849.

It is a clear colorless liquid, of a fragrant ethereal smell resembling that of ripe apples, and has a pungent, aromatic, sweetish-acidulous taste; it is very volatile, and by evaporation on the skin produces a decided sense of coolness; it is also very inflammable, and burns with a whitish flame; it mixes readily with water and alcohol, and grows acid by keeping. In commerce it is very apt to be adulterated so as to be rendered utterly worthless as a medicine.

ACTION. *On Man.*—Christison relates the case of a female, in whose chamber a three gallon jar of sweet spirit of nitre was broken. She was found quite dead, lying like one in a deep sleep. On dissection of her body, the lungs were found much congested. Kraus speaks of a boy, twelve years old, who, after taking a drachm of this liquid, was attacked with violent colic and a copious discharge of thin mucus, an effect which may probably be ascribed to the free acid contained in the medicine. According to Flourens it causes, when inhaled, much more unpleasant and serious symptoms than ether.

USES.—Although commonly employed for other purposes, spirit of nitric ether is regarded by some authorities as a powerful stimulant and antispasmodic. Richter states that in relieving hysterical spasms it is often more effectual than ether itself, and recommends it to be given in low forms of fever, as tending to sustain the strength, and, at the same time, to favor the cutaneous transpiration. Dr. Chapman regards it as one of the mildest and most agreeable of diaphoretics. Its *diuretic* properties are perhaps more generally acknowledged; for there is no form of dropsy in which it is not employed in conjunction with other and more active medicines. Dr. Christison thinks it is least serviceable in dropsy connected with diseased kidney, and most useful in the form associated with diseased heart. This opinion is perhaps correct as regards chronic dropsies of the first class mentioned, but in that form of general dropsy which follows scarlatina, the remedy is eminently serviceable, as well as in general anasarca produced by suppression of the perspiration. In these cases it is prudent to combine with it squills, the acetate or bicarbonate of potassa, digitalis, or, as Richter advises, the infusion of calamus and juniper. It is commonly employed to relieve the strangury occasioned by cantharides, to moderate the irritant action of copaiba, to palliate gravel and all diseases of the urinary organs in which it is desirable to lessen the acrimony of the urine, or by increasing the quantity of this secretion to diminish the chances of calculous deposit. It may be advantageously employed in conjunction with aromatic spirit of ammonia, or with carminative infusions for relieving flatulent distension of the stomach, or the nausea produced by indigestion.

ADMINISTRATION AND DOSE.—The dose of sweet spirit of nitre as a diaphoretic, is from ten to thirty drops repeated every two or three hours, either alone or in some warm infusion. To obtain its diuretic virtues, from half a fluidrachm to one fluidrachm should be given in some appropriate vehicle. The last-named quantity contains about one hundred drops.

CUPRUM AMMONIATUM.—AMMONIATED COPPER.

DESCRIPTION.—This preparation is made by rubbing together half an ounce of sulphate of copper and six drachms of carbonate of ammonia until effervescence ceases, and drying the product with bibulous paper and a gentle heat. The moisture developed by this process is derived from the water of crystallization of the sulphate of copper, but the precise reaction which ensues is not accurately determined. It is, however, presumed that the sulphate of copper parts with a proportion of its acid, which unites with the ammonia, and that a union also takes place between a portion of metallic copper, acting as an acid, and a portion of ammonia. The resulting compound would then be a *cupro-sulphate of ammonia.*

Ammoniated copper is susceptible of crystallization, but, as originally obtained, is a powder of a fine azure-blue color, with an ammoniacal odor, and a styptic, metallic taste. It is soluble in one and a half parts of cold water; but if much diluted, it is decomposed, with the extrication of ammonia. The solution has an alkaline reaction. Acids, potassa, soda, and lime-water are incompatible with it.

HISTORY.—This salt was first procured as a solid about the middle of the last century, but Boerhaave had previously employed a solution of copper in caustic ammonia. It was introduced into the medical practice of Great Britain by Cullen.

ACTION.—Ammoniated copper, in medicinal doses, does not produce any immediately sensible effects upon the healthy system, but in large doses it occasions nausea, giddiness, confusion or dimness of sight, vomiting, colic, obstinate constipation or diarrhœa, and, according to Richter, if its use is persisted in, it causes painful muscular spasms or paralysis, wasting of the body, and ultimately death.[1]

USES.—The principal application of this remedy is in spasmodic affections, for the cure of which it at one time enjoyed a high repute. The conditions most appropriate to its favorable operation are the

[1] Ausfürlich. Arzneim., iv. 466.

purely functional nature and the paroxysmal character of the attack. Joseph Frank, in treating of its use in *epilepsy*, expresses the opinion that it is more useful when adults than when children are affected.[1] Cullen found that it proved a cure for the disease in many cases, but in many also failed. Herpin made use of it in fourteen cases, but in none with permanent benefit.[2] It is not much relied upon at the present day; but in a disease which can so seldom be treated upon any certain grounds, this remedy should not be forgotten.

Chorea, of a purely nervous form, appears sometimes to have recovered under the use of this medicine. Dr. Walker, a physician of Leeds, in the last century, affirmed that during a period of nine years he had used it in a variety of patients laboring under this affection, and that, except in a single instance, he had never known it to fail of a cure.[3] Delarive, Willan, Jahn, Niemann, and others, have also testified to its virtues; but it must not be forgotten that chorea is one of those disorders for which the greatest number of remedies have been employed, and that their ordinary success is attributable rather to the natural subsidence of the disease than to their specific operation.

In several chronic inflammations of the *bronchia* and of the *bowels*, particularly when accompanied in the former case with spasmodic cough, and in the latter with paroxysms of colic, this medicine is also reputed to have been serviceable.

ADMINISTRATION.—Ammoniated copper is prescribed in doses of half a grain, gradually increased to four or five grains, or until it begins to produce nausea. It may be given in the form of pill made with bread-crumb or confection of roses, and only when the stomach contains food.

ZINCI OXIDUM.—OXIDE OF ZINC.

DESCRIPTION.—Oxide or protoxide of zinc is prepared by depriving the precipitated carbonate of carbonic acid by exposing it to a strong heat. It is a white powder, without smell or taste, is insoluble in water, but dissolves in acids and in caustic solutions of the alkalies.

Unguentum Zinci Oxidi.—OINTMENT OF OXIDE OF ZINC.

This ointment is prepared by mixing an ounce of oxide of zinc with six ounces of lard.

HISTORY.—This substance was originally prepared by sublimation,

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[1] Traduct. Fran., iii. 382.

[2] Du Pronostic, etc., de l'Epilepsie, p. 581.

[3] DUNCAN'S Med. Com., x. 288.

on exposing metallic zinc to an intense and continued heat. It was introduced into medicine by Paracelsus, and the first physician who employed it in epilepsy was Gaubius, who learned its antispasmodic virtues from a charlatan,[1] Ludemann by name.

Action.—The imperfect experiments of Heller led him to conclude that oxide of zinc does not undergo solution in the intestinal canal, but is entirely discharged with the fæces; but Schlossberger detected it in the urine, and demonstrated its solubility in liquids such as usually exist in the stomach,[2] and Michaelis proved by experiments upon animals that it is thus soluble, and is consequently absorbed.[3] He found it in the venous blood, but not in the chyle, and observed that it is so slowly eliminated that, even when administered in large doses, it cannot be detected in the bile or urine for four or five days. It appears in the former of these secretions first. When administered to rabbits in large doses, it acts as an irritant of the stomach, producing erosion and ulceration; and, if long continued, a gradual wasting of the flesh. The author last named cites the experiments of Werneck, who administered oxide of zinc to fifteen healthy persons and to himself, in doses of four grains and upwards, occasioning eructations, nausea, confusion of the mind and senses, heat in the epigastrium, vomiting, thirst, fever, jerking pulse, muscular spasms, &c. He also refers to the case of an epileptic patient, who, after having taken 3,246 grains of oxide of zinc, fell into a state of marasmus, with œdema of the extremities, and was only rescued from death by abandoning the medicine. His epileptic attacks were in no degree improved. Similar effects had earlier been described by Richter, and Delasiauve[4] states that he had often been obliged to suspend its use on account of the obstinate diarrhœa it produced, or the invincible disgust it inspired. Yet effects of this kind cannot be of ordinary occurrence, for we find that Home[5] sometimes gave as much as forty grains a day without injury; that Sieveking cured a case of epilepsy in which thirty-six grains of the medicine were taken three times a day without any unpleasant effect whatever;[6] and that Herpin, who directs forty grains a day as the maximum ordinary dose,[7] alleges it to be "a perfectly innocent remedy, which may be administered in doses of ninety grains a day without any other than temporary inconvenience, and may be continued with impunity for an almost unlimited period."

Uses.—The value of oxide of zinc is not fully determined, but the

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[1] Richter, Ausfür. Arzneim., iv. 505.
[2] Arch. f. Phys. Heil., vii. 589.
[3] Ibid., x. 109.
[4] Traité de l'Epilepsie, 1854, p. 375.
[5] Clinical Experiments, p. 220.
[6] On Epilepsy, p. 218.
[7] De l'Epilepsie, p. 568.

greater number of cases in which it has been employed were of a *spasmodic* nature. Even in febrile affections, such as the eruptive and other continued fevers, it has been alleged to be efficient in allaying subsultus and other nervous symptoms; but such statements do not rest upon a sufficient ground. The same remark is applicable to the different forms of *convulsion* excited by indigestion and dentition. Guersent and Blache, however, alluding to cases in which no local cause of irritation can be discovered to explain the attacks, and particularly when depletory measures have been fully tried, recommend this medicine to be given. Instead of associating it with extract of hyoscyamus, after the method of Brachet, they direct it alone, and in gradually augmented doses until as much as twenty or twenty-four grains are taken every day, divided into ten or twelve parts.[1] Their opinion of the value of the remedy is sustained by M. Trousseau, and accords with that of Percival, Odier, Voigtel, and others.

The disease for the cure of which oxide of zinc has been most celebrated is *epilepsy*. Bell, Percival, Home, La Roche, Rush, and many other physicians of half a century ago, asserted its efficacy; Odier and Hufeland attributed to it peculiar virtues; and, within the last few years, besides Néligan, who found it "more successful than any other remedy,"[2] and various writers who published isolated illustrations of its success, we have a work devoted by M. Herpin to proving its superiority.[3] Forty-one epileptic patients were treated by him with this medicine, nine of whom were under ten years of age. Of the whole number, fourteen appear to have been cured, but only eight of these without relapse.[4] It is true that, by a peculiar mode of statement, M. Herpin makes it appear that he cured twenty out of twenty-eight cases;[5] but that which we have given is less partial, and if it errs it does so in allowing the author more than a strict judgment would warrant. Other physicians, also, who adopted his method, have not found it successful. M. Moreau, of Bicêtre Hospital, applied it scrupulously in all respects to the treatment of eleven epileptic patients, and did not effect a cure in any case. M. Délasiauve employed it on a still larger scale, and although some of the patients were temporarily benefited, others became worse under its use,[6] and, as already stated, the disorder of the digestion and the disgust which it produced compelled him to desist from prescribing it. A similar result attended the numerous experiments of Dr. Radcliffe and Dr. Marcet in London,[7]

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[1] Dict. de Méd., 2ème éd., xi. 160.
[2] Medicines, their Uses, &c., 4th ed., p. 526.
[3] Du Pronostic et du Traitement curatif de l'Epilepsie, Paris, 1852.
[4] Ibid., p. 578.
[5] Ibid., p. 609.
[6] Op. cit., p. 274.
[7] Ranking's Abstract (Am. ed.), xxvii. 63.

and Dr. Sieveking speaks slightingly of the medicine. Oxide of zinc, therefore, can scarcely claim an exemption from the sentence of condemnation which rests upon all the specifics for epilepsy which have hitherto been proposed. It may be no worse, but it is not better, than the rest.

This medicine has been recommended in the treatment of *chorea* by a great number of physicians, including Hufeland, Borsieri, Gaubius, Duncan, Alexander,[1] Wright, Bedingfield, and Crawford. Mr. Bedingfield states that the remedy was so speedily and decidedly successful in the Bristol Infirmary, that he could not help regarding it as a specific. Upwards of forty cases occurring there were, with one exception, cured by it. Crawford also found it of the most uniform efficacy.[2] Several cases reported by Dr. Barth, of Sierentz, and regarded by him as chorea, but which were rather instances of irregular convulsions, appear to have been cured chiefly by this medicine.[3] Unlike epilepsy, chorea tends spontaneously to a cure, and unless the influence of a medicine upon it is very prompt and decided, its therapeutic value is difficult to determine. In the present case sufficient details have not been furnished to enable us to form a rational opinion upon this point.

Oxide of zinc is also reported to have cured *whooping-cough*, *spasmodic asthma*, *intermittent fever*, and *chronic dysentery*, but the instances of its alleged efficacy are too few to inspire any confidence in its use in these affections.

Dr. Theophilus Thompson states that the *night-sweats of phthisis* are more certainly controlled by this medicine than by any other with which he is conversant.[4] He prescribed it in conjunction with extract of conium or of hyoscyamus. This statement has been confirmed by the reports of Drs. J. B. S. Jackson, Coale, and Abbott, of Boston,[5] the last named of whom has published an abstract of twenty-three cases illustrating the efficacy of the treatment, and from which it appears that he usually prescribed four grains of the oxide with three of extract of conium. Dr. Jackson gave the former medicine alone, and in doses of seven or more grains, and also found it useful in cases of profuse perspiration unconnected with consumption of the lungs.

Externally oxide of zinc is employed in powder, and in an ointment (*Unguentum Zinci Oxidi*) as a protective, astringent, and mildly stimulant application. It is peculiarly adapted to ulcerated surfaces which are sensitive, present exuberant and flabby granulations, and discharge

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[1] Canstatt, Med. Klinik, iii. 344.
[2] Cycl. of Pract. Med., i. 411.
[3] Bull. de Thérap., xlviii. 169.
[4] Lancet, Aug. 1854, p. 97.
[5] Bost. Med. and Surg. Journ., lvi. 249, 294.

pus copiously. In powder it is much used either alone or with lycopodium, gum Arabic, starch, or fine lint to heal *fissures of the nipples*, *anus*, and other parts habitually moist; *herpes*, limited eruptions of *eczema*, and *impetigo*, *ulcers* of the nasal passages (ozæna), and chronic *leucorrhœa*. In the two last diseases it can be mixed with water and injected. The *ointment* is useful in all cases of superficial *abrasion* and *ulceration* after active inflammation has subsided, in *ophthalmia tarsi*, and to allay irritation in the skin diseases before mentioned.

ADMINISTRATION.—Oxide of zinc may be given in powder or pill, and in doses of from one to five grains or more. If it excite nausea or gastric uneasiness, the dose should be diminished.

ZINCI VALERIANAS.—VALERIANATE OF ZINC.

DESCRIPTION.—Valerianate of zinc may be prepared by the double decomposition of valerianate of soda and sulphate of zinc dissolved in water. At a temperature of 200°, crystals of valerianate of zinc form upon the surface of the liquid, from which they are removed, and, after having been washed in cold water, are dried. When pure, the crystals are of a snowy whiteness and a brilliant, pearly lustre, and of a tabular form. They have a somewhat bitter, slightly astringent taste, and a feeble odor of valerian.

HISTORY.—This salt was first proposed by Prince Louis Lucien Buonaparte, employed by Muratori and Cerulli, of Bologna, and tested experimentally in 1844 by M. Devay, of Lyons.

ACTION AND USES.—The sensible effects of this medicine upon the healthy system are usually inappreciable, but it is claimed to possess singular powers of controlling neuralgic pain and nervous derangement. As, however, it was at first a very costly preparation, and seldom to be procured in a pure state, the negative results of its administration in many cases do not necessarily invalidate the reports of its more favorable effects on other occasions. It must be confessed, however, that fancy rather than experience seems to have suggested the idea to M. Devay that there is something more in this medicine than a mere association of agents possessing analogous qualities, that, in fact, it represents the antispasmodic virtues of both carried to the highest power. In that case it would stand alone, the only medicine of a new class.

There can be no reasonable doubt that valerianate of zinc has proved an efficient remedy in certain obstinate cases of pure *neuralgia*, especially in persons of a highly nervous or hysterical constitution,

and Dr. Neligan affirms it to be no less so in the ordinary *convulsive affections* of children and young persons of either sex. It is also alleged to have cured *epilepsy* and *chorea*.

ADMINISTRATION.—Valerianate of zinc may be given in the dose of one grain two or three times a day, in pill made with mucilage or conserve or roses, or in some sweetened aromatic water, such as orange-flower water. In preparing the solution the salt should first be triturated with a small quantity of water.

Class VII.

SPINANTS. (TETANICA.)

It was stated in the introductory remarks to the Class of Cerebro-Spinal Stimulants that certain medicines act "exclusively upon the spinal marrow." These have been arranged in a separate Class, under the title *Tetanica*, and are also designated by the barbarous vernacular term *Spinants*. They are few in number. Indeed, strychnia is the only substance which operates as a stimulant of the whole spinal nervous system. Ergot and borax, and the former more particularly, in virtue of their special influence upon the uterine muscles, are held to be stimulants of a limited portion of the spinal marrow, and as belonging, therefore, to the present class of medicines; but their special applications in therapeutics render their position more appropriate elsewhere, the one with Emmenagogues and the other with Irritants.

The spinal marrow is the organ upon which the power of muscular motion appears directly or indirectly to depend, but, apart from the brain, it does not give rise to motion in any determinate direction. The brain, as the organ of perception and of will, controls the mode of muscular action. It does so evidently in regard to all the movements which bring the individual in relation to external things, and, by education and the power of the will, it becomes capable of controlling, to some extent at least, the contraction of muscles usually described as involuntary. There is, consequently, some reason to doubt the correctness of the ordinary division of the nerves into voluntary and involuntary. Again, causes which impair the nutrition of the whole body necessarily impair the muscular system, as well that part which is removed from the ordinary influence of the will, and which is usually called organic, as that which the will habitually controls, and which is described as the muscular system of animal life, of the life of relation, &c. A study of the examples furnished by experience of the loss of muscular power shows that this may be

owing to some defect either in the nervous organs themselves, or in the muscular system. If the muscles of a limb are wasted by mechanical pressure, the limb cannot move as in health, however perfect the power of the nervous system may be; and, on the other hand, the muscles may retain their due development, and yet be motionless, if the nervous centres cease to generate power, and in sufficient amount. But the cessation or diminution of the generation of nervous power may depend either upon temporary and removable causes not affecting the organic constitution of the nerve centres, in which this power is generated, or upon a physical deterioration, or even a disorganization of the nerve centres or trunks. In the latter case, there is no remedy; in the former, the cure will depend upon our power of promoting the nutrition of the muscles, or of stimulating the nervous centres, to increased activity. We have seen elsewhere how potent electricity is in quickening muscular nutrition and developing nervous power; and, were it not that this agent appears to act directly upon nutrition, as well as upon the nerves, it might with great propriety be classed along with the one we are about to examine more particularly.

Medicines capable of producing tonic spasm must be regarded as excitants of those nervous centres upon which the provoked movements depend. Such as appear to act as special stimulants of the gravid uterus probably limit their operation on the spinal axis to its lower portion; but strychnia plainly stimulates the entire centre of muscular motion. It is to strychnia, therefore, we may have recourse in all cases of loss of muscular power in the organs of nutrition, or those of relation and locomotion, provided that the paralysis depends upon some other cause than a destruction of substance in a nervous centre or trunk. But as the phenomena are by no means determinate which denote the former of these lesions, the mere suspicion of its existence, however well supported, except by permanent muscular contraction and rigidity of the paralyzed part, should not induce us to abstain from a cautious exhibition of the appropriate remedy.

NUX VOMICA.—STRYCHNIA.

Description.—Nux vomica, and its active principle strychnia, are the products of a tree belonging to the natural family Apocynaceæ, which is quite common on the Coromandel Coast, the island of Ceylon, and the neighboring countries. It is of moderate size, and has a thick trunk with a grayish mottled bark, covered in parts with a reddish-brown efflorescence. The leaves are oval, shining, and leathery;

the flowers greenish-white, and arranged in small, terminal corymbs. The fruit is ovoid, orange colored, one celled, pulpy, about the size of an apple, and containing many seeds.

The seeds, or beans, which are the officinal portion, are about an inch in diameter and two lines in thickness, somewhat depressed on one side and slightly convex on the other, or button shaped; of a greenish-gray color, and a silky, lustrous surface, owing to the fine close hairs which are set obliquely upon it and extend slightly beyond its edge. The seeds are extremely hard, and are pulverized with great difficulty. Internally, "they consist of a horny, whitish, or yellowish albumen, which separates into two parts, and contains in a small cavity in the circumference the embryo with its two acuminate cotyledons." They are inodorous, but their taste is intensely bitter and acrid.

The powers of nux vomica depend upon two alkaloids, *strychnia* and *brucia*, which it contains in combination with igasuric or strychnic acid. Of the two, the first named is the most important. It usually occurs as a granular powder of a grayish-white color, inodorous, but intensely bitter to the taste. "It is soluble in 2500 parts of boiling and in 6667 parts of cold water; but this last solution, if diluted still further with 100 times its weight of water, tastes strongly bitter."[1]

MEDICAL HISTORY.—It is generally supposed that we are indebted to the Arabians for a knowledge of this drug, but the effects ascribed by them to Dschawz elkai, translated as strychnos nux vomica,[2] are quite different from those of the last-named substance. It is stated to be emetic and purgative, and its dose is given as two drachms; but no allusion is made to its possessing poisonous properties. The only analogy between the Arabian description and that of the present day, consists in this, that one author expressly states that the medicine is useful in paralysis and locked jaw. The seeds are reckoned among the most powerful vegetable poisons, by the Hindoos. Pomet says that its specific action is diuretic, that it is a mortal poison to quadrupeds, and is used to destroy them. He adds that it is affirmed not to be poisonous to man.[3] So Bonetus, a few years previously (1693), after describing minutely its effects upon cats, precisely as more recent experimenters have done, says that it is *alleged* to be poisonous to man.[4] Lemery declares positively that it is *not* poisonous to man.[5] Although two or three scattered examples of death from its use may be found

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[1] NELIGAN, Medicines and their Uses, 4th ed., p. 445.
EBN BAITHAR, ed. Sontheimer, i. 270.

[2] Polyalthes, iii. 573.

[3] Hist. des Drogues, 1706.

[4] Hist. of Drugs, p. 138.

related by Matthiolus and by Hoffmann, its real qualities were certainly unknown until in recent times the more general use of the drug, and especially of its active principles, have rendered its poisonous effects unhappily familiar to every physician. Alston gives a full account of the subject.

ACTION. *On Plants.*—The experiments of Marcet prove that a solution of five grains of the extract of nux vomica in an ounce of water, caused a plant (*Phaseolus vulgaris*) to die within twelve hours. Bouchardat found that water containing $\frac{1}{12000}$ part of muriate of strychnia or brucia, was sufficient to kill a plant in five days.

On Animals.—It acts poisonously upon all, but in different degrees. Desportes gave a hen nux vomica in gradually increasing doses until she took nearly two and a half drachms a day. Ruminating animals appear to be less easily affected by it than other quadrupeds. Fishes placed in water containing the $\frac{4}{10,000}$ part of muriate of strychnia, die within ten minutes. Flies die in convulsions, and intestinal worms are destroyed by this preparation.

The writers quoted by Murray, say that the rapidity of the operation of nux vomica varies. If given to dogs, they pant in breathing, seem alarmed, and if forced to rise, their limbs are rigid. Tetanic spasms ensue, and, with short intermissions, recur until death. During the spasms, according to these early experimenters, the animals appear to be insensible to all impressions, so that even their ears or tails may be cut off without eliciting signs of pain.[1] This is a description of anæsthesia, not of narcotism.

More modern observers have conducted experiments with nux vomica and its preparations under extremely various conditions, but their results have been singularly uniform, and may be described as follows: By whatever avenue introduced into the system the effects are essentially the same, but are more or less marked according to the absorbent power of the surface to which the poison is applied. Hence the phenomena are developed most rapidly when it is injected into the veins. These phenomena consist of paroxysms of tetanic convulsions, from one to several minutes in duration, and with like intervals of repose between them. After a more or less frequent repetition of these, and according to their severity, death sometimes takes place by asphyxia produced by a tonic spasm of the respiratory muscles. After death, in these cases, no other lesion is found than congestion of all the internal organs, as in other cases of asphyxia. Some experimenters have added to this cause of death tetanic spasm, or, more probably, exhaus-

[1] Apparat. Medicam, i. 707.

tion of the heart, for it is found that this organ after death has lost its irritability.[1] The experiments of Mr. Harley are regarded by him as proving that death from strychnia may occur independently, 1st, of exhaustion; 2d, of asphyxia from closure of the glottis; and 3d, of suffocation from spasms affecting the respiratory muscles;[2] and that it does probably occur because strychnia destroys the power of the tissues and fluids of the body to absorb oxygen and exhale carbonic acid. This conclusion is in direct opposition to that of Dr. Brown-Séquard, who thinks that the action of strychnia consists in an increase of nutrition of the nervous centres, by which excess of nutrition the reflex faculty becomes much increased. Kölliker's experiments prove that in whatever manner this agent acts, it does so upon the spinal marrow alone, and not upon the nerves themselves or their muscles. He further shows that the loss of power and excitability in muscles tetanized by strychnia is a consequence of their previous over-excitement. He also concludes that, in frogs at least, strychnia exerts but little action upon the heart. His experiments also show that during the action of strychnia spasms may be excited by stimulus proceeding directly from without, or transmitted through the brain.[3] The last proposition is illustrated by the statement of Dr. M. Hall, that if a dog under the milder form of strcyhnism be allowed to remain quiet, it will recover, while, on the other hand, if continually excited it will as certainly die.[4]

On Man.—It is said that when the powder of nux vomica is long handled, it produces a partial vesication of the fingers. Upon the bare cutis this substance, as well as strychnia, acts powerfully as a local irritant. Internally, and in small doses, both exert a decidedly tonic action, increasing the appetite and the secretion of urine, and the fæcal discharges also, when these are infrequent, but on the other hand, diminishing them when their frequency depends upon an atonic condition of the bowel. Its continued use, like that of bitter tonics generally, deranges the digestion. It appears to augment the secretions of the mouth and stomach, as well as those of the liver and pancreas, to augment the tone of the muscular coat of the bowels and bladder, and it may be detected in the urine by chemical tests. Its action upon the bladder is shown by its disposing to frequent urination, and by its causing, when given in full doses, retention of the urine, first by producing muscular spasm of the neck of the bladder, and ultimately loss

[1] Galtier, Toxicologie, ii. 258; Baylon, Lancet, July, 1856, p. 72.
[2] Lancet, June, 1856, p. 648.
[3] Virchow's Archiv. x. 239.
[4] Lancet, Feb. 1853, p. 128.

of power in the muscular coat of the organ. In like manner it is reported to excite uterine contractions, promote the menstrual discharge, to dispose to venery, and to produce erections of the penis. The action of strychnia is mainly expended upon the peripheral portion of the nervous system. In doses of one-twentieth of a grain, it seldom exhibits any effects, except on paralyzed muscles, or, if otherwise, only a slight formication of the skin, and rigidity of the lower jaw and limbs; and, as the dose is increased, a sense of heaviness and debility is experienced, with general stiffness of the muscles, and clonic spasms.

In *poisonous doses*, the symptoms produced by this medicine are very striking. They may be developed gradually or rapidly according to the quantity, the degree of division or the solubility of the preparation, and the degree of repletion of the stomach. In the former case, the patient complains first of general uneasiness, restlessness, soreness, and heaviness in the limbs, and stiffness of the joints and muscles, particularly those of the chest and lower jaw, and these are succeeded by spasmodic symptoms. When the dose has been large, or the conditions favorable to its rapid absorption, the first phenomena are clonic spasms, or violent muscular twitches, which, with the accompanying sensation, have been compared to the effects of an electric shock. These phenomena are succeeded by thoroughly tetanic spasms of all the muscles, during which the limbs are rigidly flexed or extended, the lower jaw firmly fixed against the upper, and the body arched as in opisthotonos. The rigid contraction of the respiratory muscles renders breathing laborious, or even temporarily suspends it altogether, and, as a consequence of this immobility of the chest, a stasis of blood takes place in all the superficial veins, giving a livid color to the skin. The retracted corners of the mouth disclosing the set teeth, the foam issuing from between them, the staring eyes and the contracted brow, lend to the countenance an expression of anguish mingled with affright. Amidst this horrible array of symptoms the mind remains unaffected, and it is even probable that little pain is experienced. The convulsions may continue without intermission until death, but more generally they are interrupted by intervals of calm, or rather of exhaustion. At this time, however, the slightest stimulus, a breath of air, a sudden noise, or the lightest touch, may act with the suddenness of an electric shock to renew the paroxysms. As they succeed one another, the violence of the muscular contractions may diminish, but not so the disorder of the circulation and the exhaustion of the nervous force; these augment continually, the congested state of the bloodvessels grows more and more decided, and in the intervals between the fits the prostration is more complete.

Finally, the patient dies either from asphyxia or from asthenia, according to whether his death occurs during the paroxysms or during their suspension.

The peculiar symptoms of strychnism once developed tend rapidly to a fatal termination, and generally within an hour or two at most. A few minutes only have in some cases elapsed between swallowing the poison and death. When, however, from rejection of a portion of the poison, or from other causes, a fatal issue is escaped, the patient always complains of extreme fatigue and exhaustion, and sometimes of muscular stiffness and neuralgic pains, which may last for several days.[1]

The smallest quantity of nux vomica which is known to have caused death is said to have been three grains of the alcoholic extract. Of strychnia, the least dose which is recorded as having proved fatal appears to be one grain. Recovery occasionally takes place after very large doses, such as three or even four grains of strychnia.[2] This quantity has not infrequently been taken without fatal results when it was reached by gradual increase from a fractional dose.

The *lesions* said to be produced in fatal poisoning by this substance are neither uniform nor characteristic. The muscles are generally rigid, and all of the internal organs are gorged with blood, the brain and spinal marrow neither more nor less than the rest. The latter organ is stated in some cases to have been softened, and its arachnoid cavity to have contained serum. But the authors who have described such lesions clearly did not find them after the tetanic spasms of strychnism. Had they existed they would have produced paralysis, and not spasm. Strychnia has been said to produce a tendency to dissolution in the blood, *i. e.*, a diminished proportion in its solid elements. But in cases of poisoning by this agent the state of the blood is evidently the immediate effect of asphyxia.

USES. *Paralysis.*—The first suggestion of strychnia as a remedy for paralysis proceeded from Fouquier in 1811. He was led to test its virtues by observing, in some experiments upon animals, that it produced spasms, and his first trials were successful. At once he noticed that its primary influence was manifested *in the paralyzed muscles*, and might be restricted to them by a proper graduation of the dose employed. He also observed that the artificial spasm or rigidity was generally displayed in the flexor muscles of the upper,

[1] A full account of the poisonous effects of strychnia is given by Husemann in Journ. f. Pharmacodynamik, &c., i. 469.

[2] WHARTON and STILLÉ, Med. Jurisp., p. 516.

but in the extensors of the lower limbs, and he described the paroxysmal characters of the active phenomena and the more continuous constriction and oppression sometimes felt. His experience, even at the beginning, taught him that the remedy must be used with great circumspection in paralysis depending upon lesions of the brain or spinal marrow, and that its power was chiefly manifested in functional forms of the disease, or peripheral paralysis, produced by such causes as these: venereal excesses, abuse of opium, alcoholic intoxication, lead poisoning, anger, fright, gout and rheumatism, concussion of the spinal marrow, hysteria, &c.[1] In the work from which these facts are drawn the reader will find a number of examples given of the efficacy of the remedy. As early as 1823, Andral showed its power in lead palsy.[2] In 1830, Dr. Geddings, of South Carolina, reported several cases of paralysis from drunkenness cured by this medicine. One of them was a very aggravated case of general paralysis.[3] In the same year, Dr. J. L. Bardsley published an account of his success in a large number of paralytic cases, pointing out its peculiar value in those unconnected with lesions of the nervous centres, and especially in paraplegia.[4] He also showed the virtues of brucia in affections of the same nature. Pétrequin, in 1839, cured four cases of paraplegia by the use of strychnia internally, and the use of an embrocation containing tincture of nux vomica. The latter he found curative in anæsthesia.[5]

The caution enjoined by Fouquier in regard to the use of the remedy in central paralysis was still more emphatically reiterated by Lallemand in 1820,[6] and as other physicians met with cases of the sort in which it was manifestly injurious, there arose a general indisposition to employ it. Still later, however, as its special appropriateness to the treatment of other paralytic disorders became developed, the medicine has gradually regained the confidence of the profession. Yet it need not be entirely excluded from the therapeutics of even central paralysis, provided that its use be restricted to cases in which the symptoms have long been stationary and there is no excitement. Although a cure may not be expected from it, still, if employed with circumspection, it is capable of carrying improvement to its farthest limit. But the utmost caution should be observed, and the progress of the medicinal influence so closely watched as to secure its restraint within the bounds of safety.[7]

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[1] Bayle, Bibl. de Thérap., ii. 141. [2] Arch. Gén., iii. 294.
[3] Am. Journ. of Med. Sci., vii. 334. [4] Hospital Facts and Observations, Lond. 1830.
[5] Med.-Chir. Rev., July, 1839. [6] Recherches, p. 267.
[7] An interesting essay on this subject by Bufalini is contained in Dublin Quart. Journ., May, 1856, p. 492.

The cases to which it was originally applied continue to be those in which it renders the greatest service, those, namely, of impaired innervation. Whether in these the paralysis be limited to the tongue or the muscles of one eye, or whether it occupy the greater part of the voluntary muscles, this remedy affords a better prospect of relief than perhaps any other.

The *administration* of strychnia in paralytic affections should be very cautiously conducted. Beginning with one-twentieth, or from that to one-twelfth of a grain daily, the dose may be gradually increased until some jerking or tension is felt in the paralyzed muscles. At this point the remedy may be suspended, or its quantity diminished. Strychnia has been applied to the denuded cutis, but in this manner it causes severe pain, and is very apt to excite an erythematous inflammation of the adjacent skin; besides which, its effects are uncertain. It has also been used in frictions to the sound skin by means of an ointment, so that about one grain of strychnia, or of its sulphate, shall be daily applied. The skin subjected to these frictions should be kept carefully clean by means of soap and water.[1] Or the paralyzed muscles may be covered with fomentations containing tincture of nux vomica, while strychnia is given internally.[2]

Amaurosis.—Strychnia was employed in this disease, at an early date, by Dr. Middlemore, of Birmingham,[3] and also by Shortt, Liston, Guthrie, &c. The physician first named confined its use to those cases in which the retina is in a state of atony from some cause acting directly upon its texture through the medium of general debility of the system. He thought it peculiarly applicable when the loss of vision was due to using the eyes by a very feeble light, as in the case of miners. He found but slight advantages comparatively from its internal use, but preferred its endermic application to a blistered surface above the eyebrow. He commenced with the daily application of a quarter of a grain, and gradually increased this quantity to two grains, keeping the blister open meanwhile by a dressing of savine cerate, and tempering the pain by mixing the medicine with a little flour or powdered opium. Under similar conditions, Petrequin cured several cases.[4] Miquel and Verlegh employed strychnia successfully by friction or inoculation around the orbit.[5] Werber cured diplopia and amaurosis from deranged innervation by the endermic method, and also by dropping into the eye a solution of strychnia, of one grain to half an ounce of water.[6] Griffin was equally successful in a case

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[1] Sandras, Mal. Nerv., ii. 84.
[2] Trousseau, Thérap., 5ème éd., i. 783.
[3] Diseases of the Eye, ii. 282.
[4] Bull. de Thérap., xv. 28, 286.
[5] Ibid., xxxiii. 350.
[6] Op. cit., p. 136.

apparently of congestive amaurosis. After the failure of evacuant and depletory measures, one-twelfth of a grain of strychnia was at first given once and afterwards twice a day, until in the course of eight weeks as many grains had been taken. At the end of this period the cure was complete.[1] Sandras, who speaks highly of the use of strychnia in the form of amaurosis now described, advises that the vesication near to the eye should be made with strong ammonia mixed with lard, that it should be of small extent, and not renewed immediately upon the spot first occupied, lest a troublesome sore and an unsightly scar should result. The strychnia itself may be incorporated with the portion of lard or cerate which is used as a dressing for the blister.[2] Two cases of chronic amaurosis cured by the internal administration of strychnia are reported by Dr. Griffin, of Limerick.[3] An interesting account is given by Mr. de Ricci, of Ballymahon, of an epidemic *night blindness* which prevailed in the work-house of that place, some cases of which were peculiarly intractable, and were only cured by the internal or the endermic application of this medicine.[4]

In *prolapsus of the rectum* Schwartz used the extract of nux vomica with great advantage, both for children and adults. For the former, he dissolved two grains in two drachms of water, and of this solution gave two or three drops to infants, and from six to fifteen drops to older children.[5] Duchaussoy used strychnia with perfect success in a case of four years' standing.[6] Mr. A. Johnson also effected a cure by applying one-sixteenth of a grain of strychnia upon a blistered surface over the coccyx. Koch, of Stuttgart, was equally successful in a case of fifteen years' duration, by means of injections of cold water containing twelve drops of the tincture of nux vomica.

When *incontinence of urine*, or, on the other hand, *retention of urine* depends upon impaired power in the muscular coat of the bladder from habitual distension, or from pressure by the uterus, the operation of strychnia is generally very efficient. The remedy appears to have been first proposed by Cerchiari, of Bologna, in cases occurring after parturition. Cory relates an instance of the sort in which the bladder regained its power after the second dose of one-sixteenth of a grain.[7] Solly employed it successfully in a case of incontinence of urine after lithotomy,[8] and Lecluyse, in retention of urine and consequent paralysis of the bladder, by injecting a solution of strychnia

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[1] Dublin Quart. Journ., Aug. 1853.
[2] Op. cit., p. 429.
[3] Dublin Quart. Journ., Nov. 1858, p. 315.
[4] Ibid., Feb. 1858, p. 46.
[5] Bull. de Thérap., xi. 31.
[6] Arch. Gén., 5ème sér., ii. 327.
[7] Lond. Med. Gaz., xxiii. 905.
[8] Ibid., Feb. 1849.

into this organ.[1] In that troublesome form of incontinence of urine which so commonly affects children, Mondière found the alcoholic extract of nux vomica better than all the other remedies he had employed, and, indeed, his experience coincides with that of Ribes, Guersent, Mauricet, and others.[2] Trousseau, however, thinks belladonna superior.

The writer last mentioned has treated *sexual impotence* successfully with strychnia. He was induced to employ it by observing its effects in the case of a man affected with paraplegia for three years, during all of which time the genital organs had lost their power. Under the use of the medicine their function, along with that of the muscles of the extremities, was re-established. Similar effects were noted in a second case of the like description, and also in a third, where the want of power appears to have been limited to the penis, and where, also, it was only remedied while the medicine was actually in use.[3] Magendie, and also Duclos, found it serviceable under like circumstances. The latter used the alcoholic extract in doses of a grain daily, and gradually increased until eight were taken in a day. He found that it not only cured the sexual impotency, but also improved the digestion when the appetite was feeble, or the food occasioned gastric pain.

The diseases characterized by *excessive, or rather disordered, action*, in which strychnia has been employed with benefit, are more numerous than those which have been noticed. Even in *tetanus* its power has been unequivocally displayed. In 1847, Dr. Fell, of New York, published seven cases of tetanus, six of which were certainly of the traumatic variety, and which all recovered under its use. His plan of administering it was to give $\frac{1}{8}$ or $\frac{1}{10}$ of a grain, and in two hours $\frac{1}{16}$ gr., then reducing the dose still further, and only to the extent of producing specific signs of its influence after each one.[4] Dr. Kollock, also, relates a case of traumatic tetanus occurring in a negro girl, which was cured by strychnia, given in doses of $\frac{1}{12}$ gr. every two hours.[5]

In *chorea* there is a strong evidence of its antispasmodic virtues. Attention was first attracted to its power in this affection by Rougier, and by Trousseau. The former published ten cases of boys, between the ages of six and sixteen, who had suffered from the disease during various periods of from one month to four years. The duration of the

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[1] Month. Journ. of Med. Sci., Aug. 1850, p. 176.

[2] Dierbach, Neuste Entdeckungen, ii. 532.

[3] Thérapeutique, 5ème éd., i. 783.

[4] New York Journ. of Med., vii. 371.

[5] Am. Journ. of Med. Sci., April, 1848, p. 316.

treatment varied between one and eight weeks. One only of the cases relapsed, and that was cured anew by the same means. In all of the cases the symptoms were at first aggravated. Rougier employed nux vomica, and began by giving minute doses, which he increased until the specific influence of the medicine began to be visible.[1] Trousseau prefers a solution of sulphate of strychnia, of which each dose contains about one twenty-fifth of a grain of the salt. At first, one dose only is taken every day; after two or three days, two doses are given, and thus the quantity is very gradually increased until some itching of the scalp, which is generally the first sign of its action, or some other indication of similar import, is observed. The essential condition of its salutary influence is the production of stiffness of the neck and lower jaw, and occasional convulsive jerkings of the limbs. As soon as these phenomena manifest themselves, the choreic movements are said to subside, and sometimes the disease is removed after a treatment of fifteen or twenty days.[2] It should be borne in mind that the author cited does not propose this remedy as an infallible specific, but insists on the use of depletion or of iron, according as plethora or anemia may be present, on the administration of antispasmodics if the hysterical element predominates, or of quinia and digitalis if there is subacute rheumatism. Even with these qualifications it does not appear that strychnia has been regarded by the profession generally as an eligible remedy for chorea. Perhaps the results obtained by other physicians have not been like those of M. Trousseau. M. Sandras, indeed, implies as much, for he says that trials made for the purpose of testing his results have led to an opposite conclusion, and also that those who have witnessed the experiments of M. Trousseau declare that chorea patients, subjected to this method, recover neither quicker nor better than others.[3]

In *epilepsy*, nux vomica was asserted, even in the time of Murray, to be a valuable remedy, and in 1838, Chrestien, of Montpellier, alleged that out of thirty cases treated by this remedy eight were entirely cured by it, and the remainder benefited. Since then no similar success has been reported.

An interesting case of *spasm of the œsophagus* is related by Mathieu, of Lyons. It occurred in an hysterical woman, who was affected to such a degree that she was rapidly becoming emaciated and exhausted. All of the usual treatment adapted to the hysterical origin of the symptoms was employed in vain. Strychnia was then resorted

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[1] Med. Times, August, 1844.

[2] Thérapeutique, i. 785.

[3] Maladies Nerveuses, ii. 525–6.

to, and as soon as it developed its specific effects the œsophageal spasm ceased altogether, but the hysterical symptoms proper were unaffected.[1]

Kroyher, of Presburg, announced, some years ago, that minute doses of the tincture of nux vomica in aromatic water, or cherry-laurel water, formed a specific for the sympathetic *vomiting of pregnancy*. In many cases it proved successful within a week, or even less time.[2] Mr. Gream used the tincture with the best effects in *hay fever*. He gave from ten to twenty drops, three times a day.[3] The external use of equal parts of tincture of nux vomica and soap liniment is strongly recommended by Kissel in the local forms of *chronic rheumatism*.

Rœlants, of Rotterdam, has furnished a favorable account of the treatment of *facial neuralgia* by nux vomica. Twenty-five out of twenty-nine cases were cured, and three of the remaining four were still under treatment. Old as well as recent cases yielded to the medicine with singular rapidity.[4] Tincture of nux vomica was recommended by Serres in *lead colic*, to be given in doses of from ten to thirty drops, according to the course of the disease, and also to be administered in clysters, and applied to the abdomen on cataplasms.[5] Dr. Huss, of Stockholm, and Dr. Neligan, of Dublin, found it equally successful. More recently (1854), Dr. Swett, and also Dr. Bulkley, of New York, spoke favorably of its effects. They found that it generally procured relief within forty-eight hours, the bowels acting and the pain subsiding. In *painful menstruation*, independent of blood disease, and of organic uterine affections, and in prolonged after-pains, it has been strongly commended by Rademacher. He directs the tincture of nux vomica to be associated with tincture of castor in equal parts, and thirty drops of the mixture to be given five or six times a day.[6]

Murray refers to several writers who have recommended nux vomica in *intermittent fever*, and Vogt[7] thinks that it has been wrongly neglected. He advised that it should be associated as a tonic with the true antiperiodic medicines.

There are several forms of *dyspepsia* in which this medicine is extremely useful. The one in which it first was used was described by Rowland (1838), and is true *gastralgia*, a disease in which paroxysmal pains of various characters, but always intensely severe, are felt in the stomach, and radiating thence to the chest, hypochondria,

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[1] Abeille Méd., ix. 286.
[2] Med.-Chir. Rev., Jan. 1841, p. 231.
[3] Lancet, June 8, 1850.
[4] Archives Gén. de Méd., 4ème sér., iii. 92.
[5] Lancette Française, Dec. 1830.
[6] Bull. de Thérap., xlix. 557.
[7] Pharmakodynamik, i. 140.

and back. As the fit subsides, a copious eructation of gas, and of an insipid or acid liquid, takes place. Yet the digestion or nutrition are unimpaired, and the bowels are much confined. Rowland gave a quarter of a grain of the watery extract of nux vomica three or four times a day. In other cases the stomach is habitually irritable, and the general aspect of the patient indicates an anemic condition. In these cases, however, the gastric irritability is such that the preparations of iron are not tolerated, and then, as Clarus has shown, the extract of nux vomica renders the stomach capable of supporting ferruginous remedies.[1] Dr. Huss, of Stockholm, has employed the remedy successfully to relieve the gastric irritability which has everywhere been noticed, as a sequence of Asiatic cholera, and which appears to involve a sub-inflammatory element. Its most ordinary symptom is an uneasy gnawing pain at the pit of the stomach, and vomiting of the food. A grain of powdered nux vomica, with ten of magnesia, was given by Dr. H., three or four times a day, and every third day the dose was increased by half a grain. The patients stated that they experienced after each dose a sense of relief in the stomach, and after ten or twelve days, they were free from pain.[2] Werber strongly recommends this remedy in the more ordinary form of dyspepsia, in which the biliary secretion is defective, the digestion slow, the appetite impaired, the bowels torpid, and the spirits depressed—a condition which is apt to follow exhausting causes of all kinds, excesses in study, or business, in eating, in drinking alcoholic liquors, tea or coffee, and in venereal indulgence.

Closely connected with the last mentioned form of dyspepsia is simple *constipation*, or that which is independent of all inflammatory causes, and without signs of constitutional disturbance. It appears that nux vomica was first recommended for this complaint by Tessier.[3] Dr. Copland says that in cases apparently depending upon deficient tone of the muscular coat of the large bowels, and imperfect propelling power of upper part of the rectum, he has seen benefit derived from combining the spirituous extract of nux vomica, or strychnia, with the pill of aloes and myrrh, or with the compound extract of colocynth.[4] Dr. Neligan found the extract useful in similar combinations, particularly in females, when the constipation was accompanied with a great secretion of flatus and colicky pains.[5] Trousseau recommends

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[1] Arzneimittellehre, p. 604.

[2] Dierbach, Neueste Entdeck., ii. 527.

[3] Merat and De Lens, Dict. Suppl., p. 678.

[4] Copland's Dictionary (Am. ed.), i. 475.

[5] Medicines, their Uses, &c., 4th ed., p. 446.

it particularly for the sluggishness of the bowels which affects old persons, or those who have become prematurely feeble, and whose digestion is consequently sluggish and laborious.[1] Werber confirms these statements, adding that minute doses act more efficiently than large ones; and Dr. Peacock and Dr. Clark, of London, advise, under similar circumstances, the use of from one-sixth to one-half a grain of the extract in combination with the compound rhubarb pill. Mr. Boult, of Bath, also found that pills made by the addition of half a grain of the extract of nux vomica to three-quarters of a grain of aloes, and as much rhubarb, were sufficient, in the dose of a single one, to produce a free evacuation of the bowels, and that they lost nothing of their original power for several months.[2] Oesterlen found the extract, applied by the endermic method, successful in overcoming obstinate constipation. In *spasmodic obstruction of the bowel*, Vidal procured relief by using a sixteenth of a grain of strychnia every four hours. Dr. Parker, of Charleston, has reported a case of obstruction of the bowel which resisted a variety of purgative medicines and enemata, and only yielded to the administration of strychnia in the dose of one-twelfth of a grain, three times a day.[3] Homolle[4] is stated not only to have removed, by its means, impacted fæces, but actually to have relieved strangulated hernia, when the necessity of an operation seemed to be inevitable. A similar example of the apparent efficacy of strychnia in this affection is reported by M. Lopez.[5]

The tonic influence of this medicine upon the bowels is further shown by its efficacy in some forms of *dysentery*. In the last century Hagström employed powdered nux vomica in scruple doses, and in hundreds of instances with wonderful success; and Murray, from whom this statement is derived, refers to other confirmatory cases.[6] Hufeland also resorted to it with the happiest results in an epidemic of dysentery at Jena in 1795. He prescribed rather less than a grain of the extract every two hours. Rademacher found it necessary to give opium also in some cases. Mr. Vaux, of Ipswich, England, on the other hand, gave as much as seven grains of nux vomica three times a day, and reported his success as remarkably uniform.[7] Frisch prescribed it with advantage in subacute dysentery, and Recamier in *chronic diarrhœa*, as did also Nevins when the latter disease affected young persons.[8] In 1830 Dr. Bardsley published six cases illustrating the curative powers of strychnia in this disorder occurring in persons

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[1] Op. cit., p. 787.
[2] Braithwaite's Retros. (Am. ed.), xviii. 116.
[3] Charleston Journ., xiii. 640.
[4] Op. cit., p. 787.
[5] Abeille Méd., xiv. 253.
[6] Apparat. Med., i. 714.
[7] Armstrong's Lectures, p. 409.
[8] Annuaire de Thérap., 1850, p. 22.

somewhat advanced in life and of feeble constitution, and very plausibly conjectured that it acts by restoring the tone of the affected parts. He prescribed the medicine in pilular form, and in the dose of one-sixth of a grain three times a day.[1]

Sulphate of strychnia has been used by M. Sée in the treatment of *epidemic cholera*. The cases in which this physician prescribed it were forty-seven in number, and their results are certainly not such as to encourage a repetition of the trial. According to M. Sée, the advantages of the remedy are that in moderately severe cases it controls the discharges, without producing, like opium and other stimulants, a subsequent violent reaction.[2] But this result is obtained equally well, if not better, by the administration of acetate of lead.

Nux vomica was long ago recommended (*Murray*) as a remedy for *lumbrici*, and it is said to be commonly used, associated with drastics, by the inhabitants of the Dutch province of Overyssel to expel the *tape-worm*.[3] This is quite likely to be true, as all bitter medicines are more or less vermifuge, and this one, in addition, gives unnatural energy to the intestinal contractions.

ADMINISTRATION.—Nux vomica, divided by grating or filing, may be given in the dose of five grains three or four times a day. But its activity is too variable to render this an eligible form of administering it. The *alcoholic extract* (EXTRACTUM NUCIS VOMICÆ) is more convenient, and, when well prepared, more certain. Its dose is half a grain, gradually increased to three grains. The *tincture* (TINCTURA NUCIS VOMICÆ), like nux vomica itself, is of uncertain strength, but is usually prescribed in doses of from five to twenty drops. The dose of *strychnia* should not exceed one-twelfth of a grain, and may be gradually and slowly increased until its effects are produced. It should always be diminished at first, when a different sample of the drug is employed. It is usually made into pills with crumb of bread, or with conserve of roses, care being taken to divide it with accuracy. A preferable method, where its bitterness is not objectionable, is to dissolve a grain of strychnia in two fluidrachms of rectified spirit, with the aid of two minims of sulphuric, hydrochloric, or acetic acid, so that every ten minims of this solution shall contain one-twelfth of a grain of the salt of strychnia. When applied *endermically*, about half a grain of the alkaloid, or of one of its salts, should be used. On account of their greater solubility, the latter are here to be preferred.

ANTIDOTES.—From some experiments upon dogs, Dr. Pendell concluded that lard or other fat, taken before or along with strychnia,

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[1] Hospital Facts and Observations, p. 42.

[2] Bull. de Thérap., xlvii. 183.

[3] PLAGGE, Pharmakodynamik, p. 334.

prevented its poisonous action.[1] But Dr. W. H. Hammond, on repeating the experiment by giving two grains of strychnia with lard to one dog, and without this addition to another, found that the former died, but the latter was uninjured.[2] Dr. Shaw, of Texas, saved the life of a patient who had swallowed from ten to fifteen grains of strychnia, mixed with food, by administering large draughts of sweet oil. The oil, however, acted as an emetic.[3] Under similar circumstances, milk has served as an antidote. (*Rifoldo.*) It has been inferred from some experiments of Prof. Haughton, of Dublin, that nicotine has the power of retarding, and, in certain cases, of counteracting, the effects of strychnia upon frogs.[4] Dr. Harley has determined experimentally that strychnia and wourali are also antagonistic in their operation.[5] Animal charcoal has been proposed as an antidote by Mr. Chippendale.[6] In a case reported by him, four grains of morphia and as many of strychnia were taken, and very probably the morphia may have acted, rather than the charcoal subsequently administered, to prevent, or at least delay, the poisonous effects. Such, in fact, was what occurred in direct experiments made by Rifoldo-Rifaldi. A grain of strychnia was given to a dog, and in a few minutes a grain of morphia also. The symptoms were slowly developed and slight, and the animal recovered.[7] A similar result was long since obtained by Pelletier and Caventou.[8] Chloroform, internally, is said to have arrested the symptoms in man. Camphor is also alleged to be an antidote to this poison, by Dr. Arnett, of Louisiana, who states that he put an end to a violent tetanic attack by administering two fluidrachms of a saturated solution of camphor in whiskey at intervals of half an hour. Within two hours after the first dose, it is said, no unfavorable symptoms remained.[9]

It is evident that of these so-called antidotes some must act, if at all, by preventing the absorption of the poison from the stomach, and others by counteracting the nervous derangement and excitement which result from its absorption. Opium, nicotina, and camphor in large doses are all sedatives of the nervous system.

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[1] Am. Journ. of Med. Sci., Oct. 1855, p. 541.
[2] Ibid., Jan. 1857, p. 273.
[3] Ibid., Apr. 1856, p. 547.
[4] Ibid., Apr. 1857, p. 551.
[5] Archives Gén., Dec. 1856, p. 669.
[6] Times and Gaz., Apr. 1855, p. 423.
[7] Bull. de Thérap., xlix. 41.
[8] Journal Universel, Juin, 1819, p. 258.
[9] Charleston Journal, xii. 86.

FABA SANCTI IGNATII.—Bean of St. Ignatius.

Description and History.—This medicine is the seed of *Ignatia amara*, or *Strychnos Ignatia*, of the natural family *Strychneæ*, a small tree which is a native of the Philippine Islands. It is about the size of a small olive, but is irregularly flat on one side, and convex on the other. Externally it is rough and grayish. Internally it is of a horny aspect, semitransparent, and very hard. These seeds, to the number of twenty, are contained in a tough and ligneous envelop of the size of a large pear.

Lemery says it was a Spanish Jesuit who first discovered it to the Portuguese merchants, and called it by its present name. Its active properties depend upon strychnia, of which it contains three times as much as the vomic bean. Its proportion of brucia, on the other hand, is less.

The virtues of St. Ignatius' bean have always been regarded as identical with those of nux vomica, to the description of which the reader is referred.

Toxicodendron, vid. *General Stimulants.*
Ergota, " *Emmenagogues.*
Sodæ Boras, " *Irritants.*

Class VIII.

GENERAL SEDATIVES.

It has been elsewhere remarked that the primary action of nearly all medicines is stimulant or exciting; and, indeed, the exceptions to this statement are so very few, that it has been doubted whether any really exist. Into this question, which is theoretical rather than practical, we do not propose to enter. From a therapeutical point of view it is easy to perceive that certain agents are endowed with the power of reducing the activity of one or more portions of the system, and that their predominant, if not their exclusive action, even upon the healthy organism, is of the same nature. There is, then, a class of sedative medicines. But, on narrowly examining it, we find that it is susceptible of subdivision.

Life is recognized to exist, in general terms, by functional movements; and as by stimulants we mean medicines which directly augment and quicken those movements, so, on the other hand, by sedatives we imply medicines which directly diminish and lower them. The portions of the economy which more immediately serve as measures of vital activity are the arterial and nervous systems, and experience has proved that certain agents depress the one or the other of these, or both of them together. Of arterial sedatives there are two, digitalis and veratrum viride, the effect of which upon the system is primarily, but not exclusively, to reduce the frequency of the pulse. Of nervous sedatives the number is greater, including, in this work, aconite, hemlock, cocculus, bittersweet, tobacco, lobelia, and white hellebore. These are medicines usually ranked among narcotics, but which differ from the latter by an entire absence from their operation of any stimulant element, or, as in the case of tobacco, in the great predominance of its sedative over its stimulant action, and also by their exerting no soporific influence. Under the title of General Sedatives we include cold, and prussic acid, the former of which, as soon as it has overcome the

momentary antagonistic excitement which its immediate action produces, lowers the activity of the nervous and vascular organs, and, by its direct influence upon them, may extinguish life. The only other member of this subdivision, prussic acid, is even more a general sedative; for although its primary operation is probably upon the nervous system, it so immediately afterwards depresses the heart, and every other vital part, that, in large doses, it tends directly to destroy life.

The substitution of one sedative medicine for another is not frequently advantageous, or even possible, in practice. There is little in common between the different articles of the class, if we except digitalis and veratrum viride in their primary action on the circulatory, and aconite and veratria in their primary action on the nervous system. But the two former affect the nervous system, and the two latter the circulatory system, secondarily as sedatives.

FRIGUS.—COLD.

MEDICAL HISTORY.—The use of cold in the treatment of disease may be traced to the very earliest historical periods, and in the records of every people. Savage and civilized nations have employed it, and it has been equally the instrument of physicians and the resource of quacks. Like almost all human arts, it has passed through alternate periods of popularity and oblivion, but the duration of the former seems disproportionately brief when compared with the latter. No other remedial agent has been subject to as many vicissitudes of fortune. This will be apparent even from the brief historical sketch which is about to be presented.

The refreshing influence of cold drinks is employed as a forcible image by Solomon.[1] In Egypt, where all the usages of common life were regulated by religious laws, bathing must have been very early an established custom, for reference is made to it in the books of Moses. Yet it is remarkable that among the numerous articles of Egyptian furniture that have been preserved to the present day, or which are represented in paintings, scarcely any belong to or illustrate the bath and its appliances. From Egypt cold bathing is said to have been introduced by Melampus into Greece, whence in course of time it extended to Rome. It there reached its completest development, and was surrounded by such circumstances of luxury as have rendered the very ruins of the baths among the most surprising and interesting relics of the Roman capital.

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[1] Prov. xxv. 13.

Hippocrates appears to have formed a very just idea of the remedial powers of cold. The following are among the most conspicuous of his allusions to the subject. Warm water, he remarks,[1] relaxes and debilitates, but cold occasions convulsions, tetanus, lividity, and febrile rigors; it is inimical to the bones, teeth, nerves, brain, and spinal marrow. Cold should be used in actual or threatened hemorrhage, and not upon but around the source of the flow. Snow and ice are injurious to the chest, and provoke cough and hemorrhage. Again, he states[2] that it is useful in cutaneous diseases, and in boils produced by the chafing of the clothing, the arrest of the menses, of the perspiration, &c. Ulcerated chilblains are aggravated by it, but in gouty and rheumatic inflammations of the joints cold affusions subdue the inflammation and blunt the pain. But in this case it must be used with great circumspection. It is not profitable when applied to the rectum or uterus, nor when the urine is bloody; nor is it an appropriate dressing for indolent ulcers, for it hardens the skin and impedes suppuration; nor is it always safe in spasms and traumatic tetanus; but in the idiopathic form of the latter disease, when the patient is young and robust, and the weather warm, cold affusions produce a salutary reaction. This author also dwells upon the importance of cold drinks in fevers, and directs how they are to be prepared.[3]

Paul of Egina cautions againt the use of cold drinks in large quantities after food; and Rhases afterwards renewed this precept, of which all experience confirms the correctness.[4] Aretæus[5] enumerates cold drinks among the causes of tonsillitis, colic, and dysentery, and a desire for them as one of the signs of inflammatory fever. He cautions against yielding too readily to thirst in phrenitis, and recommends copious draughts of cold water after evacuation of the bowels in obstruction of these organs. Celsus repeats, almost in the very words of Hippocrates, the opinions and precepts of the Greek physician; but, so far as relates to the medicinal uses of cold, he adds scarcely anything of his own. He mentions, however, a certain Petro who covered his fever patients with a great many clothes, that he might excite both heat and thirst, whereupon he gave cold water to drink, and if it raised a sweat, he pronounced the patient out of danger.[6] This, it will be perceived, is nearly identical with the practice of administering cold drinks to patients under the process of "packing." Aëtius recommends cold affusions after long and hot journeys or fatigue. The same writer says that cold bathing is a marvellous

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[1] Ed. Van der Linden, i. 91.
[2] Edit. cit., i. 605.
[3] Op. cit., ii. 118.
[4] Adams's Comment., i. 67.
[5] De Causis, &c., Lugd. Bat., 1731.
[6] Book iii. chap. ix.

remedy for menorrhagia and sexual debility. Paulus recommends holding the eyes open under water for weakness and dimness of sight. In the time of Augustus Cæsar a certain Antonius Musa employed cold fomentations and cold baths to cure the emperor of a disease of the liver and bowels,[1] and his success caused the hydriatic treatment to acquire a sudden and rapid, but short-lived, popularity. In the following century it was revived again by Charmis, a native of Marseilles. Like modern hydropathists, he charged all physicians before his own time with ignorance. His method consisted in cold bathing, which he continued even during the winter season, and so wheedled his patients that, according to Pliny, even old men of consular rank grew vain of being seen to emerge from the water frozen almost stiff by the cold. He amassed a large fortune by means of his extortionate charges.[2] Galen wrote very fully upon the uses of cold.[3] He advises cold drinks when the stomach is overloaded and when the bowels are confined, and recommends that water used by the sick should be boiled, as some modern sectaries also do, though without acknowledging the source of their precept. He speaks of the power of cold to arrest hemorrhage, to alleviate heat of the stomach, to palliate continued fevers, to promote perspiration, &c. Avicenna, and the Arabian writers generally, dwell with much emphasis on the virtues of cold water in febrile disorders, constipation, and some other affections of the bowels. Cold affusion was a favorite remedy among oriental physicians, and travellers report that it still continues to be employed by them. Very probably they derived the practice immediately from the Arabians, several of whose medical writers advise the use of cold affusions in febrile and eruptive disorders, and also the internal use of cold drinks to promote diaphoresis. Alpinus relates, although he condemns, the custom among the Egyptians of administering large draughts of cold water to hasten the operation of purgatives, but he admits that these medicines are thereby made to operate in less than the usual dose.[4]

When, on the revival of learning, physicians applied themselves to rescue from forgetfulness the medical experience of earlier ages, a large number of treatises on the uses of water were published. This was during the fifteenth and sixteenth centuries. Among them the most eminent was that of Bacci, or Baccius, which will be again alluded to. Others were published by A. Lusitanus, Pisanelli, Monardes, &c., of whom Boyer observes[5] that their works give no coun-

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[1] Le Clerc, Hist. de la Méd., p. 556.
[2] Ibid., p. 584.
[3] Bell on the Watery Regimen, p. 196.
[4] De Medicina Ægypt., p. 285.
[5] Recherches sur l'Hydrotherapie. Par A. L. Boyer. Strasbourg, 1843.

tenance to the abuses which men of scanty knowledge, or evident charlatans, and even the public, professed to found upon them. From the middle of the sixteenth century cold water became a fashionable remedy, and was very much employed externally; but its internal use was still more general, at first, indeed, almost exclusively among the higher classes, but afterwards among the populace also. The excesses which it occasioned were denounced by De Vega, who drew a striking picture of its evil effects, to which many princes and noblemen had fallen victims. In the seventeenth century a number of writers extolled the usefulness of cold drinks in febrile affections, and of cold enemata in various disorders of the pelvic viscera. Before this period the practice had been confined to the warm climates of Southern Europe, but it now invaded more northern regions. Van der Heyden, of Ghent, published in 1645 a treatise in which he endeavored to show that cold water is useful in indigestion, rheumatism, and gout, that it arrests commencing inflammation, hinders suppuration, and alleviates the pains of stone; also that cold affusions are excellent in hemicrania, and cold enemata in dysentery. Soon afterwards appeared at Copenhagen the treatise of Bartholinus, *De Nivis Usu medico*, which contains a summary of all that had been previously written upon the subject. At the close of the same century the publications of Floyer began to appear in England, and almost simultaneously the cold water treatment was revived in Italy, and rendered very popular by a charlatan named Magliano. The extravagances of his method indeed fell speedily into oblivion, but the treatment by cold water was adopted by a certain number of physicians. Between 1720 and 1730, Todaro, of Parma, and Crecenza, of Naples, renewed its vogue for acute and chronic diseases, internal as well as external. Gangrene was treated with snow; in apoplexy the patient was wrapped in a wet sheet, while cold was applied to the head, &c. But the extravagances of these empirics at length destroyed their popularity when it seemed so firmly established as to be proof against all disasters, and they and their method were forgotten by the public. Meanwhile, however, physicians profited by what seemed good in the latter, and prescribed a due regulation of its employment, as appears by the writings of Rosetti, Lanzani, and others.

At the beginning of the eighteenth century cold bathing was introduced into England as a remedy, by Floyer and Baynard.[1] The former was prompted thereto, as he expressly states, by reading of its use among the Romans and other ancient people. These physicians

[1] The History of Cold Bathing, &c. Reprint, 1844.

confined their treatment almost exclusively to chronic diseases, and those especially of a rheumatic, scrofulous, or paralytic description. They were well acquainted with the diaphoretic powers of cold water, which, indeed, they seem to have got a hint of from the popular method of reducing the weight of jockeys, and which is thus described: "Dip the rider's shirt in cold water, and after it is put on very wet, lay the person in warm blankets to sweat him violently." The treatment of rachitic children was as follows: "As soon as the children are dipped, they, with their wet clothes on, are wrapped up in warm blankets, over their head and whole body, and put immediately to bed, which instantly puts them into a violent sweat. In this they lie all night, till towards morning the clothes are taken of by degrees, so that they may cool gradually." About the same time, as was before mentioned, Lanzani, of Naples, published a treatise on the method of employing cold water in fevers and other diseases. He administered it internally, and combined with its use regulated diet and exercise, and various hygienic means. At the same epoch also (1712), Hoffmann published his treatise, *De Aqua universali Medecina*, and somewhat latter that entitled *De Aqua frigida Potu Salutari*, in which he celebrates the refrigerant and purifying virtues of this element. In the former essay he insists upon the use of cold water in fevers, visceral obstructions, excess or impurity of the humors, plethora, ophthalmia, catarrhs, &c.[1]

But a more important event, as measured by its ultimate consequences, was the publication, by S. Hahn, of his *Psychrolusia* (1738), and by J. S. Hahn (1745) of a treatise on the powers and properties of cold water. These physicians, father and son, lived at Schweidnitz, in Prussian Silesia, and not more than thirty miles from Græfenberg. Their works contain a full account of the medicinal uses of cold water, including its application to almost every known disease. Without entering into detail, it is sufficient to cite a single case to illustrate the treatment employed, its derivation from that of Floyer, and its no less clear parentage of the modern hydropathic system which, as was just stated, but lately flourished almost in the same locality. "A lady was affected in almost all her joints with gout, which had resisted every mode of treatment. At last she was treated in the following manner: Cold affusions and lotions upon the bare head and body; wrapping in sheets soaked in cold water, and which were kept constantly wet for the space of two nights and two days; she sweated, and recovered." The method of Hahn found imitators in Germany,

[1] Op. Om., v. 201.

but, like its English model, soon fell into disrepute, and only continued to be employed by the Silesian horse-doctors in the service of their patients, both quadruped and biped. Mention is made by Geoffroy[1] of a Franciscan monk in Malta, who treated acute and chronic diseases very successfully with cold drinks. Indeed he allowed his patients no food whatever, and no nourishment but water. In dysentery and inflammations of the pelvic viscera, he prescribed enemata of ice water.

From this period until near the close of the eighteenth century there exists but little trace of the medicinal use of cold water, but at the last-mentioned date, Robert Jackson, and soon afterwards Currie, brought it once more into notice. The former employed cold affusions for the cure of fever as early as 1774,[2] and the latter used it for the same purpose in 1787. Both were led by fortuitous circumstances to the adoption of this practice; Jackson by learning that some twenty years before a number of patients on board a hospital ship had, in the delirium of fever, thrown themselves into the sea, and that the survivors from drowning were restored to their senses. Currie was indebted to a paper published in 1786 by Dr. Wright, who therein mentions having successfully employed affusions of cold sea-water when he himself was ill with fever on shipboard some years before. The works of Currie and of Jackson will be referred to for illustrations of the treatment of various diseases by cold water. In spite of the interest which attached to their writings, heightened, as it was, by a contest between them for the honor of having revived so valuable a therapeutic agent, the method once more fell into comparative disuse. It certainly had ceased to form a part of the systematic treatment of either acute or chronic diseases, and to the greater number of practitioners was perhaps entirely unknown, when it once more rose into a higher repute than ever before, and was celebrated by charlatans and not a few physicians in every part of the world as the rightful successor or supplanter of all previous medical systems. Yet its vogue is already declining ; the exaggerations of candid but too credulous inquirers, and the monstrous misrepresentations of avowed partisans, are rapidly shrinking into more rational proportions, and there is even reason to fear that the mischiefs of the system will cause its benefits to be forgotten.

The last *avatar* of the watery divinity, whose career has just been sketched, is represented by Vincent Priessnitz, the keeper of a wretched road-side inn at Græfenberg, in Austrian Silesia. This

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[1] Mat. Med., i. 84.

[2] Treatise on the Fevers of Jamaica, 1791.

peasant seems to have possessed much native shrewdness, which enabled him to make use of some vague notions gleaned among the neighboring shepherds, who treated many of their injuries and ailments with cold water, precisely as Hahn had done a century before. They, however, imagined that the virtue of the application was communicated by certain mystical ceremonies, such as had been practised three hundred years earlier by the cotemporaries of Ambrose Paré. Like that great surgeon, the peasant innkeeper divined in what the curative power of the treatment resided, and immediately began to employ it for his own profit. Accompanied by his brother, heralded by his fame as a water-curer, and with his sponges on his back, he traversed the mountains which divide Græfenberg from Prussian Silesia, visiting the sick in the villages, giving them advice, and employing his remedy for the relief of sprains, bruises, &c., in men, and for the cure of lame horses. Although these acts were contrary to law, they were performed in spite of the police, and the itinerant quack-salver soon acquired all the celebrity and honor which persecution usually confers upon the meanest persons. This persecution was zealously promoted by the physicians of the neighborhood, who, being unable to deny results which were palpable to every one, alleged that the sponges of Priessnitz were medicated. They even caused the wonder-working implements to be seized, in the hope of detecting in them some medicinal preparation, but when, after tearing them to pieces, nothing could be discovered, these ill-advised zealots found themselves the laughing stocks of the whole country. The rude pathology of the itinerant healers was the popular one, the humoral. This faith procured a ready acquiescence in measures which were declared all powerful to purge the blood of its peccant humors, and which were to purify the system by means of baths and frictions and forced sweats. A certain professor, Oertel, in 1828, fell in with Priessnitz and advised him to add the internal use of cold water to his other curative means, and, not content with this, published a work setting forth the virtues of a system of which the world might otherwise have remained in ignorance, and but for which the water-cure mania might never have become epidemic. Very soon the number of patients at Græfenberg multiplied exceedingly, and the vogue of its curative method spread over Europe and America. Men of rank and influence, who had been restored to health by its discipline, procured for Priessnitz the right of creating a water-cure establishment, which became the model after which numerous others were formed in every part of Europe and in the United States. Its proprietor grew rich, but, although he was taught some measure of prudence by the fatal

results of his earlier practice, he continued to the last wedded to his ignorance, and his boorish nature remained unsoftened by his intercourse with the educated and refined persons who sought for health at his hands.[1]

It is worthy of remark, as an illustration of how little theoretical dogmas have to do with a belief in, or a submission to, the practice with which they are united, that the system of Priessnitz—the most notable illustration that could be conceived of the dogma *contraria contrariis curantur*—should have arisen about the same time and out of the same nation in which *similia similibus medentur* was proclaimed as an infallible and universal principle. Nor is it less remarkable, as an illustration of the effrontery of medical impostors, that many of the sectaries of the latter heresy are the boldest trumpeters of the former, although each necessarily excludes and contradicts the other. The interpreter of nature, indeed, adopts neither dogma; for he perceives that neither forms the principle of more than a limited class of facts. As exclusive systems, he rejects both, but is equally ready to adopt the perturbating method of Priessnitz or to imitate Hahnemann by withholding all medicine, when either seems more appropriate than the medicinal treatment which, in the great majority of instances, effects the quickest, safest, and most agreeable cure.

Surgical History.—The ancients do not appear to have employed cold as an external agent in surgical affections, to as great an extent as modern physicians. Traces can nevertheless be found of their partial acquaintance with its value. Besides those which have been mentioned incidentally, may be cited the testimony of Celsus, who mentions the power of cold water in arresting hemorrhage,[2] and that a slight wound is helped by laying on it a sponge squeezed out of cold water. But, he adds, in whatever way it is put on, it does good no longer than it is moist. There is no prominent mention of the subject by surgical writers of note, during the long period that elapsed between the time of Galen and the fourteenth century. The gross polypharmacy which had so long prevailed, then began to be supplanted by an affected simplicity of treatment. Wounds, ulcers, and many cutaneous affections were treated by water alone, or by water in which some unimportant substance had been dissolved, and which was dignified by a singular or sonorous name. But it was not until the middle of the 16th century, after the return of the French from the Italian wars of Francis I., that the value of cold water was

[1] Schedel, Examen Clinique de l'Hydrotherapie, Paris, 1845.

[2] Book v. ch. i. and xxvi.

recognized in the treatment of injuries and wounds.[1] Ambrose Paré contributed not a little to make the method generally accepted, although he himself adopted it reluctantly, because it was generally practised by quacks, and disfigured by superstitious practices. A few years later (1570), Palazzo published a treatise on "the true method" of curing wounds with pure water and pledgets of linen, in which he holds up to ridicule the charms and superstitious observances which were popularly thought to make the applications useful. In 1601, Martel, wrote an apology for his own use of cold water, in which he defended the practice against the attacks of those who stigmatized it as unprofessional. His estimate of the plan he expressed in the words: "I consider that keeping wounds clean is one of the chief means of promoting their cure; now it is certain that water cleanses and purifies them thoroughly. By its coldness it prevents inflammation, moderates the acrimony of the humors, &c." According to Percy the employment of cold water was gradually supplanted, in the northern part of Europe at least, by a variety of vain or superstitious practices, including the use of the famous sympathetic powder. In the milder climate of Provence and Italy, its vogue was of longer duration.

About the beginning of the last century, Sir John Floyer alluded to the use of cold water in surgery for the purpose of arresting hemorrhage, and preventing hemorrhage after wounds; and Smith, in his *Curiosities of Common Water*,[2] says, "Cold water is an absolute cure for small cuts in the fingers or other parts." After adjusting and bandaging the wound, he directs the following treatment: "Double a linen rag five or six times, dip it in cold water, and apply it to the part, *binding it on fast.* This, by preventing inflammation and a flux of humors, will give nature time soon to heal it without any other application." The same author speaks also of its usefulness in lacerated wounds, and in strains and bruises, to which he directs it to be applied by keeping "the part in a tub of cold water for about two hours," or by laying to the part folded towels dipped in cold water. About the same time (1713), Sancassani, of Venice, published a treatise in which he says of the use of cold water for wounds, "It prevents any interference with nature, who is, after all, their true healer."[3]

It would appear that the use of cold water in surgery again fell into disuse, according to Percy, for the *fifth* time, and was very little employed until 1785, when its vogue began a new career. A number of officers and soldiers of the French army were wounded at Strasburg by the bursting of a cannon, and were very successfully treated

[1] Percy, Dict. de Méd., tom. x. [2] 4th ed., 1723. [3] A. Amussat, Thése, 1850.

by a quack, who used cold water only for the cure. A similar accident occurred soon afterwards, and the same treatment was again employed, but on this occasion by Lombard, who, together with Percy, caused the practice to be very generally accepted. So strong was Percy's persuasion of its value, that he declared he would have abandoned the practice of surgery, had he been denied the use of water-dressings. Their advantages were pre-eminent in the treatment of lacerated wounds involving fibrous structures. He boasts that by means of water alone, he preserved limbs which nothing else could have saved from amputation. By water more or less cold, according to the external temperature, and applied in baths, on sponges, or on compresses, he prevented or moderated inflammatory symptoms, and brought about cures with which no others could be compared. This method of treatment was, as has been stated, revived and became general during the wars of the French Republic and Empire, and although used on many occasions because the customary dressings could not be procured, yet the army surgeons were unanimous in its praise, and preferred it to less simple measures. Larrey speaks of the great success which attended the use of cold sea-water as a surgical dressing on the march of the French army across the desert which divides Syria from Egypt. After the battle of Baylen, in Spain, an immense number of wounded were to be cared for, but except linen dressings wet with water, none could be obtained. Yet out of five hundred patients, not more than seven or eight were attacked with gangrene, and only two with tetanus. Guthrie, whose field of observation was adjacent, and not less extensive, was accustomed to treat all wounds of the soft parts in persons of good constitution, by cold water applied over a dressing of simple ointment, and kept cool by constant renewal. But he soon learned that the method was not of universal application. Some patients suffered from the sensation of cold, and a still greater number did not continue to be benefited by its operation. His practice, therefore, was to discontinue the application whenever it appeared to produce chilliness or pain, when the parts became callous by its use, and when it seemed to check suppuration unduly. These views were systematized and more extensively applied by Macartney.

During the long peace which followed the year 1815, there was little occasion to resort to cold water dressings in military surgery, and they seem to have again fallen almost completely into disuse. The next revival of their employment is perhaps traceable to the notoriety of the Silesian water cure. It was, at least, several years posterior to the establishment of the latter in 1834, that Josse of Amiens employed with great success continuous irrigations in various

inflammatory affections and injuries. According to the published account of his experience, it would seem to have been not only exempt from accident, but even remarkably successful. Mayor, of Geneva, Liston, and Malgaigne, attributed excellent results to the treatment of surgical affections by cold water. The last preferred irrigation to other methods. He, as well as Nélaton, and many other surgeons, considered it as chiefly applicable to contused and lacerated wounds of the head and extremities.

In spite of the use of the cold water dressing by so many distinguished men, and at so many different periods, its last revival was fated to the same issue as preceding ones. On account, as Amussat suggests, of the care and caution which the method requires, and especially of the evils which it sometimes occasioned, it has been gradually once more abandoned by the most eminent surgeons, and is now very rarely used in hospital practice.

Action.—The temperature of the human body varies with that of the surrounding medium. In the mouth and rectum it is about 98° F., and in the blood, according to Magendie, 102° F. Inflammatory diseases may raise it to 102° or 106°, and in scarlet fever it sometimes reaches 112°. In malignant cholera, on the other hand, the temperature of the mouth has fallen as low as 77°.[1]

In health, the animal temperature is very nearly uniform, owing to the combined influence of food and the interchange of caloric with surrounding objects; but if these influences are suspended, and the outer air grows cooler, the temperature of the body may fall considerably. To maintain a moderate and equable degree of warmth in the system clothing is employed, and varied with the season. The warmest material for clothing, that is to say, the least perfect conductor of heat, is made of furs or feathers; silk follows next in order, then wool, cotton, and finally linen. The thickness of a garment made of any among these materials, is of course an important element in estimating its power of retaining the animal heat, so that the better conductor may make the warmer garment owing to its thicker and closer texture. Cold air abstracts heat chiefly from the surface of the body. Water is also used to absorb internal heat, when employed in the form of cold drinks and cold enemata.

The exhalation of aqueous vapor from the lungs and skin is the principal means by which the animal temperature is lowered; but the activity of this process depends upon the hygrometric state of the atmosphere. Therefore, warm and moist air augments the suffering

[1] Mitscherlich, op. cit., i. 401.

from heat in summer, while cold and damp air produces a corresponding increase of distress in winter. In the latter season dry air is the most agreeable and healthful, when the temperature is at or near the freezing point, and in summer, also, under almost all the ordinary conditions of heat at that season. Cold and dryness combined give rise to a copious exhalation of aqueous vapor, as well as of heat, from the body, and make, therefore, a large demand upon its nutritive function to supply the loss. This is one cause of the more vigorous appetite and digestion enjoyed in winter. In summer, on the other hand, the loss consists in a much larger proportion of fluids, particularly of perspiration, hence the craving for liquids, and the desire to drink them cold in order to moderate the painful accumulation of heat within the system.

When the body is exposed to a moderate degree of cold, the skin at first grows more ruddy, and the sensation of coldness is felt in the fingers, the tip of the nose, the ears, and other parts which are comparatively unprotected, and are remote from the central organ of the circulation, and owing to the smallness of their mass, are readily exhausted of their caloric. If the cold acts upon the entire surface of the body, as in a bath at 60° F., for example, the temperature of the hand may fall from 98° to 72°, while the interior of the body probably does not change its temperature at all. As the temperature of the body falls, the skin grows pale and shrivelled, and has more or less of the appearance known as goose-flesh, and the nipples and the penis are shrunken. Wherever a part thus loses its volume, the capillary vessels no longer supply it so abundantly with blood, and to this circumstance, and to the absence, or at least the diminution, of the calorifying processes which result therefrom, must be attributed the sinking of the temperature. The influence upon the pulse of cold applied internally in the form of cold water, has been studied experimentally by Lehmann,[1] and by Dr. H. Bence Jones and Mr. H. Dickinson,[2] who all found it lowered in a degree proportioned to the coldness of the water. The douche has also a more marked influence than other baths, especially when the volume and shock of the water are great. The sensibility is also lessened by the application of cold to the whole surface of the body, and, when it exceeds a moderate degree, numbness is produced. At the same time all of the secreting organs perform their functions imperfectly, and the muscular system is more or less torpid.[3] The operation is, however, followed by an increased discharge of urine.

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[1] Arch. f. wissent. Heilkund., i. 521. [2] Times and Gaz., April, 1857, p. 421.
[3] Mitscherlich, op. cit., i. 404.

The inspiration of cold air produces marked effects. It acts more powerfuly upon the nasal passages than upon the trachea and its branches, because in the latter it is tempered as well by admixture with the expired air, as by the heat of the parts themselves. Dry air abstracts caloric from the lungs more rapidly than moist air, because it more readily absorbs the pulmonary exhalation; but this cooling process is more than compensated for by the greater proportionate quantity of oxygen which the air supplies to the blood, and by the slighter abstraction of caloric which it makes directly from the surface of the body and of the respiratory mucous membrane. But if dry, cold air is inspired immediately after the respiration of warm air, the former acts as an irritant upon the relaxed mucous membrane, checking its secretion and often causing it to inflame. Yet the danger of this result is greatly increased when the air is both cold and damp. It then acts not only as a local irritant, but also by abstracting heat from the surface of the whole body, it lessens that power of reaction which, when the air is dry, tends to ward off the injurious local effects of cold. Furthermore, it drives the blood inwards upon the organs of the trunk, and disposes these still further to inflammatory disease.

Ice, *snow*, and very *cold water*, *taken internally*, produced phenomena which vary only in degree. The ordinary effects are a sense of coldness in the mouth, throat, and stomach, and more rarely, a general shuddering, and a slight diminution of the frequency of the pulse and of the heat of the body. In large quantities they often produce pain in the stomach, trismus, various spasmodic phenomena, and even sudden death; in other cases vomiting, decided chill, and occasionally inflammation of the stomach and congestion of the lungs or brain. A permanent sedative action is not to be looked for, but on the contrary, the secondary effect of a draught of cold water is to increase the animal heat, quicken the pulse, and augment the perspiration.[1] The conditions which favor the injurious action of cold drinks are, as Rush first pointed out,[2] general heat of the body, emptiness of the stomach, the large quantity of liquid taken at a time, and the low temperature of this liquid. These effects, which are remarkably frequent in the United States, have been amply illustrated by Rush, Brewster,[3] Carroll,[4] and other American writers. The symptoms, as described by Brewster, are these: Soon after the patient has swallowed the cold water, he feels an uneasy sensation about the scrobiculus cordis, which,

[1] Mitscherlich, op. cit., i. 406; Guerard, Bullet. de l'Acad. de Méd., vii. 422.
[2] Med. Obs. and Inquir., i. 193.
[3] Phila. Journ. of the Med. and Phys. Sci., xi. 99. [4] Ibid., xiii. 122.

gradually increasing, is soon converted into violent lancinating pains which extend all through the abdomen and thorax. Breathing produces as much distress as in pleurisy, and the patient describes his pain to be as if a cord were bound tightly around his stomach, or as if sharp-pointed instruments were penetrating it. It then becomes more intense, and assumes a paroxysmal spasmodic form, which has been compared to the throes of labor. As the suffering grows more excruciating, the patient bends himself almost double in order to obtain relief, and writhes in the most indescribable agonies. If no assistance is afforded, he may become delirious. The pulse, though in some instances thready, is very hard when examined closely; the face is excessively red; the eyeballs glare. These symptoms gradually subside, and the patient falls into a lethargic coma, and lies perfectly easy. The jaws are now fixed; deglutition is interrupted; respiration is slow and stertorous; the pulse is gone; there is a sluggish circulation, with cold sweats, and pallid surface, and singultus generally closes the scene. If death does not take place, violent reaction commonly ensues, with general fever, and congestion of internal organs, particularly of the brain.[1]

The transient application of cold to a living organism develops the peculiar effects of this agent so slightly that they are scarcely cognizable before the phenomena of reaction appear. The impression seems, indeed, almost like that of a direct stimulant. The involuntary muscles are thrown into active movement, the surface to which the cold is applied becomes highly colored with blood, particularly when it is of considerable extent and unused to receive external impressions, as in those parts which are habitually protected by clothing. By its stimulant influence the cold weather of autumn and the early part of winter increases the activity of nearly all the functions. The fat and flesh increase, and the stools become less abundant and more consistent, while the fluids of the economy, instead of finding an outlet on the skin, are secreted more abundantly by the kidneys, so that the urine becomes copious and watery.

Cold air abstracts heat gradually from the parts of the body with which it comes in contact, from the skin, that is, and from the mucous membrane of the air-passages. When the temperature of the atmosphere is between 64° and 68° F. and the clothing is moderately warm, an almost constant temperature of the body is maintained. But when the air is colder, it becomes necessary to protect the body with

[1] Compare Currie "On the disease that arises from drinking cold liquids, or using the cold bath, after severe exercise." Op. cit., i. 97.

additional clothing, and to maintain its temperature by means of exercise and food. A still lower degree of external cold prevents the due renewal of lost caloric, and congelation follows. Gradually the ears, nose, chin, hands, and feet become insensible, then stiff, red and painful, but afterwards dry, pale, and insensible. The nails first grow bluish, the teeth chatter, the whole body is restless and shivering, the chest is constricted, the breathing hard, the circulation sluggish, the movements painful; congestion of the internal organs takes place, exhaustion follows, the senses become obtuse, and by degrees all signs of life vanish. When the abstraction of heat takes place rapidly, sleep is induced which tends to pass into coma, and sometimes into death. The body is insensible and pale, and feels hard and cold; the features are distorted and every part firmly contracted. The mouth is shut, the feet and limbs are drawn up, the eyelids open, the cornea is turbid, and the excrements are no longer discharged. But even this degree of general congelation is not always fatal, but is attended with such a degree of torpor only as does not entirely preclude recovery, provided that heat be gradually and systematically applied. Humboldt showed that when the irritability of a frog's leg is diminished by cold, it can nevertheless be again revived by a gradual restoration of warmth, while under the sudden or rapid restoration of heat it displays only a brief and feeble vitality.

The more strictly *local* effects of severe cold are observed in the parts above enumerated, as those which first suffer from its general application, the nose, ears, fingers, &c. After having become insensible, the frozen portions are either covered with blisters, or the color of the skin changes to livid or black, showing that gangrene has set in, which, if the cause continues to operate, merges into sphacelus; the part appears to the sufferer singularly heavy, and the epidermis, when peeled off, shows the livid and marbled chorion beneath. The flesh then grows soft and exhales a putrid smell; and the fingers, the toes, or a whole limb, even, may perish and separate spontaneously from the body. After death from cold, the external parts of the body are remarkably pale and bloodless, while the internal organs, on the contrary, are gorged with blood. Serum is often found in the ventricles and under the membranes of the brain, and sometimes the signs of sanguineous apoplexy.

The action of cold upon the animal economy varies according to the conditions of *rest* or *motion* of those who are subjected to it. Its effects in the first case have already been pointed out. They are of a depressing, benumbing, and debilitating character. But the same degree of cold will produce the very opposite effects upon a person in

active motion. It will develop color, strength, and warmth, instead of producing pallor, feebleness, and coldness, activity instead of torpor, vivacity instead of dulness. Under its influence the appetite grows keen and the digestion vigorous—life exhibits its perfect energy. On the other hand, when the body is at rest and the cold in motion, as cold wind, its ordinary effects are greatly magnified. The air rapidly carries away the heat of the body, and excites severe pain wherever it comes in contact with the skin. A slight degree of cold, or what, for the present purpose, is the same thing, a partial application of severe cold to the surface of the body, acts, at least indirectly, as a stimulus, and probably by the painful sensation it excites. This may be well illustrated by the fact that the cold hand placed upon the abdomen of a pregnant female will excite strong contractions of the womb; dashing cold water upon the feet, or walking upon a cold pavement, has been used even from ancient times to procure relief from constipation; a few drops of water sprinkled in the face is a popular method of exciting the respiratory movements and restoring the consciousness of persons in a swoon; the same expedient is resorted to for the same purpose to establish respiration in feeble and asphyxiated infants at birth; cold affusions are employed to arouse persons from narcotism; and animals in the apparent death of hybernation may be revived by the same means.

All *strong emotion* produces more or less insensibility to cold. Acute pain, deep study, fixed attention, the excitement of hope, of emulation, of ambition, of anger, a deep sense of danger, violent terror, the morbid fixedness of ideas in monomania, the rapid and tumultuous flow of the thoughts in mania—all of these and their kindred conditions destroy in a great measure the sensibility to cold, and even seem to lessen its hurtful influence. The former effect is familiar to every one who has had charge of the insane, whom it is not unusual to see moping or raving in a state perhaps of perfect nudity, yet without apparent suffering, when the temperature of the air is such as to chill their attendants thoroughly. Cases of this sort seem, indeed, to prove that no small part of the ordinary suffering from a low temperature is due to the depression of the system which the first painful sensations of cold produce. Every one must have observed how rapidly the suffering from cold augments under the pain of a suppressed desire to urinate, and how much less the cold is felt immediately after that desire is gratified.

Age modifies materially the action of cold upon the living organism. Those ages which are most distinguished by feebleness present the greatest number of examples of its hurtful effects. The new-born

infant feels its impression perhaps more painfully than any other person. The aged, having completed the cycle of life, return in many respects to the condition of infancy, and in none more than in extreme susceptibility to cold. The mortuary registers show a very remarkable increase of deaths among the aged and the very young whenever the winter is unusually severe. It fact, not to multiply illustrations, it may be stated in general terms that whatever weakens vitality augments the injurious influence of cold upon animal life.

The effects of cold have been illustrated on a large scale in the annals of military expeditions undertaken in the winter season. Such were the campaigns of Alexander the Great, in the North of Asia; of Tamerlane, when he issued from the wilderness to invade Russia; of Charles XII., in the barren and ice-bound steppes of the Ukraine; of the marshal of Belle Isle, who left 4000 of his men victims to cold and hunger on the hills of Bohemia. But the most memorable illustration is to be found in the history of the invasion of Russia by Napoleon. Out of a well-appointed army of four hundred thousand men which invaded Russia, scarcely thirty thousand recrossed the Niemen. The rest had nearly all perished by cold and famine. On the retreat from the Beresina to Wilna, says a historian of this disastrous campaign,[1] the soldiers, oppressed with weariness, gave themselves up to the seductive approaches of sleep; some were even indifferent to death. Many had their limbs frozen, and were but too happy to escape thus alive; some, stopping to obey a call of nature, perished where they halted. After the pillage of Kowno, eight hundred intoxicated men slept in the snow, and never woke again. Horsemen who had been obliged to wear their boots for several days together were surprised, at the end of this time, to find their toes or feet frozen. Sentinels were frozen stiff and motionless at their posts. Comrades were obliged to warn one another of the state of their ears and noses, for the vitality of these organs was frequently destroyed without the least consciousness on the part of the sufferers.

Remedial Operation.—The sketch that has now been given of the properties of cold in its relation to animal life renders it evident that the mode of its action is not simple and uniform, but multiple and various, according to the circumstances under which it operates. According to the nature of these, cold may be refrigerant, excitant, sedative, astringent, tonic, debilitating, or perturbating. Its *refrigerant* property renders it applicable to all cases in which the heat of the whole or any part of the body is excessive, and enables it to check

[1] Moricheau-Beaupré, Effets du Froid, 1817.

inflammatory processes tending to disorganization or other substantial derangement. In proportion to the suddenness of its application, cold becomes a *stimulant*, indirectly, however, through the reaction which follows its contact with the body. It acts upon the general sensibility to arouse the whole system to greater activity, as in cases of suspended animation, of paralysis, or of atony affecting particular organs. Cold is a powerful *sedative* by means of its prolonged influence upon the whole or any portion of the body, relieving the pain, heat, and swelling of local inflammation or of determination of blood, and indirectly subduing the excitement of the nervous and circulatory systems dependent upon these causes. This property may be illustrated by the pale and shrivelled aspect of parts subjected to cold, and by the readiness with which erectile tissues shrink under its influence. Pathological facts may be cited to the same effect. The flow of the menses, the milk, and the perspiration, is interrupted by cold. In Italy, it is said that the peasant women arrest the secretion of milk in their breasts by having very cold water dashed between the shoulders, and prevent its establishment after childbirth by means of cold applications to the mammæ.

The *astringent* action of cold is, for the most part, a mechanical effect; it is, however, carried further in living than in dead matter, because the fluids are more easily moved in the former than in the latter, and because a sedative influence accompanies it. Hence it empties an inflamed or swollen part of its fluids by a direct mechanical or constringing power, and at the same time subdues the local excitement which invites the afflux of blood. Hence, too, it gives tone to the tissues which it constringes, by removing from them the fluids by which they were distended and weakened.

The *tonic* action ascribed to cold may be regarded as a combination in various degrees of its sedative, astringent, and stimulant qualities. In proportion as a part or the whole of the body is susceptible to external influences, so may it be said to be in a state of irritability which strongly inclines it to become inflamed. Cold, if duly applied, reduces this morbid over-action, imparting at the same time greater firmness of tissue and activity of function; in other words, increasing its tone. Such will be the effect when the system possesses a due share of resiliency; but if it is unable to react under the impression of cold, neither will stimulant effects immediately follow the application of cold, nor yet the tonic results which are, as it were, the signs of an aggregate of separate stimulations. The sedative effects will remain predominant. Hence it is evident, as also direct experience teaches,

that cold applications are dangerous when the system is exhausted or debilitated, and useful when excitement or strength exists. According to the aphorism of Sanctorius, *Lavacra frigida corpora robusta calefaciunt, debilia refrigerant.* Cold has also a mode of action which seems combined of its stimulant and *antispasmodic* properties. Perhaps it possesses the latter in virtue only of the former. The sudden impression of cold water will generally suspend spasmodic paroxysms, whether general or partial, and when these are chronic and habitual, will often, by constant use, remove them entirely. In the former case the antispasmodic action is immediate and direct, but in the latter the tonic property of cold is more distinct.

REMEDIAL EMPLOYMENT. *Continued Fevers.*—Galen, according to Baccius,[1] states that a cold bath taken after a warm one cures ephemeral, putrid, and the greater number of hectic fevers, and that the former alone is frequently of great service in fevers, provided the patient have strength enough, if there is a deposit in the urine, and the important organs are free from disease. These recommendations, guarded as they are, were still further qualified by requiring that the patient should be young, the weather hot and dry, and the fever violent. As will appear in the sequel, the most judicious among those who have recently employed cold water in the treatment of febrile affections, reached by means of their own experience, conclusions almost identical with those of Galen. The method was not confined to the Eastern hemisphere. Americus Vespuccius relates that the aborigines of this country when attacked with fever, were accustomed to bathe in the coldest water they could procure, and, immediately on leaving it, to run as far as possible, and use violent exercise before a hot fire; after which they slept, and awaked free from fever. Without dwelling longer upon the remote history of this branch of the subject, it is sufficient to state the results of modern experience in the treatment of fevers by cold, and especially by cold water.

Probably the use of this remedy is beneficial during the periods of augment and station in nearly all the graver forms of idiopathic fever, or when it assumes a typhoid type during one period or another of its progress. Most of the cases of "inflammatory fever" (*Synocha*, Cullen) which are contained in the works of ancient and modern writers, were probably examples of symptomatic fever, the source of which was unsuspected, or at least undiscovered. In this, however, as indeed in all forms of fever, whether idiopathic or symptomatic, cold has its appropriate uses, which are especially to moderate the heat of head,

[1] Op. cit., p. 412.

cerebral excitement, and thirst, which are common to them all. But it is in the graver forms of fever, and especially in *typhus* (*t. petechialis*), that the value of the remedy is pre-eminent. It was for this affection that Currie so successfully used cold sea-water, at 44° F., of which several gallons were poured over the patient's body. When applied at the onset of the disease, it sometimes arrested the attack abruptly and by a single effusion. But a day or two, or even a few hours, later, the result was less prompt, and the application had to be renewed. In these cases the heat of the skin was always great, and usually at or above 100° F.; a lower temperature than this was not considered to warrant the employment of cold affusions. The preceding statement is in full accordance with the results of Jackson's experience. "The period," he remarks, "within which a complete and final cure may be expected to be attained with confidence, *is comprehended within the third day.*"[1] At a later stage of the attack, this method may, perhaps, palliate the symptoms, and even determine a salutary issue of the disease, but will not much, if at all, abridge it. All experienced writers on this subject coincide in the opinion here expressed. One of the most eminent, Armstrong, uses language almost identical with Jackson's. "During the first, second, and third days of the stage of excitement," he remarks, "more especially during the first, I have sometimes seen the simple typhus entirely extinguished by the affusions of cold water . . . . but from the fourth day of this stage, I have not often seen them useful."[2]

In *typhoid* fever (slow nervous fever, dothinenteritis, typhus abdominalis, enteric fever), cold affusions are of slight advantage, if, indeed, they are not positively injurious. The disease will run a definite course, usually exceeding a fortnight in duration, and cannot be cut short by cold, and probably by no agency whatever. The cerebral symptoms may indeed be palliated by cold lotions applied to the head, or even by cold affusions upon this part, but the application of cold water to the entire surface of the body ought, perhaps, in every instance, to be avoided. The patient may be placed in a warm bath, while cold water is poured upon the head, with great advantage in those cases of the disease which are distinguished by violent delirium, or profound coma, with cool extremities and a collapsed state of the cutaneous surface.

The general success of the method under notice is attested by a great number of physicians, to some of whom reference may be

[1] An Exposition of the Practice of Affusing Cold Water, &c., p. 183.

[2] Pract. Illustrations of Typhus, &c., Am. ed., p. 65.

made. Dr. Hall,[1] in an epidemic of petechial typhus, employed cold vinegar and water for washing the body, and found it of great advantage, particularly by rendering the pulse slower and stronger, by abating the delirium and heat of skin, and procuring sleep. During the disastrous wars of the French empire, typhus fever ravaged Europe, destroying thousands whom the sword had spared, and severely tasking the strength and the feelings of the officers, civil as well as military. Active measures, therefore, recommended themselves to those who had little hope in any means of arresting the pestilence, and hence the use of cold affusions became general. Reuss and Horn, in Germany, and Mylius, at St. Petersburg, employed them upon a very large scale, and found them of greater service than any other means whatever. Horn, especially, attached great importance to their use, which he combined with the internal administration of cold drinks, with ice to the head, and frequent ablutions of the skin.[2] Hildebrandt, too, was disposed by some trials of his own, and by the reports of Currie, to adopt this method of treating typhus.[3] It must be confessed, however, that his authority cannot lend it much weight; for a few years later, and although he had made no trials with it in the interval, he professed his repugnance "to seeing a patient sluiced with cold water as if he were a dog." After a long and extensive experience, Froelich[4] gave a preference to cold affusions over every other mode of treating continued fever; but he limited their application to cases in which the skin was preternaturally hot (above 100° F.). Under this temperature he, like Currie, regarded tepid or cool applications as more salutary than cold, and preferred them to be applied locally rather than generally.

In the "famine fever" which prevailed in Great Britain and Ireland, a few years ago, and which was essentially typhus, a modification of the treatment by cold water was used with very satisfactory results by Dr. Gill, of Nottingham.[5] Instead of cold affusion, he adopted the wet wrappings of the Græfenberg school. When the skin was burning hot, a sheet wrung out of cold water was applied *closely* to the whole body, which was then enveloped in three or four blankets. Small quantities of cold drink were given from time to time, and the operation lasted from an hour and a half to two hours. The application was followed by a most grateful sense of refreshment, and soon afterwards by a more or less warm perspiration; the muscular pains were relieved, and the delirium and thirst abated. Incipient cases

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[1] Edinb. Med. Com., xx. 327.
[2] Schedel, Examen. Clinique, &c.
[3] Du Typhus, &c., Trad. de Gasc, 1811, p. 260.
[4] Archiv. Gén., iii. 628.
[5] Ranking's Abstract (Am. ed.), vi. 1.

were often cut short by one or two applications of the method. When catarrhal complications or diarrhœa existed, they were improved and not aggravated. In several instances, even, the treatment induced a confined state of the bowels.

It will be observed that between the epidemics of 1812–15 and a very recent period, the treatment of continued fever, of the typhous type, by cold water, appears to have been quite abandoned, nor perhaps would its revival have taken place but for the attention drawn to the subject by the temporary influence of the hydropathic heresy. As Schedel points out, in spite of the general approbation which the method once enjoyed, it soon became reserved for exceptional and urgent cases. When once the epidemic declined which had rendered it popular, the treatment also fell into disuse. Some, like Bateman, did not find it to fulfil the hopes entertained of it, and employed sponging with cold water in its stead. Others relinquished it, and this was perhaps the most common case, on account of the strong aversion to it on the part of the sick, and of the great trouble its employment entailed, so great, indeed, that in private practice it could seldom be resorted to efficiently.

The conclusions which seem to be fairly deducible from the evidence now referred to may be thus summarily stated. Cold affusion forms a powerful, safe, and prompt remedy for typhus fever if applied within two or three days of the onset of the disease, if the patient is vigorous, if the heat of the skin exceeds 100° F., and if no intercurrent inflammation exists. At a later period of the disease, it can act only as a palliative, and is not unattended with danger. At all stages, however, of the augment of typhus, cold sponging of the entire surface of the body tends materially to moderate the febrile action; and throughout the disease cold, in any form, applied to the head, is an indispensable remedy for the delirium and cerebral excitement which belong to this affection.

Eruptive Fevers.—The treatment of exanthematic fevers by cold water is far from being new. Kæmpfer makes mention of it in *measles*, and Bartholini and Theden in *smallpox*. Smith refers to the plentiful use of cold drinks in smallpox as very useful, although in opposition to the received opinions of his day. Sir John Floyer relates several cases of the same disease in which the patients recovered after having thrown themselves into cold water, and Currie, several also in which its application may have done good. But such instances must be regarded as exceptional, rather than as grounds on which to base a rule of treatment. It does not follow, on the other hand, when the imperfection of the eruption, or the feebleness of the patient, forbids

the use of cold water, that the old practice of endeavoring to force a development of the eruption by thick bed-clothing, and by excluding the fresh air, is to be commended. On the contrary, in all of the exanthemata, though in measles with greater circumspection, cool air should be freely admitted, for it goes far, at least, to assuage the irritability of the skin. Hancock, Kæmpfer, and others, indeed, report cases in which cold drinks, and even cold affusions, seem to have been serviceable in measles. Guersent approves of the latter when there is no pulmonary inflammation, and Giannini expresses a similar opinion. The method can seldom, however, be appropriate in a disease comparatively of such feeble action as measles, and in which the pulmonary complication usually contraindicates it. The only form in which cold would here seem to be allowable is that of the wet sheet thoroughly wrung out and covered, immediately after its application, with blankets.

But it is in *scarlatina*, a disease in which the skin grows hotter than in any other whatever, that the benefits of cold air not only, but of cold water applied by sponging, affusion, and even the douche, are so striking as to merit a more particular description. For this method of treatment medicine is indebted to Currie, who published his first account of it in 1797. He was then of opinion that the affusion of cold water "extinguishes incipient scarlatina," preventing the eruption and curing the patient radically. He also recommended the affusions to be made early in the disease, and if at a later period, then only if the skin was dry and the heat greater than natural. He considered cold affusions to be especially applicable to the forming stage of the more sthenic forms of the malady, when the heat of the skin is intense (105° to 112° F.), and attended by great sensibility and a bright red flushing over the whole body, with some stiffness of the neck, hoarseness of the voice, and rawness of the throat. When called in at this early period, his plan was "to strip the patient and dash four or five gallons of the coldest water to be procured over his naked body. . . . In one or two hours afterwards the heat is often found, on examination, as great as before. The affusion is therefore repeated again and again, as the obstinacy of the heat may indicate. . . . At the end of this time, but commonly earlier, the force of the fever is broken, and a few tepid affusions, at longer intervals, are sufficient to subdue it entirely. . . . On the third day, very generally, or sometimes the fourth, the patient is convalescent.[1] After the third or fourth day, Currie did not use cold, but only tepid, affusions. It must be borne in mind, also, that he did

[1] Med. Reports, &c., 3d ed., ii. 47.

not recommend, but, on the contrary, condemned, this treatment, except when the febrile reaction was free and strong. Indeed, he speaks of certain patients over whom "several gallons of cold water were madly poured" when they were laboring under low delirium, with a cold moist skin and a scarcely perceptible pulse.

Several writers confirm the statements of Currie to a greater or less extent by the results of their own experience. Among them, Richter mentions that he used it with success after the failure of the ordinary method which had previously been curative in his hands. Henke regards the use of cold affusions as applicable to cases in which intense heat of skin and dryness exist along with a small and frequent pulse, and to those in which cerebral symptoms are prominent at the outset of the disease.[1] Cold affusions, and the cold bath, were also successfully used by Gérard, Bruére, Giannini, and others, in the more violent forms of scarlatina. No one has given more authority to the use of this method than Armstrong, in whose hands it was very successful. His mode of employing it was adopted from Currie, and he declares that he has "in several cases seen the disorder completely arrested by five or six repetitions of the cold affusions used on the first day and night of the excitive stage."[2] This statement refers both to the anginose and the malignant forms of scarlatina. Upon the whole, however, a less energetic use of cold has been found to suffice in the sthenic forms of the disease. Dr. Jackson, then of Northumberland, Pa., first called attention to the advantages resulting from the use of iced drinks, and of pieces of ice held constantly in the mouth. The latter he confined in a gauze bag when the patients were too young to avoid swallowing them.[3] He directed the remedy to be used almost without intermission until the local swelling and the heat of skin began to decline. A more energetic plan than this, and safer than that of Currie, is the one successfully employed by Dr. Corson, of Conshohocken, Pa.,[4] who, in addition to the means recommended by Dr. Jackson, applied ice to the sides of the neck opposite the swollen tonsils, in some instances, and in others, surrounded the throat with cloths kept wet with ice water. At the same time, he used the latter in affusions upon the head, and as a lotion to the whole body. In this manner, cases of extreme severity were cured. It is proper to mention that the hydropathic authorities blame this practice as dangerous, particularly when the fever is high, unless the wet sheet is applied at the same time. They

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[1] Rilliet and Barthez, Mal. des Enfants, ii. 653. [2] On Fevers, Am. ed., p. 387.
[3] Am. Journ. of Med. Sci., xii. 261 and 550; and ibid., xxii. 45.
[4] J. F. Meigs, Diseases of Children, p. 480.

employ the so-called "stimulating compresses" to the throat, renewing them as often as they become dry, and giving iced water constantly to drink.[1]

Periodical Fevers.—Cold has been employed for these affections in three different modes: 1st. To prevent the paroxysm; 2d. To arrest the paroxysm in its hot stage; and 3d. To fortify the system against a relapse. Currie, Giannini, Beaupré, and Bailly used it before the rise of the modern water cure, and of these authors the second attributed to its use a prompt and powerful effect in arresting the paroxysm. Beaupré, in like manner, treated with immediate relief, and ultimate success, cases which already wore, or which threatened to assume, a malignant type, cases in which the fever was violent, the countenance injected, the respiration laborious, and the mind either morbidly excited and confused, or dull. A cold bath, lasting about ten minutes, put an end to the paroxysm. The same means were resorted to anew on the return of subsequent paroxysms, and bark was exhibited in the intervals between them. The results of the so-called "water cure" in these diseases are far from encouraging. The frictions with cold water during the chill, the packing during the hot stage followed by renewed frictions and ablutions, with variations of these measures during the apyrexia or remission, seem to have had a far less decidedly curative effect than various medicinal plans, to say nothing of the specific treatment by quinine or arsenic. But simple cold affusions, in anticipation of the paroxysm, as recommended by Currie, have more evidence in their favor. In a paper presented to the Parisian Academy of Sciences in 1848,[2] M. Fleury furnishes the results of his use of the douche in various forms of intermittent fever. All of the recent cases, seven in number, were permanently cured by, at most, four applications of the remedy. Four patients had been affected with the disease between two and eleven months, and had used quinine ineffectually. In two of the cases a cure resulted after three baths, in another case, after five, and in a fourth case as many as forty-eight were required. It is made evident by the preceding facts that the cold bath and cold affusion are valuable remedies in intermittent fever; the paroxysms are moderated or abridged by the former, and prevented by the latter. Affusion, particularly, is deserving of trial in those cases of obstinate intermittent which resist anti-periodic remedies, and also whenever quinine of good quality cannot be procured. It is even more important in the treatment of the algid form of malignant periodical fevers, and in that case must be applied during the cold stage. Of

[1] SCHEDEL, op. cit., p. 170.

[2] Archives Gén., 4e. sér., xvi. 289.

all the means which can be resorted to for securing reaction in this dangerous malady none is so efficient as cold affusion.

Cold drinks in fever ought not to be freely used in the cold stage,[1] however urgent the thirst, because they increase the coldness, oppress the stomach, and weaken the pulse. When the hot stage is fairly formed, and the surface is dry and burning, cold water may be drunk with the utmost freedom. Jackson advises[2] that in attempting to cure intermittent fever by cold water, and provided that the attack is decidedly sthenic in its type, drinks should be refused until the thirst becomes "outrageous," and then given abundantly, so as to extinguish the fever with a single stroke. When this measure is salutary, sensible perspiration and sleep commonly follow. As soon as the skin becomes moist, and the pulse falls, the cold drinks should be suspended. Otherwise a chill, followed by visceral inflammation, will probably be produced.

Congestion and Inflammation.—Nothing allays the painful excitement which accompanies or follows intense application of the mind more readily than washing the head with cold water. Certain persons addicted to prolonged and severe study have sustained their mental activity by keeping a wet cloth bound upon the forehead. The local use of cold water is an essential part of the treatment in all diseases of which headache, delirium, &c., are prominent symptoms. Indeed, it often seems to contribute more than any other remedy to their favorable issue. The sedative impression, to be effectual, must be uninterrupted; if suspended even for a short period, reaction follows, and the symptoms it was intended to subdue becomes more violent than ever. This is most strikingly the case in local inflammations. A superficial burn, for example, if kept under the influence of cold for a short time only, will be rather aggravated than improved, but if the contact of the remedy is longer maintained, it will effectually prevent the development of inflammation. To obviate this difficulty, Dr. Arnott has proposed the use of a hollow cushion, made of impermeable materials, through which a stream of water at any required temperature can be kept flowing;[3] and M. Chassaignac has stated that for several years he employed what may be called ice poultices to the eye, in cases of idiopathic and traumatic inflammation of this organ. They consisted of pounded ice inclosed in a piece of fresh pig's intestine, and were applied directly to the integument, or over adhesive plaster.[4]

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[1] Currie, i. 92.
[2] Op. cit., p. 371.
[3] Lond. Med. Gaz., Jan. 8, 1846.
[4] Abeille Méd., x. 63.

Cold drinks, as every one knows, afford great alleviation to the heat and thirst experienced during warm weather, particularly when they contain a vegetable acid. They are not less agreeable and useful palliatives of the morbid heat which is created by febrile affections, including the phlegmasiæ. Nothing is so grateful, or so promptly arrests the vomiting, in *gastric inflammation*. On the other hand, debility of the stomach is sensibly lessened by drinking a glass of cold water before meals.

Cold has been used in treating erysipelas, but examples are not wanting of serious symptoms, such as delirium and coma, and even death, following its application in the idiopathic form of this disease. A mode of applying cold in erysipelas has been proposed by Dr. Arnott,[1] which is certainly a bold suggestion, and, were it not sustained by actual experiment, is not of a nature to invite imitation. It consists in applying to the inflamed surface, by means of a flat sponge, or a thin gauze bag, a mixture of pounded ice and salt for about ten minutes, until the skin becomes white and hard. According to the cases reported, the inflammation does not return in the parts that have been congealed. Dr. Arnott assures us that the remedy is not only certain and speedy in its operation, but also agreeable and safe. In no instance out of hundreds in which it was employed for various purposes did it produce any injury or untoward consequences.[2] It is incorrect to say, with Dr. Arnott, and Dr. Watson, whom he quotes, that there is no such hazard as we read of, that erysipelatous inflammation may be repelled from the surface and attack some vital organ. If examples of this accident are not numerous, they exist nevertheless, and ought to serve as a warning against so extreme a measure as Dr. Arnott recommends. Tepid affusions and emollient applications are not only more grateful to the patient, but also more useful, and at the same time safer. In traumatic erysipelas, however, fluids may be applied at a lower temperature with less risk of harm, because the disease is more strictly local.

Other accidental inflammations, such, for instance, as are occasioned by the friction of the clothing, or of the thighs or buttocks, in walking, by the bites of insects, the irritation of nettles, of the poison oak, and of the *urtica marina*, or sea nettle, a gelatinous animal that abounds on the beach at our bathing places, are satisfactorily treated by cold water. Dioscorides recommends it in excoriations, and for bites of venomous insects and reptiles. Non-febrile *diseases of the skin* are less usually affected by cold than by warm applications, which, indeed, in

[1] Lancet, 1841–2, ii. 439.

[2] Vid. infra.

the form of baths, form an essential part of their treatment. In several establishments devoted to the methodical treatment of skin diseases, cold water has been put to the trial, but the results are not such as to encourage a renewal of the experiment.

The general sentiment of the profession is adverse to the use of cold applications to the trunk in the treatment of its internal inflammations, except when the vigor of the patient is unusually great. Perhaps the sentiment is more in the nature of a prejudice than a conviction. But cold drinks, and cold enemata, are of the greatest service in sthenic inflammation of the *stomach* or *bowels*. In thoracic inflammations, warm and tepid drinks are to be preferred.

Cold is one of the most efficient remedies for cerebral excitement, such as occurs in febrile diseases generally, as well as for positive *inflammation of the brain*, or its membranes. Pounded ice, or, what is preferable, iced water, and artificial refrigerant lotions, constitute, perhaps, the most effectual means of overcoming the last named disease, as well as for reducing cerebral excitement of a symptomatic character. Abercrombie calls it by far the most powerful of local remedies in cerebral inflammation, and mentions the cold douche as the most efficient form in which it can be employed. Indeed, when a stream of cold water is directed against the crown of the head, and continued for some time, it forms a remedy of such energy as to require to be used with much caution.[1] Two apparently opposite conditions exist, in both of which this remedy is indicated; the one in which there is maniacal excitement, the other where the functions of the brain appear to be oppressed. The former is that to which Abercrombie has especial reference, and which belongs to the early and active stage of cerebral inflammation. When this has passed, or when, without its having existed, an effusion within the cranium is indicated by the tendency to coma, the dilated pupils, and an infrequent and slow pulse, cold affusions on the head may produce the happiest results. But the water must be of low temperature (about 36° F.), must fall from a height of two or more feet, and its application must be renewed at intervals of three or four hours. If perspiration breaks out, the affusion should be suspended. Probably more hopeless cases of such affections have been cured by its means than by any other. The immediate effect being to restore some degree of consciousness, it is probably also accompanied with a renewed power of assuming a more healthy action by virtue of the innate powers of the system, or through the operation of other remedies, both internal and external. It is a

[1] Diseases of the Brain and Spinal Cord, Am. ed., p. 174.

remedy which should never be omitted from the treatment of any case, the symptoms of which denote pressure upon the brain. In some cases of acute meningitis, it has saved life when all hope was lost.[1]

Rheumatism and even *gout* have been treated by cold water from time immemorial, and in every age some writers may be found to favor the method. Hippocrates, Galen, and Celsus, speak of cold affusions as relieving the pain and reducing the swelling of inflamed joints. Barthez, while confirming this statement in regard to gout, cautions against the use of too cold a liquid, especially before the affection becomes thoroughly localized. This danger apart, however, he regards the means as tending powerfully to promote diaphoresis, and in that way to dissipate the disease. Compresses thoroughly wrung out of cold water and covered with dry cloths, form the principal means employed for these disorders by the modern hydropathists. Such applications, it will be observed, become warm so rapidly, that the patient is but little, if at all, exposed to the danger of displacing the gouty inflammation. Of all the local means employed, it is the most efficient in alleviating the pangs of this severe disease. It need not of course exclude the use of internal remedies, and particularly of colchicum. In *rheumatism* the same mode of treatment is frequently of signal service. By the partisans of hydropathy, frictions with cold water, followed by sweating in the wet sheet, are recommended as sovereign and certain cures. This assertion may be true as regards general rheumatic fever of slight severity, but is incorrect if applied to severe articular rheumatism. For this disease, the treatment by cold water offers no more advantages, but many more inconveniences and dangers than the other recognized methods. When acute rheumatism is confined to certain joints, the use of wet compresses, as just now described, presents a more certain and less annoying mode of local treatment than perhaps any other. In the decline of the disease, or when it has become chronic, the cold douche, followed by the wet compresses, will seldom fail to remove the pain, swelling, and stiffness, particularly if frictions and a moderate degree of active or passive motion of the part be conjoined.

Scrofula.—Cold bathing, and especially sea-bathing, has always been regarded as a powerful means of counteracting the development of scrofulous swellings, inflammations, and ulcers, and of healing the latter. The local application of cold compresses has more recently been employed for the same purpose. Combined with appropriate

[1] See SCHUTZENBERGER, Abeille Méd., xii. 238.

exercise and diet, the stimulant and curative effects of cold for these disorders is incontestable. They were among the most striking advantages of the ancient systems of hydriatry, and that they still have a claim to confidence, is shown by abundant examples of their curative effects. There is no evidence, however, that the peculiar appliances of the Silesian system are more effectual than such as have been established by long experience. Cullen observes that cold bathing seems to have been of more benefit than any other remedy he had occasion to see employed.[1] White recommends it, in common with many other writers, as one of the best prophylactics against scrofula; Russell ranks cold sea-bathing among the first of remedies for this disease;[2] Phillips shows that the temporary benefits of sea-water are at least decided, although he questions its curative power. Lebert accords to the forced sweats, &c., of the hydropathic system an incontestable value,[3] and Schedel regards these measures as powerful and useful adjuvants to a well regulated dietetic and medicinal plant.[4]

Hemorrhage.—Cold is variously employed to arrest hemorrhages. A familiar example is its application to the nape of the neck, or to the surface of the nose to relieve *epistaxis*. Care should be taken not to disengage the coagulum which forms in the nostrils under these circumstances. The writer has seen epistaxis that had continued so long as to become serious, arrested by the application of pounded ice to the outside of the nose. It is said to produce the same effect when applied upon the testicles. When *hæmoptysis* is so profuse as to exhaust the patient, or more immediately to endanger life, it may often be arrested by the use of cold alone. Weak lemonade, mixed with pounded ice, should be sipped continually, bags containing ice should be moved slowly over the front of the chest, while the air of the apartment is kept as cool as possible. Precisely similar means may be used in *hæmatemesis*, except that the pounded ice should be applied to the pit of the stomach. In *menorrhagia* the vulva is an appropriate place for the application, and during the inter-menstrual periods, cold hip-baths and the cold douche may be employed every day. Cold is no less effectual as a means of arresting hemorrhage *after parturition*, or abortion. Compresses dipped in ice water may be applied over the hypogastric region, the vulva, and the upper part of the thighs, cold drinks should be administered, and cold water, or even ice introduced into the vagina and rectum. When, owing to uterine

[1] Works, ii. 637.
[2] Cooper's Surg. Dict., Art. Scrofula.
[3] Maladies Scrofuleuses, 104.
[4] Op. cit., 513.

inertia, the placenta fails to be discharged, its expulsion may be provoked by injecting cold water into the umbilical arteries. A still more efficient method, is that recommended by Dr. Septimus Wray, and which consists in throwing cold water into the cavity of the uterus.[1] The expedient has the double advantage of evacuating the clots contained in the uterus, and powerfully stimulating it to contract. The benefit to be derived from cold in arresting hemorrhage, both before and during labor, is less decided, because it generally depends upon causes over which this agent has but a slight control. When, however, the loss is slight, and the uterus is quiescent, cold may contribute to put an end to the discharge. Cold is not without its use even in *traumatic* hemorrhage, particularly from small vessels, or when there is a simple exudation of blood from the injured surface; but for this purpose it must be continuously applied so as to prevent reaction and a consequent increase of the discharge.

Chlorosis and Anemia.—These allied but not identical affections are, as is well known, more or less medicable by ferruginous preparations, but their cure is both hastened and confirmed by the judicious employment of cold. The cold douche is here the most efficient means. It was used with perfect success by M. Fleury,[2] and to the exclusion of all internal medicines in five cases of confirmed chlorosis. The treatment lasted from two to seven months, and the douche was administered two or three times a day, and for as many minutes at each time. The shock at first produced difficulty of breathing, and violent palpitations of the heart, but after the third or fourth day these phenomena ceased. The appetite and strength soon increased, the stools grew regular, and the neuralgic symptoms disappeared. Afterwards the skin became ruddy and clear, the menses were re established and became both more abundant and less painful. Idiopathic anemia, and that which is symptomatic of convalescence from tedious diseases, of certain uterine affections, of neuralgia of long standing, of hypertrophy of the liver or spleen, of miasmatic cachexia, chronic inflammation of the digestive organs, profuse and repeated hemorrhages, &c., were found by M. Fleury, to be thoroughly curable by cold affusions. When the anemic condition depended on an organic yet removable cause, on the one hand, or upon incurable disease upon the other, the condition of the patient was still materially improved. In the former case the cure of the principal disease was rendered more practicable, and in the latter the general health and comfort of the patient were promoted.

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[1] Lancet, April, 1855, p. 361. [2] Archiv. Gén., 4ème sér., xxv. 180.

Diseases of the Nervous System.—An affection very nearly allied to the one just noticed, has been described by various authors as susceptible of cure by the same means. It is one of *nervous exhaustion*, a state which seems to be almost the normal condition of certain delicate individuals, but which may also proceed from prolonged fatigue, wasting discharges, undue exertion of the mental faculties, &c. This condition is very certainly relieved by a judicious use of cold water. But very often the patient is too feeble to react under even a trifling and partial application of cold. When the constitution, says Beaupré,[1] "is extremely delicate and susceptible, the skin cold and pale, or of a dusky leaden hue, when the eyes are dull, the flesh soft, flabby, or œdematous, the perspiration viscous and cold, the pulse small and feeble, and there is a frequent sense of chilliness," the free use of cold applications in any form will be attended with danger, and certainly produce no good. In such states as are here referred to, the use of the cold bath should be approached very gradually, and means vigorously employed promptly to restore the circulation to its full activity. By such a method the dangers referred to may be averted, and the full tonic power of cold, with all its advantages, employed. There is an original state of the constitution the general features of which are closely analogous to those of the acquired condition just described, and which has a strong tendency to favor the development of organic diseases, and especially those of a lymphatic nature. It is a state of general debility, as shown by muscular weakness, a pale transparent and flabby skin, a languid circulation, and a morbidly susceptible nervous system. It is most distinct in children, and unless early checked and modified, leads, as has been stated, to serious and even fatal disease. Cold bathing, and especially the cold douche, is the most efficient auxiliary in renovating this constitution, and converting it gradually into a condition less susceptible to morbid impressions; but this means must be united with active exercise, wholesome nourishment, and the withdrawal of all merely nervous stimulants.

Insanity. The paroxysms of furious delirium which frequently attend insanity, are more effectually moderated by the cold douche than by any other means whatever, and when the disease is acute, this treatment often brings about a perfect cure. Its efficacy is greatly increased by being administered while the patient is in a warm bath. In the intervals between the baths cold compresses may be applied as often as possible to the bare scalp. The method employed by M. Brierre de Boismont was so successful as to merit par-

[1] Op. cit., p. 216.

ticular notice. The patients remained from eight or ten to fifteen hours in covered baths at 82° to 86° F., while a current of cool water flowed continually over their heads. The temperature of the affusions was from 40° to 60° at the commencement of the bath, and at its conclusion from 64° to 68° F. The following are among the inferences drawn from his experience by M. Brierre: 1. Acute insanity, and especially acute mania, may be cured in from two to four weeks by this method. 2. The essentially calming and sedative action of these baths is demonstrated by their influence on the circulation and the respiration, the absorption of a large quantity of water into the system, and the gradual and general cooling which they produce. 3. The duration of the baths should, in general, be from ten to twelve hours; they may be prolonged to fifteen or eighteen hours. 4. This treatment may improve, but does not cure chronic mania.[1]

As the shower-bath and the douche are both of them repugnant to almost all patients, they become powerful means of moral treatment in the hands of a judicious physician, and if they are prescribed, not as punishments, but with the distinct announcement that they have the power of removing the delusion, hallucination, or state of mind which causes the patient to act contrary to the settled laws of truth.[2] To use them for punishment is to degrade a wholesome and kindly discipline into an instrument of torture. The cold bath and the douche are also very efficient remedies for the sleeplessness which is so common in the active forms of insanity.

Delirium Tremens. Cold affusions on the head have been recommended by many authorities for this disease, particularly if the body of the patient is at the same time immersed in a warm bath.[3] Armstrong used them with greater boldness. When the patient was robust and in the first stage of the attack, he caused several gallons of cold salt water to be dashed over his body.[4] But he confined its use to patients who had much constitutional vigor, and both before and after its application gave them warm wine and water to drink, and followed the douche by active frictions of the skin with warm flannels. Without doubt there are instances of the more violent and maniacal form of the disease (*mania-à-potu*) occurring in robust patients which have been wisely and safely treated by this heroic method; but it cannot be generally applicable even to the more violent cases. That the tepid bath with cold affusions to the head is safer and more

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[1] Journ. of Psychological Medicine, i. 456.

[2] Comp. Leuret, Traitement Moral de la Folie, p. 156.

[3] Blake, Pract. Essay on Delirium Tremens, p. 88.

[4] Pract. Illustrations, ed. cit., p. 268.

effectual cannot, it is believed, be doubted. Old and broken-down drunkards cannot bear the sedation even of this mode of applying cold, and, indeed, in any form it should rather be avoided in treating them.

In *poisoning by narcotics* there is no remedy more important than cold affusions. Applied to the head, they may be repeated frequently, but they cannot be so often renewed to the rest of the body; for, although the shock which they cause is of the highest utility in arousing the torpid functions, yet their frequent repetition lowers the temperature of the body too much, and rather hastens than impedes the progress of coma.

Chorea. Many years ago, Dupuytren drew attention to the value of cold affusions in this disease.[1] He directed the patient to be plunged into a cold bath and rapidly withdrawn as often as five or six times in the course of a quarter of an hour; or sometimes he preferred simple affusions of cold water, after which the patient was made to take active exercise for a few minutes, and was then covered up warmly in bed. Dupuytren maintained the infallibility of this method, and cases of its success are reported by Hospital.[2] Biett gave a preference to the shower-bath, and asserted that he had cured severe cases of chorea in eight or ten days by the use of this means exclusively.[3] Constant[4] found cold baths (65°), continued for an hour at a time, with the use in some cases of cold affusions to the head, very successful in the same disease. Rilliet and Barthez do not furnish as favorable an account of the results obtained by them from the cold bath.[5]

There can, however, be no doubt of its efficacy; almost every practitioner can testify in its favor; but it must nevertheless be used circumspectly, and so as not to excite either dread or alarm. Hence it is a measure but seldom applicable to very feeble and excitable children, and is rarely proper in the winter season. Apart from these and similar exceptions, cold baths, and particularly cold affusions and the shower-bath, are among the most valuable means of treating chorea. They are sometimes curative even when used alone, but they are much more generally to be recommended as adjuvants to internal remedies.

Hysteria. Cold has no especial application in this disease beyond that of diminishing the congestion of the head which sometimes exists during the paroxysms, but it may become a valuable adjuvant to the other means employed in the intervals of the attack for the purpose of preventing local determinations of blood, and of reducing the

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[1] Archiv. Gén., xxiv. 130. [2] Bull. de Thérap., vi. 206. [3] Ibid., vi. 300.
[4] Ibid., viii. 333. [5] Mal. des Enf., ii. 319.

morbid susceptibility of the system. When attacks of hysteria simulate death, as they occasionally do, the sudden application of cold to the surface of the body will revive the signs of life. Closely allied to hysteria is the melancholy disease *nymphomania*, for which no remedy is more effective than the prolonged use of cold baths, and particularly of the hip-bath. It must, of course, be conjoined with various appropriate remedies, both moral and physical.

Sleeplessness, which often depends upon an over-excited condition of the brain or of the whole nervous system, arising from severe study, from the stimulus of painful and even of pleasant thoughts or occupations, is often relieved by the use of cold affusions or simply of the cold bath. On the other hand, as already stated, persons addicted to intense mental application have been enabled to maintain it for a longer time than usual by keeping cloths wet with cold water to the forehead, thus illustrating the general truth that the action even of the simplest remedy varies with the state of the organism when it is applied.

Tetanus. A case of traumatic tetanus was reported by Dr. Curry, of London, which he claims to have been cured by affusions of cold water, two pailfuls of which, at 62° F. were thrown over the patient every four hours during twelve successive days. It is proper to state, however, that laudanum was freely administered at the same time. Dr. Currie, of Liverpool, on the other hand, mentions several instances in which cold affusions did not benefit the disease at all. Indeed the inference may justly be made from the records relating to this subject, that in traumatic tetanus cold affusions are of little or no advantage. Abundant evidence, on the other hand, exists to prove that this remedy is of the utmost service in the idiopathic form of the disease referred to, particularly when it occurs in warm climates. This result of modern experience tallies with ancient observation as recorded by Hippocrates.[1] In a paper on the use of cold bathing for the cure of idiopathic tetanus in the West Indies,[2] allusion is made by its author, Mr. Cochrane, to a Dutch practitioner who, about the year 1725, employed a method suggested no doubt by the writings of Floyer. "He carried it so far," says the narrator, "as *to lay the patient in wet sheets*, by which means he cured one patient. But as the practice was new, and not having the consent of the proprietors, he could not take upon him to try this method, however desirous he might be, well knowing the risk a man runs in going out of the old beaten track."

The spasmodic symptoms, attended with high arterial excitement

[1] Aphorisms, v. 21.

[2] Edin. Med. and Phil. Com., iii. 183.

produced by drinking very cold water, or alcoholic mixtures, in hot weather, are speedily relieved by cold affusions to the head, and cold drinks.[1]

Diseases of the Digestive Organs.—Constipation. The ancient practice of promoting alvine evacuations by applying cold to the feet, is illustrated by the following case of Hippocrates.[2] A stout, healthy woman, who had taken some emmenagogue medicine, was seized with a violent pain in the abdomen, which grew much distended; she vomited blood, and became to all appearance lifeless. About thirty vessels of water were dashed over her, which procured free bilious evacuations, and the patient recovered. A certain Duke of Ferrara was subject to constipation, and could obtain relief only by walking upon the marble pavement of his chamber when he arose in the morning. Cullen observes that when every purgative has failed in this disorder, the action of the intestines may be effectually excited by throwing cold water on the extremities. An instance of this sort is related by Stevenson.[3] One also is reported by Vaidy,[4] of a patient who for twenty days had suffered from obstinate constipation, which repeated doses of purgative medicine did not relieve. A tumor as large as a man's head could be felt in the hypogastrium. As a last resort, the patient was directed to walk barefoot upon wet flagstones, and compresses wet with ice water were applied to the abdomen. Very soon afterwards an evacuation took place of liquid, and then of solid fæces, and the tumor disappeared. Two very interesting cases of a similar character were reported by Dr. Spence,[5] who caused the patients to stand on a cold, wet, brick floor, while cold water was dashed upon the lower extremities as high as the hips. Still another is related by Falconer,[6] in which a lady who was reduced to the last extremity by the long retention of her fæces, and the active measures employed to relieve her, at last obtained an evacuation under the influence of cold affusions upon her hands and legs. Mr. Whitehead[7] relates a case in which a prodigious quantity of purgative medicines and clysters had been used to no purpose. The patient was an old man, and was rapidly sinking. As a last resort, cloths dipped in ice-cold water were suddenly and unexpectedly applied to the abdomen. Immediately its distension began to subside, an evacuation of hard, dry fæces took place, and the patient recovered. A draught of cold water before breakfast is an excellent palliative of habitual constipation.

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[1] S. Jackson, N. A. Med. and Surg. Journ., ii. 250.
[2] Epidem., v. xviii.
[3] Edinb. Ess. and Obs., vi. 556, 568.
[4] Dict. en 60 vol., xviii. 414.
[5] Trans. Lond. Coll. Phys., iii. 96.
[6] Mem. Lond. Med. Soc., ii. 73.
[7] Lond. Med. Gaz., 1841, i. 58.

The advantages of modern hydriatry are more clearly illustrated in the treatment of abdominal affections, and especially of habitual constipation, than of any other disease. So large a proportion of the chronic diseases of the digestive organs arise from over-eating and sedentary occupations, that the cultivation of simpler and more rational habits of life forms the first step towards their cure; yet it is one which very few patients will consent to take so long as they remain at home. But the discipline, and the novel impressions of a sanitary establishment, together with the faith which men are prone to place in what is strange, go very far to bring about cures which had been impossible under the dominion of cherished and long indulged habits of unwholesome living. It is, however, no more than just to observe that the systematic use of bathing, frictions, sweatings, exercise, &c., as enjoined in water-cure establishments, contributes largely to their success in cases really adapted to such discipline. The daily use of the wet sheet followed by a cold bath and active frictions to the whole surface of the body, the cold hip-bath, the constant use of the stimulating compress to the abdomen, occasional cold enemata, frequent and copious draughts of pure cold water, together with a simple diet, of which milk and brown bread form a considerable part, these and active exercise constitute the means by which the most confirmed torpor of the bowels has been overcome in numberless cases for which the entire catalogue of drugs had been able to furnish no permanent nor perfect cure. When constipation is connected with disorder of the stomach, with atony, or with excessive irritability of this organ, the means just pointed out, when adapted to the vigor of the patient, are probably more effectual than any others that can be employed. In such cases the failure both of medicinal and merely dietetic remedies is only too familiar to physicians. Instances are not wanting of habitual vomiting after eating, with obstinate constipation and progressive emaciation, which have been cured by the hydriatric method, after the failure of the best devised medicinal treatment. As a sedative of deranged nervous action, a stimulant to the skin, a revulsive to the digestive organs, and indirectly as a tonic to the whole system, cold acts more powerfully and usefully in these cases, while the stomach is spared the injury of the direct contact of purgative drugs. In the class of cases alluded to, the radical morbid element destroyed or removed by cold is undoubtedly want of tone, and this sometimes is, if not usually, combined with gastric irritability. There are certain examples of *chronic diarrhœa*, in which this combination of morbid elements is present, and these may doubtless be materially benefited by the united tonic and revulsive influence of cold water.

Where there is reason to believe that the flux depends upon an ulcerated state of the intestine, the employment of this remedy is at least of questionable propriety. It is certainly inferior to many agents of the materia medica.

In Surgery.—Contusions, &c. Cold water is at once the simplest and the best application for bruises, or for that general soreness which results from a fall or other direct violence. The first application should be tempered, but the subsequent ones consist of cool water, followed by frictions to the skin, and the bruised parts should afterwards be covered with wet compresses. After the reduction of dislocations the affected joints should be enveloped in moist compresses, to prevent reaction, effusion, and consequent stiffness. Should, however, this result have already taken place, then the cold douche, followed by frictions, is more likely than any other treatment to restore liberty of motion to the joint. The use of cold affusions, or of wet compresses, is not less serviceable after injuries or fractures in the neighborhood of joints, in order to prevent inflammation. The same may be said of sprains, which, indeed, often involve laceration of the articular ligaments. Bidou, who has written upon these injuries,[1] maintains that when cold water is opportunely applied, the patient will recover the use of the limb in one-third of the time required by other methods. He recommends that the foot and ankle should be plunged into cold water, and allowed to remain there for two or three hours, the water meanwhile being kept at its original temperature. At the end of this time wet compresses may be substituted for the foot-bath, and continually renewed until the danger of inflammatory reaction is past. Some very interesting cases were reported by Dr. Tillet, of Lancaster, Pa.,[2] which illustrate the present subject in a striking manner. Among them is one of a physician who suffered fracture of an anchylosed knee. The patient was extremely corpulent, weighing upwards of three hundred pounds, and the leg became violently inflamed. During three weeks cold water was poured upon the knee every five or ten minutes, and subsequently at longer intervals, and the pain and swelling were effectually kept under by its means. So violent were the local symptoms, that no other treatment would probably have saved the limb.

Wounds. One of the first persons in Great Britain to follow the advice of Macartney relative to water-dressings was MacFadzen,[3] who had observed that in the lower animals inflammation was not necessary

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[1] Bull. de Thérap., i. 243. [2] N. Am. Med. and Surg. Journ., v. 58.

[3] Edinb. Med. and Surg. Journ., 1830, xxxiii. 84.

to the healing of wounds. He also found that under this method they healed neither through the medium of blood, lymph, or pus, but by a contracting process from the bottom of the wound upward. He applied compresses of lint, wet with cold water, and covered with oiled silk, three times a day. Beaupré, Josse,[1] and others, spoke very emphatically in praise of this treatment, and the latter proposed and extensively employed the method of continuous irrigation. It was afterwards adopted by Bérard.[2] He made use of siphons, of small diameter, to conduct the water to the affected part, which was covered with a single thickness of linen, and rested upon a piece of oil-cloth, which conveyed away the water that had been used. The first effects of this method are a lowering of the temperature of the part, and a sensation of coldness, which is generally painful at first; then the skin grows paler, and the swelling subsides; the former subsequently acquires a dull red or even a whitish color, and the superficial layers of the integument swell with the water they have imbibed. Like Macartney, Bérard found that adhesive inflammation is not hindered by cold water; that, on the contrary, even contused wounds sometimes unite by the first intention under its use. He suspected, however, that it tends to increase the chances of mortification after lacerated and contused wounds. This opinion seems to have been entertained by Dupuytren,[3] who also objected to the method as being disagreeable to the patients by causing chilliness, and dangerous by exciting internal inflammations. The apprehension of producing serious inflammations within the cavities of the chest or abdomen by employing cold applications to the trunk seems to be quite groundless. Such applications are familiarly and successfully made when hemorrhage takes place from the organs within these cavities, and a less degree of cold suffices for antiphlogistic purposes. Other surgeons, also, as Gerdy and Sanson, were inclined to believe that although this treatment favored the resolution of superficial inflammation, it nevertheless was sometimes objectionable by concealing deep-seated suppuration of the injured parts.[4] If these objections to cold water dressings are tenable, much more strongly must the plan of M. Baudens be condemned. He did not scruple to use a freezing mixture applied through the medium of a thin layer of lint or sponge upon the injured part; afterwards ice alone was substituted, then cold water, and ultimately dry lint. It may be considered as determined by experience that very

[1] Archiv. Gén. de Méd., 2ème sér., viii. 399.

[2] Ibid., vii. 1 ; and 2ème sér., xiii. 343.

[3] Leçons Orales, ed. de Bruxelles, i. 448.

[4] Archiv. Gén., 2ème sér., viii. 402.

low degrees of cold are seldom, if ever, necessary to combat traumatic inflammation. Very often the water-dressing should be even tepid, in order to meet the peculiar susceptibility of the patient, and it very seldom happens that it need have a lower temperature than 70° to 80° F. For it must be remembered that not only the temperature, but also the other physical properties of this application are antiphlogistic and healing. It carries away the secretions of the injured part, which, if allowed to remain, would perhaps excoriate the integuments or maintain the inflammation, and, by regulating the activity of the latter, promotes healing by the first intention or by rapid granulation. It is believed that of all the applications of cold water none has been more generally accepted than this; and although the more troublesome methods of irrigation and repeated affusion may be retained for exceptional cases, there is reason to expect that lint wet with cold water, and covered with oiled silk, will, for a long time at least, supersede the exclusive use of greasy applications to recent external lesions of the soft parts.

Local Inflammations. When the treatment of *boils*, *carbuncles*, *whitlows*, &c., by cold applications was revived in England, we are told by Mr. Eames that the patients were so surprised at the rapidity of the cure as to be persuaded that a charm had been used.[1] And no doubt the persevering use of cold water to such local inflammations would in a great majority of instances arrest their development completely. That most painful, and indeed serious, affection—for it may disable the hand upon which a man depends for daily bread—whitlow, may almost always be summarily arrested by holding the finger for several hours in ice-water. Mr. Curling has treated several cases of *acute orchitis* successfully by the application of ice. It speedily relieved the pain, and effected an unusually rapid cure.[2] *Ulcers* of various conditions are most beneficially treated by water-dressings. One of the earliest allusions to the efficacy of water in these affections is made by Smith,[3] who speaks of an extensive ulcer caused by molten brass running over the leg, and which was finally cured by the patient, who was fond of fishing, having stood for several hours at a time in a running stream. As early as 1813 we find a Mr. Johnson reporting the remarkable success he had met with in treating indolent ulcers by sea-water only.[4] As generally happens, so in this case, a theoretical objection opposed the general acceptance of the improved treatment. It had grown into an article of faith that cold was hostile to the re-

[1] Edinb. Med. and Surg. Journ., xxx. 84.

[2] Times and Gaz., Feb. 1855, pp. 210, 233.

[3] Curiosities of Common Water, p. 35. [4] Edinb. Med. and Surg. Journ., ix. 277.

parative process, and consequently the evidence which demonstrated its salutary influence was unheeded or disbelieved. But the power of truth ultimately overcame disbelief. Percy and others demonstrated that nothing was more conducive to the healing of indolent and flabby ulcerations than the cold douche, and nothing more likely to counteract the tendency to inflammation and extension of active ulcers than the permanent application of cold water dressings. In those ill-conditioned sores that spread by gangrene, or in consequence of the low vitality of the parts they affect, nothing effects a change for the better so soon as water, applied at a temperature adapted to the sensibility of the patient and of the affected part. Butzke[1] was very successful in curing atonic ulcers of the feet by the cold douche, continued for an hour or more at a time. The first effect of the remedy was severe pain, which made it necessary to render the application very brief; but this was followed by a deep redness of the skin near the ulcer, with some bleeding from the surface of the latter, an itching sensation, increased heat and swelling of the part, and a larger discharge of pus, demonstrating the stimulant effects of the remedy. After its application in the manner described, the part was wiped dry, covered with charpie, and bandaged.

Burns and *scalds* have been very successfully treated by cold water. As early as 1806, Dr. McDowell, of York, Pa., reported two cases of severe scald of the feet and legs which were treated by immersion in cold water, with the effect of speedily relieving the pain, and causing the skin to heal very quickly;[2] and several years later a case of extensive superficial burn of the hand, to which snow-water and afterwards cold pump-water were applied, almost immediately allaying the pain, and preventing suppuration.[3] In burns of the first and second degrees cold water, applied by affusion, irrigation, or simply upon thin cloths, not only relieves the pain, but arrests the inflammatory process and promotes a speedy return of the part to its normal action. But, to be successful, the application must be constantly and steadily made, otherwise reaction annuls all the benefits of the first impression. It ought, moreover, to be employed at the earliest moment possible after the injury is received, while the blood is still mobile in the vessels, and before any effusion has taken place. No other treatment affords such prompt relief, or promotes so evidently the direct restoration of the functions of the part. James Earle advocated the use of cold water, and even of pounded ice, applied on cloths or in a bladder;

[1] London Med. Gaz., N. S., 1839, i. 893.

[2] Med. Repos., ix. 366.

[3] Ibid., xiv. 286.

Dr. Kinglake wrote to the same purpose; Emasle, who is quoted by Kentish,[1] relates a singular instance of the efficacy of continued affusions of cold water; Dzondi wrote a treatise to advocate its use[2] as the *only* sure and painless mode of curing these injuries; and Küsten also reports striking instances of its healing power.[3] *Ice* has been very extensively and successfully used for the same purpose by Blandin, Jobert, Baudens, Robert, Hutin, and others.[4] It was generally pounded, and applied in a bladder to the affected part. According to Robert, it should be continued, even when the burn is deep, until the sloughs are thrown off; but such a plan has nothing to recommend it, and much to dissuade from its adoption. One of the authors cited advises that, even when the injury occupies a large surface of the body, the patient should be lifted upon a sheet, and plunged over and over again in a cold bath. This treatment, it is alleged, procures infinite relief from suffering, and greatly restricts the extent of the sloughs which follow. The measure seems, indeed, a bold and dangerous one; but, provided the patient is sufficiently vigorous to sustain the shock, it may doubtless prove salutary. It must abstract a large amount of morbid heat from the body, and, at the same time, by the reaction it induces, invigorate the skin, enable it to resist the tendency to gangrene, and reanimate the powers of life, which are never more depressed than by extensive burns. In well-selected cases, therefore, it is not improbable that the cold plunge-bath may be safely and advantageously employed.

Strangulated Hernia. By the application of cold to a hernial tumor it is often made reducible. If ice is employed, it should be very carefully managed lest it occasion gangrene. But cold water, or ether, which, by evaporating, produces cold, is sufficient to expel the fluids from the tumor and enable it to be reduced. When it only contains air, the action of cold lessens its volume with singular rapidity. Writers upon this subject draw a just distinction, in reference to the advantage of cold, between strangulations caused by distension and those produced by inflammation. The former are relieved readily and effectually by the brief action of a low degree of cold, but when the protruded parts are attacked with inflammation it is more prudent that the temperature of the application should be more moderate and maintained for a longer time, because the tissues to be acted upon are denser and less mobile than in the previous case, and do not, there-

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[1] Essay on Burns, 1817, p. 38.

[2] Ueber die Verbrennungen, und das einzige sichere Mittel sie in jedem Grade schnell und schmerzlos zu heilen. Halle, 1816.

[3] Am. Journ. of Med. Sci., Oct. 1847, p. 488. [4] Annales de Thérap., iv. 62.

fore, contract so readily under the action of cold. Still, there are cases in which, although inflammatory symptoms had set in, the free and prolonged application of pounded ice has been followed by relief. In one,[1] peritonitis, following the operation for strangulated femoral hernia, was arrested by the persevering use of this remedy. Ice and other means of producing cold were used by Sir Astley Cooper to promote the reduction of hernia; the former has been successfully employed by Mr. Le Gros Clark,[2] and no less than nine cases have been published by M. Baudens to demonstrate its efficacy when conjoined with graduated compression.[3]

Anchylosis. The stiffness which continues to affect joints after prolonged rest and after idiopathic or traumatic inflammation is more effectually removed by cold affusions than by any other single means. They should be managed so as to stimulate the affected parts, and their use should be combined with frictions and passive motion. Indeed, they serve admirably to prevent the injurious effects which the last-named manœuvre occasions when too vigorously performed.[4]

Vascular Distensions. It has been proposed to cure superficial aneurisms by a constant application of ice. Cases of success in the early stage of the disease are recorded by Guérin, Pelletan, and Böe. The palliative use of this remedy in dilatation of the hæmorrhoidal veins is well known, and Chrestien reports a case in which the application of cold to the penis enabled him to introduce a catheter the entrance of which had been prevented by a varicose condition of the veins of the urethra.[5] Repeated irrigations of cold water are sometimes of immense advantage in reducing the engorged and ulcerated neck of the *uterus* to a normal condition, and thus indirectly of curing its displacements.[6] M. Aran attributes great advantages to this method, to which, also, he adds the introduction of pieces of ice into the vagina by means of the speculum.[7]

Cold as an Anæsthetic. A soldier whose leg had been amputated suffered excruciating pain in the stump, which neither opiates nor any other means relieved, until compresses wet with cold water were applied, when the pain ceased at once as if by enchantment.[8] Dr. Arnott, whose original suggestion of a mode for the topical application of cold is described in another part of this article, proposed also the use of congelation by means of a freezing mixture as an anæsthetic

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[1] Bull. de Thérap., l. 472.
[2] Lancet, March, 1855, p. 238.
[3] Efficacite de la Glace combinée à la Compression, &c., Paris, 1854.
[4] Fleury, Archives Gén., 4ème sér., xvii. 317.
[5] Beaupré, op. cit., 380.
[6] Faure, Archives Gén., 5ème sér., i. 551.
[7] Bull. de Thérap., li. 258.
[8] Beaupré, p. 211.

in surgical operations, and he first employed it himself to destroy the sensibility of the skin where he intended to establish an issue.[1] M. Velpeau subsequently made use of the same expedient to produce local anæsthesia in the operation of evulsion of the toe nail,[2] and was followed by M. Alquié and by M. Simon, of Nancy.[3] In these cases the toe was surrounded with a freezing mixture of ice and salt for the space of from two to five minutes. The same procedure was successfully employed by Mr. Nunn, of the London Western Dispensary, in order to render the excision of syphilitic vegetations painless. In one case, that of a female, the excrescences occupied the whole extent of the nymphæ and surrounded the clitoris. It is worthy of remark that no hemorrhage followed the operation.

In this country anæsthesia by means of frigorific mixtures has been extensively and successfully employed by Dr. Thomas Wood, of Cincinnati,[4] in minor and superficial operations, such as those for removing *warts*, *small tumors*, and *nævi*, for *opening abscesses*, and the *evulsion of nails*. In *paronychia* he found it unsuccessful, as many others have done. A similar report of its utility is furnished by M. Coste, of Marseilles,[5] who employed it in many and various operations. Dr. J. Mason Warren, of Boston, made use of it with remarkable advantage in removing, by subcutaneous section, a large *nævus* from the integument of the knee-joint, and which was so exquisitely sensitive that the patient previously shrank from the mere approach of the fingers to the part.[6] It has also been used to prevent pain in the *introduction of setons*, the *ligation of arteries and veins*, the operation for *strangulated hernia*, for *paracentesis*, *carbuncle*, *extraction of teeth*, &c.

Generally, when the surgical operation involves subcutaneous tissues or organs this method has been found inefficacious, either on account of the depth of the incisions required, or because the length of time consumed permitted the flesh to regain its ordinary degree of sensibility. This defect in the method was early pointed out by Mr. Critchett, who, in extirpating a fatty tumor, found that, although the incisions through the skin were painless, the dissection of the tumor itself caused the usual degree of suffering.[7] The same defect was observed in an operation for the removal of a tumor from the abdominal walls by Mr. Walton.[8] And although these and similar cases disposed Dr. Arnott to confine his method to operations upon super-

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[1] Lancet, Sept. 1848.
[2] Bull. de Thérap., xl. 32.
[3] Ibid., xli. 410.
[4] Western Lancet, April, 1854.
[5] Times and Gaz., Nov. 1855, p. 517.
[6] New York Journ. of Med., March, 1855, p. 312.
[7] Lancet, Oct. 1854, p. 335.
[8] Times and Gaz., Sept. 1854, p. 342.

ficial parts,[1] he is still of opinion that the sensibility of the body can be destroyed, to a depth sufficient for most operations, by the use of a freezing mixture in which muriate or nitrate of ammonia is substituted for common salt. A case is reported by Dr. L. A. Dugas which goes to show that the benumbing influence of cold may penetrate very deeply. A fungous tumor was removed from the arm, requiring a double elliptical incision extending from the acromion process to within three inches of the elbow. The frigorific application consisted of ice and salt; the adipose layer was frozen so hard as to cut like tallow, and the patient experienced so little pain that he suffered more from the dressing of the wound than during the operation itself.[2]

It is claimed by Dr. Arnott for this method that parts which are incised while congealed heal more rapidly than under ordinary circumstances; that, indeed, it tends to prevent traumatic inflammation, while it restrains hemorrhage, and disposes the wounded parts to heal by the first intention. If the skin is merely benumbed no redness follows the application, and if congelation of the subcutaneous adipose layer takes place, redness of the part follows, and may continue for a day or two, but a true inflammatory condition does not result.

An attempt was early made by Velpeau, as well as by Dr. Arnott, to prevent the growth of *cancer* by congelation. It was, even earlier, argued by Prof. Bennett that a temperature low enough to arrest the progress of a parasitic growth might not be injurious to the sound structures around it, if it were not too long maintained. For some time the treatment was thought to be successful; in several instances it evidently suspended the growth of the cancerous tumor, and palliated the sufferings of the patient in a remarkable manner. But we cannot learn that the success of the treatment has been decided.

Dr. Arnott has made use of the frigorific mixture in a variety of local affections of an inflammatory or only painful character. The following are the most important of them: *lumbago*, *chronic* and *acute rheumatism*, *sciatica*, *rheumatic gout*, *erysipelas*, *eczema*, painful *nodes*, *sprains*, *contusions*, *headache*, *neuralgia*, *toothache*, and *mercurial sore mouth*.

The method recommended by Dr. A. in the application of intense cold is the following:[3] If the congelation is not to be extensive or long continued, a piece of ice of the size of a large orange will be sufficient. This is well pounded in a coarse cloth or bag, and the powder, being placed upon a large sheet of paper, is thoroughly

[1] Month. Journ. of Med. Sci., July, 1854, p. 38.
[2] Am. Journ. of Med. Sci., July, 1855, p. 279.
[3] Month. Journ. of Med. Sci., July, 1854, p. 34.

mixed, by means of a paper-folder, with about half its weight of common salt. The mixture is then put into a net of about four inches diameter, and as soon as it begins to dissolve it is ready to be applied. The net is not kept motionless on the part, but is frequently raised in order that fresh particles of the mixture may be brought into contact with the skin, and the water that escapes from it may be absorbed by a sponge, or allowed to fall into a basin placed underneath. If the surface to be acted upon is of small extent, a very thin and large copper spoon containing the mixture, or a solid brass ball of about a pound weight, which has been immersed in ice and salt, will often answer, and be a neater mode than the net.

The moment a gauze net, or a thin metallic vessel containing ice and salt, is applied to the skin it is benumbed. There is hardly a sensation of cold produced, and no tingling or smarting. If the contact of the frigorific be continued a few seconds longer, the surface becomes suddenly white, in consequence, doubtless, of the arrest of the circulation; and this change of color is attended with a slight smarting like that produced by mustard. There is now complete anæsthesia, which, if the frigorific were removed, would remain complete for several minutes. But if the frigorific be allowed to act, another change is produced—the adipose matter under the skin is congealed, and the part becomes hard as well as white. The depth to which the benumbing influence of cold will extend depends upon a variety of circumstances, as the degree of cold, the duration of the application, the vascularity of the part, whether pressure is used, or the circulation is suspended, &c. &c. After the usual application of cold for anæsthesia, the circulation soon returns to the part, and the skin assumes a red color which lasts for several hours. If the congelation has been considerable, there is now some smarting felt, unless the natural heat be more gradually restored by pouring cold water on the part, or by placing on it a little pounded ice, or a bladder containing iced water. If the application has not exceeded the first stages, there is no smarting, and no necessity, therefore, for such precautions.

CONTRAINDICATIONS.—An agent so powerful and of effects so various as cold must be cautiously employed. In the preceding pages attention has been incidentally drawn to its dangers, yet a more connected but summary view of them may form an appropriate conclusion to this article.

The dangers of drinking cold water when the body is heated by exercise or by a high atmospheric temperature have been sufficiently indicated. The risk is of hardly less magnitude in various morbid conditions of the system, such as feeble digestion and chronic diseases

of the stomach generally. The state of gastric atony, which an habitual use of alcoholic drinks engenders, is a serious obstacle to the digestion of water. Cold water is seldom beneficial in pulmonary affections, but tepid drinks, on the other hand, are salutary. Cold drinks ought never to be administered during the cold stage of fever. When there is great debility they are hurtful, except in small quantities, and they must be very sparingly allowed when there is a tendency to congestion in important organs, and during discharges of a critical nature.

Bathing in cold spring water in the summer season, and in water under 50° F. at any season, is attended with risk to old persons and to infants. It is hazardous when the system at large is feeble, whether from a temporary cause or from the progress of organic disease, when the bath inspires terror, and in all congestive or inflammatory affections whenever there is a predisposition to metastasis or to hemorrhage. Chronic diseases attended with wasting discharges, or in which a sudden shock may be dangerous, are unfit for treatment by cold bathing. The administration of the several partial baths should be governed by the same precepts as that of general cold baths; they are almost equally objectionable whenever there is extreme debility connected with a local morbid action tending to disorganization.

The rude treatment at first employed by Priessnitz was the natural result of his having learned the system by experiments, at first upon quadrupeds, and afterwards upon hardy Silesian boors, but he was obliged to modify its harshness when his patients were recruited among courtly sybarites and other luxurious denizens of towns. He restrained the sweating and douching practices within narrower limits when he beheld the dangers and mischiefs of their indiscriminate use. Not a few cases were reported of sudden death following his original discipline; very many examples of insanity were among its consequences; organic diseases of the heart were attributed to it; and it was said habitually to depress the animal temperature, and, after having been used for some time, to increase very much the susceptibility to catching cold. A portion of these results may be ascribed to the impoverishment of the blood which has been observed to follow the hydropathic regimen, and in those especially who drink large quantities of water. The symptoms were in the main those of scurvy, viz.: pallor of the integuments, œdema of the face and ankles, a frequent pulse, palpitation of the heart, pale and fetid urine, ulcers of the mouth, and a disposition of all wounds to bleed profusely. These facts furnish a weighty objection to the method in question as it was originally, or is even now practised, by the speculators in its

use; but, as they relate almost exclusively to results which followed a protracted application of the system, they ought not to be permitted to prevent its judicious employment by capable and conscientious physicians.

ADMINISTRATION.—The modes of employing cold in medicine may be conveniently arranged under the following heads: 1. The simple application of cold by means of baths, irrigations, epithems, and of a low temperature without liquid; 2. Cold, with mechanical stimulus of the skin, *e. g.*, ablution, affusion, the douche, and the shower-bath; 3. Cold so applied as to stimulate the skin permanently.

Cold Baths.—It is not easy to indicate very narrow limits of temperature within which a bath may be called *cold.* At almost any temperature under 70° F. a bath will produce a distinct sensation of coldness, but it has been usual to describe as cold, a bath between 33° and 60° F., and one between the latter temperature and 70° F. as *cool.*[1] The common and safer practice is to begin with the cool, and proceed gradually to the cold bath. Natural baths, however, may be used at a much lower temperature than those prepared at home. Neither should be used immediately after a meal, and seldom within four hours after a full repast. The skin should be moderately warm, and the mind cheerful. Hence a certain amount of exercise before bathing is beneficial. It renders the impression of cold water more agreeable, and the subsequent reaction more complete. For this reason, doubtless, the bath taken at noon in summer is the most grateful. The early morning bath is next to be preferred, when the body is not only warmed by lying in bed, but invigorated by the night's sleep. Before entering the bath, it is prudent to pour a vessel of water over the head and shoulders, for the purpose of preventing congestion of the brain. During the bath, which may last from five to twenty minutes, the skin should be actively rubbed, and the least chilliness should be a signal for withdrawing. On quitting the water active friction of the whole body should be practised with a coarse towel, until the skin glows. Rest may then be enjoyed, and some light, digestible food taken. But if reaction be not complete, walking in the open air, and if possible in the sunshine, will generally restore the due degree of animal heat.

The frequency of such baths ought to be regulated by the vigor of the patient, the temperature of the air, and their influence upon the health. Once a day is generally sufficient. Sea baths may be taken more frequently, yet seldom more than twice in the twenty-four hours.

Local cold baths comprise those which are applied to the head, the

[1] MITSCHERLICH, op. cit., i. 421.

pelvis, or the feet. The first of these is most conveniently taken in the horizontal posture, the head resting in a shallow basin partly filled with water. Habitual fulness of the head, headache, weakness of sight, and even chronic catarrhal affections of the nasal passages, are benefited by this agency. The cold hip-bath is a favorite remedy with the hydropathic sect, in affections of the abdominal organs, such as constipation, piles, &c., and as a method of derivation in diseases of the brain, heart, and lungs. The effect of this bath is decidedly tonic when it is used for a few moments only at a time, and if the water is quite cold (40° F.). Its derivative influence is obtained by a higher temperature (50° to 60°), and by a longer application, as for an hour at a time. The latter effect is not always attainable without some risk of augmenting internal inflammations, or of producing cerebral congestion. It ought, therefore, to be very cautiously, if at all produced.

By *irrigation* is meant the keeping a constant stream of cold water over an affected part and the adjacent surface. These should be placed in such a manner that the water, having served its purpose, may flow freely away, and come as little as possible into contact with the sound parts. It may be supplied from a reservoir, through a simple tube or by means of a flexible siphon. The supply ought to be controlled by means of a stopcock, and should be extremely gradual, but, at the same time, continuous. In the absence of a siphon, a strip of woollen cloth, several inches in breadth where it is immersed in the water, and gradually tapering to a point, answers the purpose perfectly well. The water must be kept at a uniform temperature; for if this precept be not observed, a series of alterations in the supply of blood to the part takes place, and the very object of the treatment is defeated. Before suspending entirely the use of irrigation, the temperature of the water employed should be gradually raised, and its quantity diminished until there is little more than dampness left on the affected part.

Under the term *cold epithem* is included every local application of cold moisture, by means of compresses, sponges, or other soft porous bodies. It is variously employed, according to the object in view. When it is intended that the impression of cold shall be protracted, the application must be constantly renewed, as in cases of cerebral excitement. A degree of cold greater than that produced by cold water or pounded ice may be obtained by the use of artificial mixtures, such as the following: ℞.—Potass. nitrat. ℥ss; ammoniæ muriat. ℥ij; aceti f℥iss; aquæ f℥xx. The anæsthetic applications of freezing mixtures have been described in this article. More generally the antiphlogistic effect is sought, not so much from the primary or transient, or even the more lasting impression of cold, as from the emollient

and more durable influence of the moisture. For this purpose wet compresses, covered with a larger piece of oiled silk or some other impermeable tissue, may be employed. Care must be taken to wet the compresses afresh as often as they become dry.

Ablution consists in applying cold water, with more or less friction, to the surface of the body. In addition to the direct impression of the cold fluid, the sense of coolness is prolonged by its evaporation. It is one of the most useful and grateful palliatives which can be employed in fevers attended with a hot and dry skin, and may be resorted to when the disease itself, or the age, weakness, or timidity of the patient renders more energetic antiphlogistics inappropriate. A more active form of ablution consists in rubbing the skin with cold water and the hand, while the patient sits in a bath-tub half full of water. It should last from five to ten minutes, and be followed by a speedy and complete reaction. A cold foot-bath, in which friction is performed by the feet upon one another, is an excellent means of preventing cold feet and relieving headache in feeble and excitable persons.

Affusion.—Jackson thus describes the manner in which he employed cold affusions for typhus in 1794: "The patient was in the first place washed and made perfectly clean by means of soap and water; the skin was rubbed strongly, and under the state of susceptibility and artificial animation consequent to friction, cold water (which was sometimes at a temperature but little above the freezing point) was poured upon the head and shoulders and other parts of the body from a bucket, or it was applied by means of sponges in such manner as to imitate a shower-bath."[1] Currie lays down nearly similar rules, and they are further confirmed by the authority of Armstrong. The two last-named writers, however, do not seem to attach so much importance to the preparation of the patient by washing with soap and water. Yet it is a measure which must exert a powerful influence on the subsequent action of the affusion, and there is good ground for its prescription, if it were only because the ancients employed such alternate impressions of heat and cold, and because they are to this day in vogue among the Asiatics and the eastern nations of Europe.

Jackson pointed out very clearly that merely to abstract heat is not to cure fever, and that therefore the *modus operandi* of cold affusions includes other elements than this. We are rather to look for an explanation of their salutary action in fever in the double movement, first of depression, and then of reaction, which they produce. This indirect stimulation seems to enable the system to assume a more

[1] An Exposition, &c., p. 19.

healthful action. To obtain such a result, it is not sufficient to apply cold to the skin, for this, if performed slowly and gradually, will prove the reverse of salutary; but it must be applied with such suddenness and force as to impress the nervous system strongly, and rapidly to abstract heat, and, in proportion as this is successfully done, will the subsequent reaction tend to terminate in a critical sweat, or at least in a more healthful movement of the circulation. The hotter the skin is, the greater is the probability of this result. Thus, of all diseases in which cold affusions are salutary, scarlet fever and typhus are the most successfully treated by them, and are distinguished by the greatest heat of skin. The ancient system of bathing, and that still practised in Northern Europe, recognize the same principle. The bather, after having been for some time in a hot vapor-bath, where the stimulus is so great as to produce dyspnœa, and violent palpitation of the heart, plunges at once into cold water, or even rolls in snow. Not only is he not injured by the sudden and violent transition, but, on the contrary, he experiences an indescribable sense of comfort, and perspires freely. In fevers attended by a very hot skin, several repetitions of the affusion may be required to obtain its permanent effect, and even then sensible perspiration does not always indicate the final arrest of the febrile movement. The intimate modification of the vital processes produced by cold affusions in fever is as little known as the nature of fever itself. What simple observation teaches can alone be held as certain, viz., that the nervous system is aroused, the heat of the body lowered, the blood temporarily repelled from the surface, to return more abundantly, imparting to the skin a livelier color, a lower temperature, a softer texture, and a moister surface.

Douche.—This is one of the most potent appliances of the watery regimen, and requires therefore to be circumspectly managed. When rightly employed, its effect is to stimulate and fortify the skin. The sudden and severe shock which it gives to the system renders a state of general excitement the most favorable one for its use, and that excitement in particular which is produced by active exercise. For all useful purposes the douche need not exceed an inch in diameter, nor fall from a greater height than from five to fifteen feet. At the commencement of its use a smaller stream and a less considerable fall are to be preferred, and it should not be sustained for more than half a minute; but by degrees a larger stream may be borne, and for a longer time. Some persons can endure it for three or four minutes, but only the most robust can expect to escape without injury from such a shock. The douche ought never to be received upon the head, but its blow upon this part may be broken by the clasped hands, and the force of

the stream received upon the shoulders, back, and hips. The most suitable time for the use of this bath is before breakfast. Except in very robust persons, reaction does not speedily follow a strong douche bath; as a rule, therefore, the skin should be actively rubbed with coarse towels after the bath, and a walk should be taken briskly in the open air before eating.

Shower Bath.—The shower bath is a modification of the douche, and is formed by water passing through a plate perforated with numerous small holes. It is generally described as being less powerful than the douche, but it so envelops the bather as to take away his breath, and its shock, if less powerful, is also less concentrated, and is therefore borne by a larger surface of the body at once. "It gives a thousand little blows which vex by their minuteness and bewilder by their number." It is nevertheless preferable to the douche when a comparatively gentle stimulus is required, on account either of the age or the feebleness of the patient.

Hydropathic Measures.—Sweating, produced by enveloping the body in dry blankets, and administering cold drinks, although generally described as a part of the hydropathic treatment, was in reality very little used by Priessnitz, and does not belong to the general subject of this article. It consisted, however, in endeavoring to produce active diaphoresis by sweating the patient in blankets, and carefully adjusting them about the neck, so as to prevent, as nearly as possible, all escape of heat from the skin. The head meanwhile was kept cool by wet compresses, and, when once sweating began, small quantities of cold drinks were administered every few minutes. The desired effect was frequently not produced for several hours.

Packing in the Wet Sheet.—This is the most usual and efficient of the processes employed. A large and coarse sheet is thoroughly wrung out of cold water and spread over a blanket previously extended upon the bedstead. The patient lies at full length in the middle of the sheet, which is at once closely and thoroughly wrapped around him, and the blanket is applied over it in the same manner. A feather bed, or a down covering, is laid over all. This is a very powerful apparatus, and deserves to be withdrawn from the hands of the charlatans, who have converted it into a deadly weapon. Its first impression on persons in feeble, or even ordinary, health, is one of disagreeable coldness, but this soon passes away, and is followed by a mild and grateful warmth. The temperature of the skin gradually rises until it feels hot, the face becomes injected, and general perspiration breaks out, which, if desirable, can be maintained by repeatedly administering small draughts of cold water. When complete reaction has taken

place the wrappings are removed, and the body is washed with cold water, or the patient plunges at once into the cold bath. This, at least, is the regimen in chronic diseases. In acute affections, the sedative action of cold is rather sought for, and as soon as reaction manifests itself, fresh wrappings are applied, and the process is repeated until the pulse is permanently lowered.

The stimulant or sedative effects (for they may be either) of the wet sheet are obtained upon a small scale, and, locally, by means of wet compresses. When these are saturated with water, and frequently renewed, they act as refrigerants, and diminish the quantity of blood in the part to which they are applied; but if allowed to remain longer in place they are simply emollient. The so-called hydropathic belt consists of a bandage, five or six inches in diameter, and long enough to go twice or thrice around the body. After having been dipped into cold water, and carefully wrung out, it is very closely wound around the trunk, and a longer and wider dry band is accurately applied over it. It is renewed as often as it grows dry, which is nearly every hour. Compresses are applied in the same manner upon various parts of the body, and particularly upon joints affected with rheumatism, and upon the skin over diseased viscera. The exciting effects of the belt are "manifested in what may be called a depurative sweat, which is at first clear, and is difficult to be procured; but as the treatment advances it becomes more profuse, is viscid and glutinous, of a dark yellow and brown color, sour, and even fetid in its smell, and is sometimes impregnated with the most disagreeable odors. When these morbid phenomena appear, the perspiration may be considered of a critical nature, as if it were the elimination of a morbific humor."[1] The compresses, as well as the belt, produce an eruption of a vesicular, pustular, or simply an erythematous character, and the more abundantly in proportion as the cloths are dryer. This effect appears to result from the softening of the cuticle, and the irritation produced by the close contact of the compress or bandage. It is a useful result, and may, in certain cases of chronic disease, be advantageously substituted for vesication or pustulation by pharmaceutical irritants.

Cold without Moisture.—A convenient apparatus has been proposed by Dr. Arnott for the topical application of cold.[2] It consists of a bladder, into both ends of which tubes provided with stopcocks are inserted, the one to receive cold water from a reservoir, the other to convey it away after having been used. The bladder rests upon the affected part. A freezing mixture may be directly applied to a small

[1] Bell, op. cit., p. 300.

[2] An Exposition, &c., p. 19.

portion of the skin, by means of a lamp-glass or tumbler covered with a piece of bladder. If it is desired to affect a larger surface, the mixture may be immediately applied to the skin.

ACIDUM HYDROCYANICUM DILUTUM.—Diluted Hydrocyanic or Prussic Acid.

History.—The well-known pigment, Prussian blue, was discovered by Diesbach and Dippel at Berlin in 1704. Nearly half a century later, Macquer found that alkalies decomposed and decolorized Prussian blue; and in 1775, Bergmann announced that the coloring principle of this compound was an acid. Scheele was the first to isolate this substance. In 1782, he demonstrated its properties, and pointed out new and more perfect methods of preparing it, but it was not until 1815 that the acid was obtained in a pure and anhydrous state, by Gay Lussac, who also gave the name cyanogen to its radical.

Hydrocyanic acid exists naturally in numerous plants. It has been obtained from the leaves, flowers, and kernels of peaches, cherries, plums, and bitter almonds, from the leaves of the cherry-laurel, the bark of the wild cherry (*Prunus Virginiana*), &c. In some of these it does not exist already formed by nature, a statement which would seem scarcely reconcilable with their well-known poisonous qualities, when taken in substance, although the fact is attested by ancient authorities and made familiar by modern experience, had not science proved in what manner the poison is developed out of the elements furnished by the plants on the one hand, and the animal economy on the other. Dioscorides mentions that bitter almonds are poisonous to foxes and other animals, and even to men, when eaten in large quantities, and his statements are fully confirmed by Matthiolus, Wepfer, and others.[1] It would appear also that this substance, or, as some suppose, its radical, is, under certain circumstances, a product of the animal economy. Fourcroy relates that "a woman, aged about thirty years, labored under a nervous and melancholic affection in consequence of protracted grief. The principal seat of her suffering was in the epigastric region. She became exceedingly emaciated, with hectic fever, and a livid paleness of the skin. After a few days she was seized with a convulsive trembling and faintings, which were followed by the discharge of drops of blood from the edge of the eyelids, the nostrils, and the ears. The linen with which the blood was wiped off was marked with spots

[1] Wibmer, Wirkung, &c., i. 154.

of a beautiful blue."[1] A similar case is one by Coulton, in which pus from the wound of an extirpated cancer continued during five days to tinge the linen of a fine blue color.[2] Dr. Pereira met with a very analogous instance. Dr. Batt, of Genoa, found, in the urine of a little girl, of seven years of age, a dark blue sediment, which proved on analysis to be prussiate of iron.[3] It has been supposed that the poisonous matter of decaying cheese and pork is closely allied to the acid under notice, which is also alleged to have been clearly detected in ergot, a substance which, as is well known, is apt to produce gangrene of the extremities when used with the food for any considerable time.

Hydrocyanic acid produced by chemical processes was first employed in 1804 by Borda, for the same diseases in which he had been accustomed to prescribe the oil and distilled water of cherry-laurel. Soon afterwards, Brera, of Padua, and Rasori, contributed by their favorable reports of its effects to bring the new and powerful agent into vogue, while Magendie, in France, and Granville, Elliotson, and others, in England, drew very general attention to its medicinal employment. But the reality of very few among the virtues it was at first supposed to possess, has been established by continued experience, and at the present time the therapeutical applications of the acid are comparatively few and unimportant. This result may be attributed less to its intrinsic want of medicinal powers, than to the alarming and sometimes fatal consequences of its incautious administration.

PROPERTIES.—Medicinal hydrocyanic acid is prepared by distilling diluted sulphuric acid with ferrocyanuret of potassium and water, or by the action of diluted muriatic acid upon cyanuret of silver. The latter is adapted to its extemporaneous preparation. Anhydrous hydrocyanic acid is a clear transparent liquid, which is extremely volatile, and freezes by its own evaporation at 5° F. Its boiling point is 80° F. Light readily decomposes it and renders it yellow or brown. Its taste is at first cool and afterwards burning, its odor resembles that of bitter almonds, and is irritating to the nostrils. Its vapor is inflammable, and burns with a reddish-yellow flame. Its acid reaction is very feeble, as it reddens litmus very slightly. It is partially soluble in water, but perfectly so in alcohol, ether, and the ethereal oils. *Officinal* hydrocyanic acid contains but two per cent. of the anhydrous acid, and possesses, of course, the essential properties of the latter in a low degree. Owing to its susceptibility to decomposition by light, it should be kept in bottles covered with black paint or

[1] Am. Med. Recorder, ii. 516. [2] Ibid. [3] SIGMOND, Lancet, 1836-7, ii. 745.

paper, and be renewed from time to time. According to Dr. Christison, this decomposition does not take place so readily when the acid is prepared by the action of sulphuric acid on ferrocyanuret of potassium, and seems in a great measure to be prevented by the presence of a small excess of the acid just named.

ACTION. *On Vegetables.*—If two hyacinth bulbs are placed, the one in a vessel containing pure water, and the other in a vessel filled with cherry-laurel water; the first will send out roots, stem, and flowers; but the second, on the contrary, will give no signs of vegetation; the roots will die and begin to putrefy in a few days.[1] Seeds lose their power of germination, and the leaves of the sensitive plant their irritability, by immersion in water impregnated with hydrocyanic acid. Its hostility to vegetable life has been thoroughly illustrated by Mr. Nunneley.[2] He employed in his experiments a great variety of plants, of which corresponding cuttings or roots were placed in similar vials, with and without the acid. The vials contained one and a half fluidounces of water, and those containing the acid and the water respectively were kept in different rooms. The quantity of acid employed was six, ten, and thirty minims in several series of experiments; and in another one, the plants were placed in glass jars of the capacity of a pint and a half, ten minims of acid were introduced, and the top of the jar was closely covered over. After giving the experiments in detail, the author remarks that they "will probably be regarded as sufficiently numerous to show that hydrocyanic acid affects vegetables generally... The most remarkable effect of the acid, whether the plant be exposed to the influence of the vapor, or be put into a weak solution, so that it may be absorbed within the tissues, is the complete prostration of all the power of the plant; it becomes shrunk, feeble, and dry, or, if it be a succulent plant, moist, often with the sap exuding from the stem. The condition of the plant strongly resembles that of animals when in a state of paralyzation from a dose of the acid, or the extreme flaccidity immediately after death, before the commencement of rigidity. The acid soon disappears, being either decomposed or absorbed; for a few hours after the experiment, no smell of it was perceptible."

On Animals.—Hydrocyanic acid is poisonous to all animals, but acts rather less rapidly upon the cold than upon the warm blooded. Shrader, of Berlin, in 1802, was the first to illustrate its terrible power, which the experiments of Emmert, Coullon, Schubarth, Ma-

[1] DUVIGNAN and PARENT, Med. Record., ii. 553.

[2] Trans. Prov. Med. and Surg. Ass., N. S., iii. 58.

gendie, Londsdale, and Nunneley have amply confirmed. When the effects produced by a dose of hydrocyanic acid are not too rapid to be observed, the earliest appears to be giddiness, with a loss of muscular power and control over the combined action of the muscles; the head droops, the mouth is open, the tongue protrudes, there is apparently a sense of distress and constriction in the fauces, and the respiration is hurried and panting. This unsteadiness and loss of power are speedily succeeded by spasm, frequently of the most intense kind. It may be either tonic or clonic, according to the strength of the dose of acid, and the susceptibility of the animal. If the spasm be tonic, not only do the voluntary muscles continue rigid, but the heart is, at least to the same extent, affected. It ceases to pulsate, and the respiratory muscles are affected with spasm. Hence the lividity and bloated appearance of the face, the protrusion of the eyes, and the excessive congestion of the veins. In this condition of the two all important functions is to be seen one of the causes of the almost instantaneous death which takes place in some instances. When, however, the dose of the acid is less, or the susceptibility of the animal not so great, the rigidity of the muscles soon abates and gives way, and is followed by more or less complete paralysis; at the same time the respiration either becomes excessively rapid, the chest being but little expanded, or it is very slowly performed, and is deep or sighing. The heart beats very rapidly and feebly. This state of paralysis may continue, the weakness gradually increasing until the animal dies, or, as more generally occurs, the creature is convulsed and paralyzed at intervals, the heart continuing to beat very feebly for two or three minutes after all signs of sensation and motion have ceased; though, by no means infrequently, a strong convulsion immediately precedes death. If the animal recovers, it will often lie in the most complete state of paralysis; after a time slight convulsive movements of the limbs, or some spasmodic action in respiration may be observed. These gradually grow stronger, until the convulsions often become very powerful. The animal howls loudly, reflex action returns, and subsequently, sensation. But for some time it continues very feeble, is indisposed to move, and has very little command over its muscles. If it survives, the symptoms resemble those from opium in the deep, quiet sleep, and indisposition to be aroused from it, while the condition of the pupil is variable, being often, at this stage, by no means dilated. The acid acts locally as well as generally. When dropped into one eye of an animal, the pupil of the eye is sooner, and to a greater extent, dilated than that of the other; and when the acid is administered by the rectum or the

vagina, both hind legs are sooner affected than the anterior portion of the body. But the constitutional symptoms appear almost as rapidly as if the poison had been swallowed. Much has been said of the shriek which often precedes death from hydrocyanic acid. It is by no means a constant occurrence, but, when it does take place, the cry is of so peculiar a kind, and so indicative of severe distress, as to give the idea of consciousness on the part of the animal of impending death. *Post-mortem* examinations, whether made immediately after life has ceased, or not until some time afterwards, do not throw any very decided light upon the cause of death. But, if the body be opened while the heart is pulsating, it will be found that when death has been long delayed, or the dose of acid very small, the blood is usually dark in color, alike on both sides of the heart, and all the cavities of the viscus may contain more or less of it, especially the right, which is often much distended; while, on the contrary, if the death has been sudden, in almost every case the left side of the heart, and especially the ventricle, is found to be perfectly empty and rigidly contracted, while the right side of the heart contains blood, being in some cases, though by no means always, much distended. The stomach, or whatever part the acid had been applied to, is almost invariably found reddened. The veins of the brain, and indeed throughout the body, are remarkably engorged. Cadaveric rigidity is probably greater after death from hydrocyanic acid than after death from some other causes. Kölliker concluded from his experiments upon frogs that prussic acid directly and primarily produces cerebral paralysis, and then affects the spinal marrow, destroying, first its reflex, and afterwards its direct motory function; and that it paralyzes the heart, and permits it to become distended with blood.[1]

There is no fixed quantity of the acid which will invariably destroy life. The more vigorous the animal, *cæteris paribus*, the larger is the quantity that may be taken. In like manner, a smaller dose is fatal in young animals than in the old, although in very young animals large doses are required. The degree of concentration of the acid has no very material influence over its action. Given on successive days, hydrocyanic acid does not show a cumulative action, but rather the reverse; it is more probable that the system becomes habituated to it, and by repetition will endure a dose which, if given at first, would have been destructive to life. It was curious to observe, says Mr. Nunneley, that however helpless and paralyzed a dog might be lying, if another dose were given, the first and *immediate* effect of it was to rouse the animal, and often to produce violent motion.[2]

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[1] Virchow's Archiv, x. 288.

[2] Op. cit., p. 84.

When introduced by the rectum or vagina, or applied to wounds or to the conjunctiva, hydrocyanic acid occasions the same series of symptoms which have been described, but more gradually. Injected into the veins it may destroy life instantaneously, and when inhaled in a concentrated state it is scarcely less immediately fatal.

On Man.—The phenomena occasioned in man by hydrocyanic acid may be conveniently studied under three heads: the effects, 1st, of small or medicinal doses. 2d, of those which are poisonous, but not immediately, if at all fatal. 3d, of those which are directly destructive of life.

Under the first head may be mentioned irritation of the throat and windpipe, with an increased flow of saliva, a sense of heat in the epigastrium, diffusing itself over the whole abdomen, and even to the entire surface, constriction and heaviness of the head, dizziness, buzzing in the ears, headache, numbness, duskiness of the countenance, staggering, laborious respiration, constriction of the chest, often palpitation of the heart, inclination to vomit, but sometimes a feeling of emptiness in the stomach, and craving for food, a quick and excited, or an unusually slow pulse, and, for some hours after these symptoms, a sense of weariness and an inclination to sleep. These phenomena occur more readily in feeble than in robust persons.[1]

Examples of the second class are seldom met with; for when much more than the due medicinal dose of the acid is taken, either by accident or design, it almost always proves rapidly fatal. The following, which are the symptoms that occurred in the case of Dr. Bertin, of Rennes, may be taken to illustrate this class. Dr. B. had already more than once taken a dessertspoonful of the medicinal acid without injury, and on the present occasion procured from an apothecary a like dose of the medicine prepared by one of the best chemists of Paris, and swallowed it in two mouthfuls, before leaving the shop. Almost immediately afterwards he fell down as if struck by lightning. His symptoms were the following: loss of consciousness and sensibility; trismus; a constantly increasing dyspnœa; cold extremities; a noisy and rattling respiration; the characteristic odor of the acid upon the breath; distorsion of the mouth; a thready pulse; the face was swollen and dusky, and the pupils fixed and dilated. The trismus increased, and was soon accompanied by opisthotonos. At the end of an hour a violent convulsion came on, the whole trunk grew stiff, and the arms were twisted outward. The convulsive attacks were repeated, but did not last more than a few minutes. The abdomen was distended with

[1] Compare Becquerel, Gazette Méd. de Paris, 1840, No. 1 et seq.

flatus, and continued to enlarge. After two hours passed in this condition, the patient began to regain his consciousness, said that he had taken prussic acid, and begged that he might have more air, and be allowed to die in peace. The mind gradually became clear, but there was marked dyspnœa, and from time to time a fit of coughing which caused the expectoration of a little opaque, whitish mucus. There was no paralysis whatever. About nine hours after the accident the patient was taken home, and walked upstairs to the second story without assistance. For several days he experienced the symptoms of a pulmonary catarrh, which may have been unconnected with the poisoning; his urine was scanty, and he complained of a sense of stricture across the chest. He was not able, for a fortnight after the accident, to leave the house.[1]

In the third series of cases death may take place without being preceded by any definite symptoms. MM. Trousseau and Pidoux say: "We have witnessed three cases of poisoning by prussic acid. *There were no convulsions.* The first phenomenon observed was a profound stupor, an immediate and almost total extinction of animal life. The pulse could not be felt at the wrists or temples, but was perceptible in the neck, and very faintly in the groin. The breathing was hurried, but not labored, and interrupted occasionally by deep sighs. The pupils were widely dilated." These phenomena are merely those of the act of death, and although, for obvious reasons, they are seldom witnessed at their inception, there is evidence enough that they may begin and end within the space of one or two minutes, and display themselves even while the poison is in the act of being swallowed.

The *post-mortem appearances* after poisoning by hydrocyanic acid are very slight. Externally, the body is commonly livid, or the skin is tinged of a violet color; the nails are blue, the fingers clenched, and the toes contracted; the jaws firmly closed, with foam about the mouth, the face bloated and swollen, and the eyes have been observed to be glassy, very prominent, and glistening. Internally, the venous system is gorged with dark colored blood; the veins of the brain and spinal marrow, of the solid viscera of the abdomen, and of the lungs, as well as those emptying into the heart, and the right side of this organ itself, are distended with blood. This fluid is uncoagulated, is of a dark bluish-black color, and tarry consistence. Like the organs, it generally smells distinctly of the acid. The mucous membrane to which the acid has been applied, is usually reddened. The irritability of the muscles of organic life is much diminished.

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[1] Revue Med., xvii. 265.

A *rationale* of the symptoms occasioned by hydrocyanic acid can only be inferred from a careful analysis of them, since no organic change capable of explaining them can be detected after death. Since the phenomena are nearly identical in man and in the lower animals, those derived from both sources may be used to elucidate the modus operandi of the agent under consideration. It has already been seen that in quadrupeds the immediate consequences of a fatal dose of the acid, so far as they relate to the point under consideration, are general spasm of the muscular system, and death from an arrest of the action of the heart and lungs. If, instead of taking place immediately, death be postponed for half an hour or longer, spasm is followed by debility of the muscles of animal life, while those of the heart and thorax act more rapidly to compensate for their feebleness; the pulse is frequent and faint, and the breathing hurried and short. In this condition the struggle between life and death is demonstrated by the recurrence of more or less general spasms, which either exhaust the system, and so directly destroy life, or, growing feebler themselves at each return, at last leave the vital powers triumphant. It may be objected that such figurative expressions explain nothing; they, however, portray the phenomena whose essence is inscrutable. It is, moreover, clear that the force of the poisonous agent is spent upon the nervous system. Some experimenters, regarding too exclusively the singular rapidity of its action, have conjectured that all of its effects are produced directly and immediately through this system. But the opinion is untenable; for a complete division of the spinal cord in animals does not prevent the instantaneous and fatal effects of the poison introduced into a wound of the lower extremity. The demonstration is, moreover, direct and clear of the bloodvessels being the channel through which the poison acts. For if it is introduced into a limb in which the circulation is suspended by a band firmly applied, no constitutional effects whatever take place until the pressure is removed, but immediately thereafter the signs of poisoning display themselves.

Remedial Employment.—MM. Trousseau and Pidoux, on reviewing the evidence in favor of hydrocyanic acid as a medicine, arrive at the conclusion that "it is often dangerous, almost always useless, and very rarely curative." This judgment is scarcely impartial. Undoubtedly a very great many of the expectations which were indulged of the usefulness of the medicine have, as in the case of nearly all new agents, been disappointed; but a fate which befalls the good and the worthless alike ought not to be made a ground of condemning the former. From the following summary it will be perceived that the

medicine has just claim to confidence in the treatment of several diseases.

Spasmodic and Painful Diseases.—Whooping-cough. In no other affection has the value of this medicine been more highly exalted, and there is apparently some ground for a favorable opinion of its merits. Dr. E. P. Atlee[1] prescribed it for children and adults in more than two hundred cases of the disease, which it cured in from four to ten days, or at furthest in a fortnight. He employed a preparation containing four and a half per cent. of the pure acid, of which five drops were mixed with an ounce of syrup, and of this mixture a teaspoonful was given three or four times a day to a child from six to twelve years of age. Dr. Hayward[2] found, in the latter stages of the disease, when there is little or no mucus in the lungs, nor any tendency to congestion of these organs, that two or three doses of the medicine would put an end to the disease. Richter[3] considered it as useful towards the termination of the attack, but inefficient at its height, and in this opinion various other authorities coincide. According to Dr. West, if the paroxysmal character of the cough be well marked, and the fits are of frequent occurrence, but the child in other respects ails little, much benefit will accrue from the use of hydrocyanic acid. It sometimes exerts an almost magical influence on the cough, diminishing the frequency and severity of its paroxysms almost immediately, while in other cases it seems perfectly inert; and again, in others, without at all diminishing the severity of the cough, it exerts its peculiar poisonous action on the system so as to render its discontinuance advisable.[4] This statement explains why some persons question its efficacy altogether, and why other physicians employed the remedy successfully in one epidemic but failed to derive any benefit from it in subsequent ones. The latter circumstance has been plausibly explained by the greater mildness of the disease on the first-mentioned occasions. On the whole, it appears to be a useful medicine in mild attacks of whooping-cough, and generally during the decline of the affection. Dr. West prescribes a dose of half a minim of the acid (P. Lond. or U. S.) every six hours for a child nine months old, gradually increasing the dose to one minim every four hours for a child of that age, and so in proportion for older children. If the child appear faint, or dizzy, or bewildered, after its administration, the dose should be diminished or the medicine suspended. The following formula is used by Dr. W.: ℞.—Acid. hydrocy. dil. ♏iv; Sodæ bicarb. gr. x; Mist. amygdal. ℥j. —M. S.—A teaspoonful every sixth hour for a child nine months old.

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[1] Am. Journ. of Med. Sci., x. 128.
[2] Ibid., iv. 51.
[3] Op. cit., ii. 523.
[4] Diseases of Children, 3d ed., p. 342.

Simple nervous cough, apparently independent of pulmonary disease, is sometimes of great urgency and violence, and while it seems to be kept up by an irritable state of the system, appears to be aggravated by opiates and the usual expectorant remedies. For this affection there is no more certain palliative than hydrocyanic acid. Dr. Hayward and numerous authorities concur in this opinion. In *spasmodic asthma* its benefits are much less distinct; indeed, so many remedies excel it in relieving this complaint that it need scarcely be employed in its treatment.

In other spasmodic affections its advantages are by no means eminent. Andral and Becquerel, who experimented extensively with the medicine, found that, in severe cases of hysteria and in the nervous symptoms that attend chlorosis, it was altogether inefficient. A case of *spasmodic dysphagia* is reported by Richter,[1] which, from its degree and long duration, as well as from the extreme emaciation it had caused, was thought to be organic, but which was rapidly cured by hydrocyanic acid in conjunction with counter-irritation of the neck. In *dysmenorrhœa* this remedy seems occasionally to have acted as a palliative. In a case of *angina pectoris* Schlesier found that it afforded immediate and very decided relief. In other *diseases of the heart* Andral and Becquerel regarded it as more injurious than useful. Richter found it beneficial in *neuralgia* resulting from cold or combined with a *rheumatic* element; and Dr. Coates[2] reports two cases of the latter description in which it procured a more decided advantage than the other remedies employed.

Gastralgia.—One of the earliest applications of the remedy in England was to the relief of this form of *dyspepsia*, for which it was first generally introduced in that country as a remedy by Dr. Elliotson.[3] He prescribed it in cases of which the main symptoms were pain and tenderness of the epigastrium; and although the previous duration of the disease varied from a few weeks or months to as many years, it yielded with great rapidity. In another series of cases epigastric pain and tenderness were accompanied by such symptoms as flatulence, vertigo, headache, loss of appetite, nausea, pyrosis, vomiting, nervousness, palpitation of the heart, cough, and dyspnœa. In these, too, the acid was equally successful. This application appears to have been originally suggested by Sprengel, who doubtless drew the idea from a similar use of laurel-water in the last century. Dr. A. T. Thompson, perhaps without a knowledge of these circumstances, also suggested its use, and even at a much later period continued to believe that no

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[1] Op. cit., ii. 523.

[2] Med. Recorder, iv. 146.

[3] Med.-Chir. Rev., 1821, i. 639.

remedy is so well adapted, as an adjunct of tonics, for removing those dyspeptic affections which are attended with irritability of the mucous membranes of the stomach, and accompanied with heat and soreness, and the elongation of the papillæ of the tongue.[1] In 1828, Dr. Bailey published a tabular record of cases similar to those of Dr. Elliotson. Their prominent symptoms were epigastric tenderness, indigestion, flatulence, and palpitations of the heart. He prescribed three minims of the British officinal hydrocyanic acid three times a day, and cured all of his cases in from one to three weeks. Its effects were striking from the first days of its administration.[2] All of these writers regarded the medicine as improper when the dyspeptic symptoms were attended by fever. Dr. Pereira contributed to the history of the complaint in question several striking examples of the prompt and permanent relief of its symptoms by this medicine. But, as he remarks, it is attended either with perfect success or perfect failure. It not only allays pain, but relieves *vomiting*. *Enteralgia* is no less certainly and immediately palliated by this remedy, and in most instances is permanently cured by it. Dr. Prout has found it useful in the pains of *colica pictonum*.

In *chronic pulmonary affections*, and even in phthisis, hydrocyanic acid was at one time extravagantly praised by several English and other European writers, who acquired a wide-spread notoriety by their alleged success in its employment. Foremost among these were Dr. Granville[3] and Magendie, whose reports of success bordered on the marvellous, but which neither contemporaneous nor more recent experience has confirmed. The whole value of the medicine in consumption is now well ascertained to consist in its power of allaying the cough.

Acute inflammation, of the lungs especially, was at one time supposed to have encountered a specific cure in the acid under notice. Great was the surprise of the physicians and students, says an Italian writer,[4] at Borda's clinique in the hospital of Pavia, when they saw these affections yielding as if by enchantment to the use of the medicine. The fever ceased immediately; a gentle moisture appeared upon the skin; the pulse fell, and resumed its normal characters; a salutary expectoration took place; the pains and the cough vanished away. Some years afterwards Brera obtained equally favorable results at Padua, and from these cities, as already related, the medicine began its vogue. The long list of authorities who vouched with no less confidence than

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[1] London Dispensatory, p. 839. [2] Lond. Med. Repos., Apr. 1828.

[3] History and Practical Treatise on the Internal Use of the Hydrocyanic Acid in Pulmonary Consumption, &c. Second edition. London, 1820.

[4] GIACOMINI.

these writers for the virtues of the remedy contains the names of distinguished men, and their enthusiastic assertion of its powers in many curable, and even incurable, diseases, stands on record to swell the proof of the fallibility of human testimony where facts and opinions are not sufficiently distinguished from one another.

External Use.—A number of writers agree in testifying to the utility of this acid in certain cutaneous affections attended with itching. Dr. Thomson, particularly, regards it as the only application that can be depended on for allaying the itching and tingling which are so distressing in *impetiginous affections.* He directs it to be used in the proportion of f℥iss to f℥viij of water. Schneider, of Dusseldorf,[1] has also employed it successfully in various cutaneous eruptions, and especially in those of the genital organs, for the purpose and after the manner above described.

Dose and Administration.—The average dose of medicinal hydrocyanic acid is two or three drops, given several times a day in some mild and simple vehicle, such as gum-water, syrup, or orange-flower water, with a few drops of alcohol, and cautiously and gradually increased until a slight degree of giddiness or faintness is produced. The most prudent plan is to begin with one drop as the minimum dose, and augment it rapidly until the average is reached, when its further increase should be very cautiously directed. In order to more clearly designate the preparation, as well as to shield it from the action of the light, the vial containing it should be covered with black paper or varnish. Whenever the medicine is renewed, the risk of employing a sample of unascertained strength should be avoided by giving at first the minimum dose.

As a wash it can be employed after the manner described above. Christison directs one part of the medicinal acid in two hundred parts of water, which may be increased afterwards to twice or thrice that proportion. Drs. Wood and Bache prescribe from thirty minims to a fluidrachm, dissolved in a fluidounce of distilled water. But care must be taken to use only the weakest solution whenever there is the least abrasion of the skin, for alarming symptoms have followed a neglect of this precaution, and it is said that signs of poisoning have followed an application of the pure acid even to the sound skin.

Antidotes.—"I know of no antidote to hydrocyanic acid," is Mr. Nunneley's conclusion from his numerous and carefully conducted experiments with this substance. He found *chlorine* of little or no value in moderating the effects of the poison. For practical purposes,

[1] Mérat and De Lens, ii. 549.

too, it could seldom be accessible. Unlike most other poisons, hydrocyanic acid, taken in large doses, leaves but little time for interference, and the only reliable remedies, as a general rule, must be such as are always at hand. For this reason *electricity* and *galvanism* could seldom be employed, even if they were efficient; but, although proposed, and even vaunted, there is no ground whatever for confidence in them as practical resources against the poison under notice. In regard to *ammonia*, which has been considered the chief resource by some experimenters, Orfila concludes, from his experiments, that it is very decidedly useful if properly employed; that is to say, if the preparation be not strong enough, or so constantly applied, as to cauterize the mucous membrane with which its vapor comes in contact when inhaled. Mr. Nunneley's experiments do not contradict this statement, although his general conclusion does. He thinks that it may be useful in cases where the dose has been so small as to leave it uncertain which way the balance of life will turn; but then he does not appear to have applied ammonia so that the poisoned animal should duly inhale it, but rather to have rubbed it upon the skin, or immersed the animal in a vessel containing more or less of the vapor of ammonia. If, as there is reason to suppose, this agent operates only by means of its stimulant properties, and that chiefly through the Schneiderian membrane, these methods of testing its virtues were clearly inappropriate. *Artificial respiration*, produced by compressing the thorax, although nothing more than a subordinate resource, ought never to be neglected, and the same may be said of *shaking*. Indeed, Mr. Nunneley was inclined to estimate the value of the latter as high as anything he tried. But, of all the resources against poisoning by hydrocyanic acid, none is so valuable as *cold water*, applied to the upper part of the body in the form of a douche.[1] This is the inference to be made even from experiments on quadrupeds, whose thick hair and hide necessarily caused its effects to be less decided than they would have been under analogous degrees of poisoning in the human subject. The water is not to be applied, as some have recommended, by immersing the whole body in it, a plan which infallibly destroys whatever vitality is left, but is to be dashed upon the chest and spine at intervals, so as to excite the respiratory act, and with it renew the series of organic changes on which life depends. The first effect of this treatment, when successfully employed during the stage of paralysis or resolution, is to excite spasms of the muscles, which grow firmer, and ultimately regain their natural tone. Besides experiments

[1] See a memoir by Dr. HERBST in Journal des Progrès, xvii. 33.

on animals, numerous instances of the success of this antidote in poisoning by hydrocyanic acid[1] indicate that it is one never to be neglected. It should be at once resorted to on the discovery of the patient's condition or on the first development of the symptoms, and, along with ammonia applied to the nostrils, artificial respiration by compression of the chest, and judicious agitation of the patient, be relied on as the chief resource against the effects of this the deadliest in the catalogue of poisons.

POTASSII CYANURETUM.—Cyanuret of Potassium.

Description and Properties.—This substance is obtained by subjecting a mixture of ferrocyanuret of potassium and carbonate of potassa to a strong heat. It is white, has an alkaline reaction, and the characteristic smell and taste of bitter almonds. It deliquesces rapidly on exposure to moist air.

The properties of the salt are identical with those of hydrocyanic acid, for which it has been proposed as a substitute. In two-grain doses it is fatal to the smaller animals. A solution of it, applied to the tongue, causes a sensation of coldness, which is followed by irritation and constriction of the fauces; and if allowed to remain long in contact with the skin, it is apt to excite a papular, or even a vesicular, eruption. It may also at the same time occasion general symptoms like those of hydrocyanic acid. According to Mr. Hornidge, it is certain that three grains are sufficient to destroy life.[2] In a case reported by Dr. C. E. Ware, of Boston, seven grains destroyed a woman's life in less than an hour. Immediately on swallowing the solution she was seized with a severe burning pain in the stomach, and a feeling as if the bowels were about to act. In three or four minutes she became unconscious; there was no convulsion, but in ten minutes after the heart ceased to beat there was a sudden convulsive action of the whole body.[3] A drop of the solution upon the conjunctiva causes severe, but momentary, pain. The powder, either pure or incorporated with cerate, excites severe burning pain when applied to the skin, and, if allowed to remain, will produce an eschar.[4]

Uses.—M. Trousseau states that this preparation is very efficacious, when applied in solution to the forehead, in headaches depend-

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[1] Taylor, On Poisons, 2d Am. ed., p. 587.

[2] Times and Gaz., Jan. 1859, p. 80.

[3] Bost. Med. and Surg. Journ., Dec. 1856, p. 387.

[4] Trousseau and Pidoux, op. cit., ii. 144.

ing on dyspepsia, and connected with imperfect menstruation, or such as are generally included under the term sick headache. The solution should contain from two to four grains of the salt to an ounce of water, and be applied on compresses.

The same solution forms a very convenient means of removing the stains of nitrate of silver from the skin, which it does more quickly and thoroughly than iodide of potassium.

Internally this medicine may be given in the dose of one-eighth of a grain.

CLASS IX.

ARTERIAL SEDATIVES.

THE pulse is regarded as one of the best indices of the state not only of the circulatory apparatus, but also of the general system, and at first sight it would seem as if its condition might be taken as a safe guide in the choice of remedies calculated to exert an influence upon the heart. But a little reflection makes it evident that this is a mistaken opinion. Morbid arterial action is not always of the same nature. An excess of the normal nutritive constituents of the blood may give the pulse a force which suggests the existence of fever, although its degree of frequency may not be proportionately great. The same effect is often produced by simple hypertrophy of the left ventricle of the heart. These are cases rather of the imminence of disease than of its actual existence. Again, in febrile affections the force and frequency of the heart's contractions are increased, in consequence, probably, of the presence and retention in the blood of an excessive proportion of some effete and morbid material arising from the disintegration of the solids. In all of these cases immoderate arterial action is the consequence of a positive redundance of normal or abnormal elements in the blood. This redundance may, however, be relative. The quantity of blood in the body may not exceed the amount required for nutrition, but, owing to a mechanical obstacle in the heart itself, such as a contraction of the mitral or the aortic valves, this organ may be forced to act with unnatural frequency in order to maintain a due supply of blood in all the organs. The same effect is produced when, instead of a mechanical obstacle impeding the passage of the blood propelled by a powerful ventricle, the ventricle itself is feeble in consequence of dilatation, softening, fatty degeneration, &c.

But conditions the very opposite of those mentioned may occasion frequency of the pulse. The simplest type of this group is a case of

sudden and profuse hemorrhage, in which the pulse becomes exceedingly frequent, and often presents a tension under the finger which cannot always be distinguished from that which accompanies inflammatory fever in a person of good constitution. The same pulse is often observed in chronic anemia, chlorosis, and the advanced stages of chronic disorders accompanied with disorganization. In such diseases the frequency of the pulse is due, in part, to the necessity of maintaining the strength of the body by a more rapid distribution of its imperfect nutriment, and thus compensating, by the frequent renewal of the supply, for its defective quality. It is also partly due to the excitability of the nervous system which always attends impoverishment of the blood, and is most frequently, perhaps, the immediate cause of functional palpitation of the heart.

With these facts distinctly before the mind, it seems hardly necessary to remark that it would be impossible for the same medicines in all cases to allay undue arterial action. The nature of some as plainly requires the use of depletion, evacuants, and sedatives, as that of others does the administration of stimulants, nervines, and tonics. Practically, therefore, the class of arterial sedatives might be considered as embracing all of these antagonistic medicines, and many others besides. But we have thought that two among them are so peculiar in their operation, depressing so directly and powerfully the action of the heart when given in appropriate doses, that they are entitled to stand in a class by themselves. Digitalis and veratrum viride are the only medicines which display this power. It matters little for our present purpose whether it resides in them as an essential and primary virtue, or whether, in the case of one or both of them, it is secondary to some more general operation upon the nervous system. This question is perhaps difficult of decision; but, in regard to digitalis, the truth appears to be, that, like several of the class of diffusible stimulants, it acts as a direct sedative of irregularity of the heart depending upon debility, by giving strength, or at least temporary power, to this organ; and that, when its toxical action is developed, it renders the pulsations of the heart less frequent by an influence almost peculiar to itself and to veratrum viride, though analogous to that which in aconite is associated with powers of a different description. Veratrum viride manifests more unequivocally than its associated medicine a sedative action on the heart, and displays it without any necessarily antecedent phenomena, in states of the system decidedly sthenic, and even in fever of an inflammatory origin and type. These facts have seemed to require that the two medicines should be comprised in an independent class. No allusion is here made to the diuretic virtues of digitalis, which

are perhaps more valuable than any others which belong to it, and which would rank it with squill, parsley, and broom, did it not also display its peculiar action on the heart.

DIGITALIS.—Foxglove.

Description.—The leaves of the *Digitalis purpurea*. This biennial plant is a native of Europe, where it grows wild upon exposed hill-sides and river-banks. It is also cultivated in gardens on account of its beautiful purple flowers, which are arranged in a spike of pendulous bells, upon a stalk of from two to five feet in height. The leaves are very large, the lower ones measuring seven or eight inches in length by two or three in breadth. They are of a loose texture, and are of a deep green color upon their upper surface, but paler below. The leaves of the mature plant are alone suited for medicinal purposes. They lose their virtues if dried too fast or if kept too long. They have a sickening and heavy odor, which probably accounts for animals refusing to browse upon them. Their virtues depend upon a peculiar principle, *digitalin*, which will be more particularly described at the conclusion of the present article.

The following are officinal preparations of digitalis:—

Infusum Digitalis.—Infusion of Foxglove.

A drachm of the dried leaves is macerated for two hours in a covered vessel with half a pint of boiling water and a fluidounce of tincture of cinnamon. The dose is from one to four fluidrachms.

Tinctura Digitalis.—Tincture of Foxglove.

This tincture is prepared, either by maceration or percolation, with four ounces of foxglove and two pints of diluted alcohol. The dose is from ten to twenty drops two or three times a day.

Medical History.—Fuchsius, in 1542, appears to have been the first medical author by whom this plant was described, and by him it was called digitalis, in allusion to the German name of *fingerhut*, or "thimble," an article which its bell-shaped corolla resembles. The English name of *foxglove* has an analogous origin. In 1576, it was described by Lobelius,[1] who styles it a vulnerary. Culpepper, nearly a century later, mentions its use by the Italians as a dressing for recent wounds and old sores.[2] He recommends it as purgative, emetic, and deobstruent; as beneficial in scrofula and scalled head; and as having

[1] Hist. Stirpium, p. 305.

[2] "Aralda tutte le piaghe salda," is quoted by Ray.

"been found of late to cure divers of the falling sickness that have been troubled with it above twenty years." Sir John Floyer, not long after, repeated Culpepper's statements almost literally in his *Touchstone of Medicines*. About 1711, William Salmon, a quack doctor, extolled the virtues of digitalis in his *Botanologia*. He particularly dilated on its efficacy in consumption of the lungs, affirming of it all that is usually said at the present day by the venders of specifics for incurable diseases.

About the same time, Lemery[1] described the medicine as laxative and detergent. In 1721, it was included in the *London Pharmacopœia*, but was omitted in the edition of 1746, and reinstated in that of 1788. A similar hesitation is observable in the successive editions of the *Edinburgh Pharmacopœia*, and this fact shows the apprehension with which the use of the medicine was regarded. Its final introduction to a determinate position in the Materia Medica was due to Withering, in 1775. But he was induced to make trial of it by discovering that it formed the chief ingredient in an old family receipt for dropsy, which had long been kept secret, and also by the cure of one of his friends affected with dropsy of the chest by means of another empirical prescription of the foxglove root. It would appear, indeed, to have been a popular domestic remedy for dropsy in several parts of England. In this, as in so many other cases, science was the adopter, and not the discoverer, of the therapeutic virtues of a plant.

Action. *On Animals.*—The extract or infusion of digitalis administered in large doses to dogs produces restlessness, dulness, slowness of the pulse, watery dejections, a staggering gait, convulsions, and death. A hen that had taken the powder of digitalis for some time, became drooping and began to shed her feathers. A turkey-hen staggered as if drunk, and voided reddish excrements, but ultimately recovered; while another grew dull, erected its feathers, and drew back its neck spasmodically. After eating the leaves for several days it refused any more, its excrements grew red, its gait was tottering, it became convulsed, and ultimately, at the end of eighteen days, died very much emaciated.[2] Orfila[3] inferred from his experiments that digitalis first quickens the circulation and then retards it, rendering it, at the same time, more or less irregular; that it produces symptoms of intoxication or stupefaction, augments largely the secretion of urine, and irritates the mucous membrane of the genito-urinary passages, and, wherever applied, tends to produce inflammation.

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[1] Dict. des Drogues, 2ème ed., p. 305.

[2] Wibmer, Wirkung der Arzneimittel, &c., ii. 313.

[3] Toxicologie, ii. 566.

Traube performed a number of experiments by injecting an infusion of digitalis into the jugular veins of dogs. He concluded from them that, in proper medicinal doses, digitalis is a stimulant of the circulation, and particularly of the heart, but in large or poisonous doses it acts as a direct sedative of the circulatory organs, ultimately paralyzing them. He maintained, however, that the diminished frequency of the pulse is, in cases of feebleness of the heart, a proof of the stimulant operation of the medicine.[1]

On Man.—According to Boerhaave, digitalis may produce ulceration of the mouth, œsophagus, and stomach;[2] but this statement has not been confirmed by subsequent experience.

Withering's description of its effects[3] corresponds very nearly with the results of the most accurate observers since his time. According to him, when given in very large and quickly repeated doses, it occasions sickness, vomiting, sometimes a copious flow of saliva, purging, giddiness, and confused vision, objects appearing green or yellow; increased secretion of urine with frequent motions to void it, and sometimes inability to retain it; a slow pulse, even as slow as thirty-five a minute, cold sweats, convulsions, syncope, and death. When given in smaller doses it produced most of these effects in a lower degree; and it is curious to observe, says Withering, that the sickness, with a certain dose of the medicine, does not take place for many hours after its exhibition has been discontinued; that the flow of urine will often precede, sometimes accompany, and frequently follow, the sickness at the distance of some days, and not unfrequently be checked by it. The sickness thus excited is extremely different from that occasioned by almost every other medicine; it is peculiarly distressing to the patient; it ceases and returns again as violently as before; and thus it will continue to recur for three or four days, at more and more distant intervals. These sufferings of the patient are generally rewarded by a return of appetite much greater than existed before his taking the medicine. Lettsom, who was also one of the earliest favorers of the drug, describes its general effects in the same terms as Withering, but with rather more detail.[4] According to him, the sickness it produces is very like the effects of tobacco, and resembles sea-sickness. A languor is diffused throughout the whole system; the extremities, the hands particularly, become moist and clammy, and feel cold to the touch; there is a confused aching and heaviness of the head; flashes

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[1] Canstatt's Jahresbericht, f. 1852, p. 121. [2] Murray, Apparat., i. 731.

[3] An Account of the Foxglove, &c., Birmingham, 1785, p. 184.

[4] Memoirs of the Med. Soc. of Lond., ii. 173.

of light frequently pass before the eyes, or almost all objects appear brilliant, and sometimes, after these symptoms pass off, the sight remains impaired for several weeks. These, and, it is believed, all of the earliest English writers on the effects of digitalis, appear to regard its influence on the pulse as being uniformly of a depressing nature, a circumstance which may, perhaps, be ascribed to the state of disease in which the subjects of their observations were, as well as to the small and gradually increased doses of the medicine that were prescribed. An American observer, Dr. John Moore, early demonstrated the want of uniformity in the action of digitalis on the pulse.[1] By doses of one and a half grains he caused his pulse to fall from 72 to 60 in the course of two hours; from 60 to 50 in one hour and twenty minutes; from 66 to 58 in two hours and a quarter; and from 90 to 70 in about the same time. But in several other experiments there was no depression of the pulse whatever; and in others again it positively increased in frequency, while the experimenter suffered vertigo, confusion of mind, fulness of the head, drowsiness, salivation, nausea, diarrhœa, &c. The experiments of Bidault de Villiers coincide in the main with those first detailed. He also observed salivation as one of the effects of the medicine.[2]

The experiments of Saunders were, it is believed, the first to throw doubt upon the supposed intrinsically depressing powers of digitalis.[3] By more than two thousand trials of its influence upon twenty-nine healthy persons, he was led to the conclusion that the direct effect of small doses of the drug is to *increase* the strength and frequency of the pulse, and even to develop an inflammatory state of the system; yet when once these effects were produced, if the dose was augmented, or the digitalis continued at the previous dose, an astonishing lowness of the pulse and debility ensued. These results were corroborated by observations upon the sick, which showed that during the primary action of the medicine sores begin to heal, effusions are removed, and all the functions of the body are invigorated, the pulse gaining by degrees in strength and fulness until fever is excited, when the toxical phenomena display themselves, and the whole system is prostrated and deranged. The bold experiments of Hutchinson[4] illustrate in a striking manner these opposite actions of digitalis. They consist of three series. In the first of them, 60 drops of a tincture were taken (equal to five grains of the dried leaves), and the dose was repeated at intervals of six hours. Every day the quantity was increased, so that

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[1] Caldwell's Theses, 1800.

[2] Dict. de Méd., en 60 vol.

[3] Edinb. Med. and Surg. Journ., iv. 369.

[4] Journ. des Progrès, vi. 218.

at the end of the third, it had reached 380 drops for that day. The symptoms were chiefly these: nausea, vomiting, craving for food, followed by pain in the stomach, salivation, diarrhœa, increased discharge of urine, unusual activity of mind, sleeplessness, some constriction of the head, and excitement bordering on delirium. These symptoms were followed by weariness, listlessness, and almost stupor. The pulse on the first day of taking the medicine became fuller and more frequent, and rose to 100, the second day to 125, and the third to 150, after which, and coincident with the symptoms of prostration, it fell to 60. This investigation cost the experimenter an illness which confined him to bed for a fortnight, nor did he entirely recover for two months. Some time afterwards the experiments were resumed, but with smaller doses, yet by the end of a month the daily dose of 2,220 drops was reached. The same general symptoms as before occurred, but the pulse, which was at 80 when the experiments began, did not rise beyond 100, and retained its strength and fulness. In walking it was faster by at least 20 beats a minute than in the recumbent posture. Within three days after the conclusion of the experiments, it fell to 60, and was readily excited. The third series of experiments lasted sixteen days, the daily dose of the medicine being gradually raised from 36 to 1,300 drops. When the dose reached 219 drops, the characteristic symptoms began to appear, but now the pulse, instead of growing more frequent, fell gradually from 80 to 60, 50, 46, and at last 28. Until it reached the last mentioned rate it continued strong and full, but at this point it became irregular and unequal.

Jörg, and his associates, observed substantially the same effects of digitalis as have been above described;[1] a milder degree of them, however, as might be expected from the much smaller doses employed, varying, in fact, from a fraction of a grain to two or three grains of the powdered leaves. The conclusions drawn from these trials were, that digitalis acts as a stimulant to the brain, producing an excitement followed by headache and dulness; that it irritates the digestive organs, causing, among other symptoms, diarrhœa; that it greatly augments the discharge of urine; that it excites the genital organs, causing titillation of the glans penis, erections, and seminal emissions, and in females a sense of bearing down in the pelvis; and finally, that in healthy persons it does not produce infrequency of the pulse as a primary symptom, but only when the action of the medicine has lasted for a considerable time. Hence Jörg concludes it is an error to rank digitalis among the antiphlogistic medicines.

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[1] Materialien, i. 244.

Rasori,[1] Tommasini,[2] and others of the Italian school, have labored to prove the contro-stimulant or direct sedative action of this remedy, but not, it is conceived, with success. Nearly all of the dropsies which Tommasini so successfully treated by its means occurred in habitual drunkards, persons the least likely in the world to be benefited by a purely sedative medicine. Chaumeton,[3] on the other hand, does not hesitate to declare that "digitalis is entitled to one of the highest places among stimulants." Dr. Hamilton,[4] too, gives unequivocal proof that the medicine is at least not merely sedative, for he found that no diuretic effect took place so long as an inflammatory condition existed; but when this was subdued by depletion, diuresis at once came on. The stimulant action of the medicine is admitted by Barbier as its primary, and sometimes its only one, but he remarked, as others had done, that sedation or slowness of the pulse generally succeeds. The same doctrine might be deduced from the observations made of the use of digitalis in disease. In dropsy, for instance, nearly all writers coincide with the remark of Christison,[5] that the sedative action of the drug interferes with its diuretic effects. And this conclusion agrees with the results of experiment already set forth, and which prove that diuresis not only does not follow the sedative action of digitalis on the heart as the effect of the latter, but both precedes it and is actually suspended by its occurrence. There seems to be scarcely any doubt that diuresis is a true medicinal result of the action of digitalis, while slowness and infrequency of the heart's action, when the organ is not previously diseased, is the first stage of its poisonous effects. It is therefore always a sign that the use of the medicine should be suspended. The doctrine which we have endeavored to illustrate in these pages, has received a remarkable corroboration from the observations of Mr. W. Howship Dickinson on the operation of digitalis upon the uterus.[6] As usual, this important discovery was accidental. A female was almost exsanguious from prolonged uterine hemorrhage occasioned by a fall. Sulphuric acid, acetate of lead, and tannic acid were used in vain. An attack of pericarditis supervened, and after it the action of the heart became tumultuous, and was accompanied with "a regurgitant aortic murmur." With a vague idea that the cardiac derangement might maintain the hemorrhage, digitalis was prescribed, and immediately an improvement began which terminated in health. In sixteen cases of uterine hemorrhage the

[1] Annales de Thér., iv. 405.
[2] Journ. Hebdom., vii. 33.
[3] Dict. en 60 vol., art. cit.
[4] Edinb. Med. and Surg. Journ., iv. 218.
[5] Dispensatory (Am. ed.), 447.
[6] Med.-Chir. Trans., xxxix. 1.

same treatment was essayed, and the digitalis was administered before and during labor when the pains were inadequate. They all demonstrated the power of the drug to excite the muscular action of the uterus. A short time, generally about ten minutes, after a considerable dose of the medicine is swallowed, the patient complains of severe pain in the region of the sacrum, which passes into the hypogastrium, and in every respect resembles the pain of the first stage of labor; very shortly afterwards a considerable quantity of blood, generally in part coagulated, is forced out of the uterus. A case, illustrative of the action of digitalis in arousing uterine contractions during labor, occurred in Paris under the care of M. Delpech.[1]

It is remarkable that fatal results should be comparatively so infrequent from overdoses of a medicine which possesses such a control over the central organ of the circulation. When, too, it is considered how small a quantity will sometimes occasion alarming symptoms, the comparatively trivial effects of enormous doses are difficult to be explained. Thus, for example, one person took a teacupful night and morning, of a saturated infusion of digitalis;[2] another swallowed nearly the same quantity at a single dose; another took an ounce of the tincture of digitalis; and a fourth half an ounce of the same preparation.[3] A still more remarkable case will be found in the art. *Digitalin*.

In all of these instances the symptoms were more or less alarming, but the termination was fatal in none. The dose does not seem to have been well ascertained in the published fatal cases, at least of adults. The symptoms of fatal poisoning by digitalis are summarily these: cramps in the limbs, convulsions, lethargy, dilated pupils; swelling of the tongue and lips, a discharge of viscid saliva, vomiting, suppression of urine; a slow, infrequent, irregular, and intermitting pulse; and finally, death by coma. Congestion of the brain, and redness of the mucous lining of the stomach, are the only lesions found after death from this substance. A recent fatal case is reported by Dr. Caussé,[4] but it was one in which a pregnant female took a poisonous dose of the fresh juice of digitalis, and, as violent vomiting, diarrhœa, and abortion followed, it is not easy to determine whether death was due to the last named occurrence, or to the direct agency of the poison.

It seems to be an inevitable conclusion from the preceding statement of the phenomena caused by digitalis, that the primary action of the medicine in ordinary doses is not depressing, as it is generally stated to be; that, on the contrary, it is a stimulant of the healthy sys-

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[1] Bull. de Thérap., lvi. 101.
[2] Taylor, Med. Journ. (Am. ed.), 598.
[3] Beck, Med. Journ., ii. 644.
[4] Annales d'Hygiene, Avril, 1859, p. 464.

tem, and a moderator of morbid action depending upon general or local disease. When taken in excessive or poisonous doses, it appears with equal clearness to be a direct sedative, paralyzing the heart and nervous system, and so destroying life. This double action it shares with a great number of medicines, and, among those affecting the nervous system, with none more strikingly than with opium.

Remedial Employment. *Dropsy.*—The remedial virtues of digitalis have been more clearly exhibited in this than in any other disease, to the cure of which it had long been applied empirically before it was adopted into the materia medica. It was for his success in treating dropsical affections with digitalis that the name of Withering will always occupy the most conspicuous place in its early history. To this day, even, his precepts in regard to its administration continue to be the safest guide for those who employ it. I use it, says this author,[1] in ascites, anasarca, and hydrops pectoris, and, so far as the removal of the water will contribute to cure the patients, it will cure them. Hence the water has often to be repeatedly evacuated in the same patient when the cause of the dropsy remains. In the anasarca following scarlatina, Withering cured all of the cases, without exception, that he had to treat. It resulted from his experience that if the patient be of great natural strength, warm skin, and florid complexion, and with a tense, corded pulse, or if the effusion itself be hard and circumscribed, or the anasarcous limbs be solid and resisting, digitalis will be of little, if any, service, particularly if purging by the neutral salts, venesection, and squills do not precede and accompany the use of the former medicine. If, on the other hand, the pulse be feeble, the countenance pale, the lips livid, the skin cold, the belly soft and fluctuating, and the limbs readily pitting on pressure, the diuretic action of the medicine is generally successful.

Some additional indications were enumerated by Darwin.[2] He regarded the medicine as being most successful when the patients were past the meridian of life, and accustomed to indulge too freely in fermented or spirituous liquors. Many of his own were subject to gout, and many had œdematous swellings of the thighs and legs, dyspnœa, and an unequal pulse, signs which render it highly probable that they were affected with valvular disease of the heart. This is the more probable because in many cases the effusion recurred, and was removed again by the same treatment, and because the pulse continued to be irregular after the dropsy was cured. Darwin always suspended the medicine on the occurrence of sickness of the stomach; he also

[1] Op. cit., p. 6 et seq., and p. 189. [2] Trans. Lond. Coll. Phys., iii. 255.

conjoined it with bark and iron in his treatment, and directed laxatives if the bowels were not freely opened. In dropsy confined to the abdomen, he, in common with most other physicians, found the remedy least successful; but cases of this variety were most readily relieved when the subjects of them were addicted to the intemperate use of alcoholic and fermented drinks.

Lettsom, in his first publication upon the subject,[1] was disposed to limit the usefulness of digitalis much more than the writers just referred to, excluding from the category to which it is applicable all cases depending exclusively upon a mechanical or organic cause. Withering, however, complained that the medicine had not been properly administered by Dr. L., who, in fact, was led subsequently to form a more favorable judgment of its powers, and particularly to guard against its depressing effects by a more prudent regulation of its doses, and by associating it with tonics and stimulants. Ferriar did not conceive so high an opinion of this medicine in dropsy,[2] but asserted his persuasion that when given in such quantities as to alter the pulse, and it does not speedily act as a hydragogue or a diuretic, it is merely loss of time to persevere in its exhibition. He agrees, however, with Withering in regard to the cases which it chiefly benefits, and states that he has seen all the symptoms of general dropsy, attended with a fluttering and feeble pulse, removed by digitalis in the course of a week. He particularly recommends its association with calomel and Dover's powder, a combination which even now is oftener used for dropsy than digitalis alone. Saunders regarded simple debility or exhaustion, without organic complication, as affording the best indication for the use of digitalis in dropsy.[3] McClean, in his work on hydrothorax, expresses his agreement with the precept of the earlier writers on the subject under discussion, by alleging the peculiar efficacy of the medicine in persons of weak and lax fibre, where the œdematous limbs readily pit on pressure, and the complexion is pale and transparent. Blackall subscribes to the same doctrine, and Munk emphatically reiterates it.[4] The former, indeed, specifies more particularly the appropriate cases for the medicine as being general dropsy after scarlatina, with coagulable urine, and sometimes even hydrocephalus from that cause. In hydrothorax he regards the power of digitalis as astonishing, and the more so when its combination with other remedies is avoided.

Among more recent authorities, the judicious Dr. Holland adds the

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[1] Mem. Med. Soc. Lond., ii. 145.
[2] Med. Histories (Am. ed.), p. 271.
[3] Med. Repos., xv. 403.
[4] Op. inf. cit.

weight of his testimony to the general principle here inculcated;[1] for, after pointing out the fact that there are many cases of dropsy in which a combined tonic and evacuant treatment is indicated, he states that in such he has found iron combined with digitalis eminently serviceable. Dropsy accompanied with dilatation and irregularity of the heart appeared to be remarkably improved by the medicine, and particularly thoracic and abdominal effusions. He agrees, too, with the opinion of the chief authorities now quoted, that the medicine is most efficient when the circulation is feeble and the fibre relaxed. It adds to the force of the considerations already presented on the subject to state that, according to Dr. Holland's experience, patients who have been weakened by disease often bear much larger doses than those in sounder health.

Among American authorities, Rush[2] and Mease,[3] who flourished soon after the general introduction of the remedy into European practice, both speak disparagingly of it. The former, indeed, found it to fail in most of the cases for which he prescribed it. Dr. Chapman, however, confirms the most favorable judgment of digitalis by his own experience. He directs attention to its sometimes producing diuresis suddenly, and simultaneously with its secondary or sedative effects, a circumstance which is not in harmony with the observation of others. At the same time, he regards a low and enfeebled condition of the constitution as the most propitious for its exhibition.

The virtues of digitalis in *dropsy* have occasionally been manifested by its external application. Belluci reported five cases of the cure of *hydrocele* by the application of an ointment of digitalis to the scrotum, and Lafargue has confirmed them by a case in his own practice. He made use of an ointment containing one part of digitalis to five of lard.[4] M. Falot, also, cured three cases of *ascites*, independent of organic disease, by means of fomentations made with two ounces of digitalis in a quart of water boiled down to a pint. Copious diuresis was produced, and the cure followed.[5]

The proofs of the efficacy of digitalis as a remedy for dropsy might be much further extended, but the preceding are sufficient to illustrate the nature and the limits of its power. They harmonize with the results of experiments on healthy persons, and strengthen materially the conviction which these create of the stimulant, and even tonic, properties of moderate doses of digitalis when administered to persons suffering from loss of power and tone. In dropsy, of whatever form,

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[1] Notes and Reflections (Am. ed.), p. 332.
[2] Works, ii. 110.
[3] Med. Repert., i. 145.
[4] Bull. de Thérap., xlvii. 444.
[5] Lancet, May, 1853, p. 428.

debility is the morbid element which calls for the exhibition of digitalis; and, with this qualification, the statement may be accepted that it is of all diuretics the most certain, and when it fails in dropsy there is little to hope from any other means.

Diseases of the Heart.—Writers upon this class of diseases have endeavored to determine with precision the particular cases to which digitalis is appropriate, and those in which it acts injuriously. They have, in general, arranged in the former class hypertrophy of the left ventricle, and in the latter dilatation of either the right or left cavities. This doctrine does not, however, rest upon observation, but flows rather from an hypothesis concerning the action of digitalis; the doctrine, namely, that it is a direct sedative, debilitating this organ and at the same time reducing the number of its pulsations. But this explanation is altogether opposed to the numerous facts which show that the tendency of digitalis is rather to increase the energy of the heart's pulsations than to weaken them, even when their frequency is very much lessened under the influence of the medicine. The mere anatomical condition of the heart is a much less trustworthy guide to the use of digitalis than the alterations of its power and rhythm. When its action is irregular, tumultuous, and excessive, and the breathing panting or oppressed, and when, at the same time, the patient's condition is one of debility or exhaustion, digitalis may generally be used with advantage. But when such derangement of the heart and of the breathing occurs in a person of full habit and unimpaired muscular strength, the use of the remedy ought to be preceded by depletion, diet, and purging. There is one form of heart disease, however, in which it seems probable that the action of digitalis must be injurious, to wit, contraction, with deficiency of the aortic valves. Dr. Corrigan and several other writers have insisted upon this proposition. In numerous cases reported by them the symptoms appear to have been severely, and even seriously, aggravated by the medicine; the breathing was rendered more laborious, and the cough more urgent. It is not difficult to account for this effect. The disease becomes a cause of distress because the blood regurgitates through the aortic orifice into the ventricle; hence it seems but reasonable to suppose that whatever causes the heart to beat more slowly must allow the blood to flow back more freely into the ventricle, to distend it unduly, to paralyze it, and consequently to interrupt the circulation and the breathing. The natural mode of relief for the symptoms which this disease occasions is the frequent and free contraction of the ventricle; but digitalis renders its contractions less instead of more frequent, and therefore aggravates the evil instead of palliating it.

The conclusions of Dr. Munk[1] do not vary in any essential point from the principles which have been here maintained. According to him, digitalis is seldom as advantageous in simple hypertrophy as when this is combined with other lesions of the organ, because the condition of tone contraindicates its employment, although the heart at the same time beat tumultuously. But in dilatation, with valvular disease of the organ and dropsy, it is of great utility by its diuretic as well as its indirect sedative influence. In a plethoric state of the system, he agrees with many other authorities that it is inoperative. Trousseau and Pidoux, on the other hand, recommend the medicine in hypertrophy, whether accompanied with dilatation or not, and disapprove of its use in simple dilatation, with signs of impeded circulation, such as coldness and œdema of the extremities, congestion of the face, &c. But this opinion is opposed to all experience, and rests upon a conjectural interpretation, as well of the action of the medicine as of the mechanism of diseases of the heart. Dr. Holland confirms the view which has here been taken of the true indications for the use of digitalis in heart disease. He can find nothing incredible in the fact that it may under certain circumstances tend to produce intermittent pulsation, and yet under other circumstances correct the irregularity already existing. He points out the fact, which must be now regarded as established, that the large and flaccid heart is not, as on first view it might seem, the least favorable to the use of the medicine. And he compares the action of digitalis on an irregular heart to that of fever, which often restores a natural rhythm to a deranged pulse; thus implying his belief in the stimulant properties of the medicine. Conclusions almost identical with the preceding have been drawn by M. Beau from his clinical experience. He shows that, in organic disease of the heart, congestion of the face and of the jugular veins, puffiness of the eyelids, smallness of the pulse, dyspnœa, palpitation, and dropsy are symptoms produced by a want of power in the ventricles, and that if in such disease the pulse is frequent, its frequency is merely a sign of the struggles of the heart to compensate for the small amount of blood which it distributes, by the iteration of its contractions. If, then, digitalis does—as we know that it really does—dissipate all these symptoms while it lowers the pulse, its action upon the heart must necessarily be that of a stimulant.[2]

Inflammations.—At one time a great deal was written about the antiphlogistic powers of digitalis, and especially by disciples of the Rasorian school. The founder of this sect was warmly eloquent in

[1] Braithwaite's Retrospect, x. 60.

[2] Abeille Méd., xiii. 33.

favor of the marvellous powers of the medicine in diseases of a pure inflammatory type, and especially in those of the chest. The published reports show that his patients recovered after he had prescribed for them from ten to thirty grains of digitalis a day in the treatment of pneumonia, pleurisy, bronchitis, &c., and that they must therefore be regarded as demonstrating the impunity with which large doses of it may be administered, although they afford no evidence of its curative powers in diseases which seldom require active treatment for their cure. It is unnecessary to cite the favorable opinions which have been uttered and reiterated respecting the virtues of digitalis as a remedy for inflammation. They are totally unsupported by direct evidence, or even by analogical proof. If the arachnitis of children, which is said to be signally benefited by the medicine, form an apparent exception to the remark, the origin of this affection in tuberculous deposits, its slow and gradual progress, and the merely incidental character of its inflammatory symptoms, destroy its claim to be regarded as really an exception to the general statement that has been made.

Hemorrhage is another affection to which digitalis seems to have been applied upon purely theoretical grounds. Instances are cited, by Ferriar, Jones, Richter, Burns, and others, of its controlling influence upon hemorrhagic attacks. But it is a familiar fact that in cases of hæmoptysis and hæmatemesis the bleeding almost always ceases spontaneously, provided that the patient remain perfectly quiet and in a proper position. Uterine hemorrhage, it is true, is not so apt to cease promptly, and until the discovery of Mr. Dickinson there was no sufficient proof that digitalis is capable of arresting it. This gentleman states that during a certain period he had treated all his patients suffering from *menorrhagia*, and who required medical interference, with digitalis alone. The discharge was invariably arrested from the second to the fourth day, according to the strength of the dose administered. These statements are fully confirmed by the observations of Dr. Barclay. Even in uterine hemorrhage depending upon organic disease, the influence of the medicine was distinctly marked, though necessarily less permanent.[1] M. Decaisne has furnished an example of fungous growths in the uterine cavity occasioning profuse hemorrhage at the menstrual periods, which appeared to be entirely controlled by the use of digitalin, in the daily dose of six granules.[2]

Pulmonary Affections.—The practitioners of half a century ago, and even less, were profuse in their eulogies of digitalis as a cure of pulmonary affections, including consumption. Beddoes went so far as to

[1] Med.-Chir. Trans., xxxix. 8.

[2] Bull. de Thérap., lvi. 392.

say, "Were I to affirm that it cures three out of five cases of consumption, I think I should keep within the limits of truth." Dr. Hosack took a diametrically opposite, and a much truer, view of the subject, when he said of its indiscriminate use in this disease, "Digitalis is a finger which points to the grave."[1] It may have been useful in certain chronic catarrhs of the lungs which would have been as readily cured by other means; and this forms the whole basis of a reputation which the physical methods of diagnosis effectually destroyed. There is, indeed, reason to believe that it was of service in the class of affections referred to. One even of the latest authorities, Neumann, asserts it to be, if not the only, yet decidedly one of the best remedies in bronchorrhœa. When the reports of its earlier favorers are closely scrutinized, nothing can be clearer than the conclusion that they were deceived, and that those who now interpret their language literally contribute to deceive readers of the present day. The cases of Kinglake,[2] in which any benefit was derived from the medicine, were plainly examples of chronic bronchitis and chronic pleurisy; those of Fowler were of the same character precisely; and a like judgment must be pronounced on the reports of Beddoes and Drake. To give only one, but a conclusive, proof, among those which an analysis of the cases in question furnishes, of the non-malignant character of the affections reported to have been cured, it may be remarked that in but two or three among them all is any mention made of hæmoptysis, the capital and least equivocal of the general signs of tubercular phthisis in the male sex. Besides, McLean expressly states that of the patients treated some had "genuine phthisis, whose fatal course it is impossible to arrest," but the remainder were suffering from the consequences of neglected or ill-treated catarrhs. However erroneous the ideas which some physicians entertained of the curability of tubercular consumption by digitalis, the reports now referred to furnish unquestionable evidence of its utility in chronic bronchitis attended with fever of a hectic type, œdema of the limbs, and emaciation. They leave no doubt of its value in moderating the morbid excitement of the system, reducing the pulse, allaying the cough, and lessening the perspiration, and in this manner preparing the way for a thorough cure by appropriate tonic medicines and hygienic observances.

In 1853, M. L. Corvisart, having observed that a patient subject to *spermatorrhœa*, who was taking digitalin for nervous palpitations of the heart, was entirely freed from his infirmity while under the influence of the medicine, employed it in two other cases of the same affection,

[1] Pract. Med., p. 582.

[2] Bayle, Bibl. de Thérap., iii. 265.

with complete success. The dose prescribed in each was a granule, containing $\frac{1}{6}\frac{1}{0}$ gr., twice a day.[1] Subsequently M. Brughmans reported five cases demonstrating the efficacy of the digitalis in this complaint, and in others requiring a state of repose in the virile organ, such as gonorrhœa, chancre, and other primary venereal symptoms. According to him, it dissipates the swelling of the glans penis, of the prepuce, the urethra, the prostate, and the vesiculæ seminales, with "a certainty unparalleled in the effects of other therapeutic agents." He directed six or eight grains of digitalis to be given daily in divided doses.[2] A young man had suffered for twenty days with nocturnal seminal emissions and his strength was completely exhausted; M. Laroche prescribed three granules of digitalin, and the following night the pollutions intermitted for the first time.[3]

Various Diseases.—Van Helmont used digitalis successfully as a local application to *scrofulous* tumors and ulcers, and several other writers report no less favorably of it.[4] But it is alleged to have been still more useful as an internal medicine for the discussion of tumors, by Quarin, Darwin, Kühn, Parkinson, and others. Hufeland recommends it to be associated with mercury for the resolution of engorged glands. It was also vaunted in diseases attended with pain and nervous derangement, in *spasmodic coughs*, in *convulsive* and even in *mental disorders*, upon no better ground, it would seem, than a theoretical prejudice in favor of its depressing properties. An examination of the data contained in medical records, of its use in the above-named and kindred diseases, is far from lending support to the reiterated assertions of its efficacy. Cases may possibly have been relieved by its use, in which the spasmodic element rested upon that disorder of the nervous system which grows out of debility. Such a one, for example, may have been the case of *epilepsy* which Parkinson declares that it cured, although of twenty-six years' duration, and also those which are contained in a paper of R. W. Scott;[5] but there is nothing in general experience of its use to encourage its exhibition in the disease in question.

External Use.—The outward application of digitalis to promote the resolution of enlarged glands has just been alluded to. It would seem to have been long employed for this purpose as a domestic remedy, both in England and Italy. A tincture of digitalis has been successfully used in dropsy, by bathing the affected part with it and wine of

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[1] Bull. de Thérap., xliv. 145. [2] Ibid., xlv. 424.

[3] Gaz. Méd.; and Times and Gaz., Nov. 1854, p. 473.

[4] Murray, Apparat. Med., i. 733.

[5] Edinb. Med. and Surg. Journ., xxvii. 19.

squills.[1] Chrestien was also very successful in treating dropsy following scarlatina, and even intermittent fever, by frictions upon the abdomen with tincture of digitalis.[2] M. Fallot reported three cases of ascites and general dropsy caused by suppression of the perspiration, and which were cured by fomentations of digitalis applied to the abdomen. He used an infusion of a drachm in a pint of water.[3] Dr. Christison states that he has seen diuresis induced by rubbing on the abdomen a mixture of tincture of digitalis and soap liniment, and by placing on it cloths saturated with a strong infusion of the plant, in cases where the ordinary preparations of the medicine, as well as other diuretic remedies, had failed when given by the mouth. But this method is uncertain. In 1830 Dr. Gerhard employed digitalis endermically for the purpose of allaying the action of the heart.[4]

Administration and Dose.—Many of the inequalities and seeming anomalies in the operation of digitalis are owing to the bad quality of the preparation employed. The instances are so numerous in which very large doses have been taken with but slight effects, or none at all, that it must be presumed that the drug was comparatively inert. This may have arisen from the leaves having been gathered while immature, from their having been too hastily dried, or from the fraudulent or careless preparation of the tincture, &c. The rules laid down by Withering continue to be the surest guides for obtaining the due effects of the medicine, and will be mainly followed here. The *powder* is the least certain and most unmanageable of the preparations, but is, perhaps, more generally used than the others. It may be given to adults in doses of from *one* to *three* grains twice a day, either alone or combined with aromatics. The officinal *infusion* is essentially the one recommended by Withering, and may be prescribed in doses of from half an ounce to an ounce two or three times a day. If disposed to purge, opium may be added to it. Dr. Holland, Dr. Munk, and indeed almost all authorities of weight, agree in considering it the most efficient preparation for the cure of dropsy. It is not necessary to the due effect of the medicine that it should be continued until nausea comes on, for the diuretic effect is often first produced; but it should not be suspended until it begins to act *either* on the kidneys, the stomach, the pulse or the bowels. Then, however, it should at once be discontinued. Its effects, it will be borne in mind, do not subside for several days after the suspension of the medicine. They are most readily induced when a state of rest is maintained. The *tincture* is

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[1] Mérat and De Lens, Dict.
[2] Bayle, op. cit., iii. 129.
[3] Bull. de Thérap., xliii. 512.
[4] N. Am. Med. and Surg. Journ., x. 152.

considered by Dr. Munk to be the most desirable form for administering digitalis when the intention is to affect the heart. The dose of it is from ten to twenty drops repeated two or three times a day.

As *antidotes* to the poisonous action of digitalis, wine, opium, and strong coffee have been proposed. Tannin, and substances containing it, have also been recommended, because this principle renders digitalin insoluble. An emetic should of course precede these agents when the symptoms proceed from a large quantity of the drug recently taken.

Digitalin.

HISTORY AND PROPERTIES.—After many attempts to isolate the active principle of digitalis, it was finally obtained in a pure state, in 1844, by MM. Homolle and Quevenne, who entitled it digitalin. It occurs in pale, straw-colored scales, or a white powder, and is inodorous and extremely bitter; its taste is most strongly perceived in the fauces; its smell is peculiar and faintly aromatic; it acts as a violent sternutatory when diffused through the air, and, when applied to the denuded cutis, irritates it powerfully. It is most soluble in alcohol, is neutral in its chemical relations, and combines neither with acids nor bases. It is unchangeable by exposure to the air.

ACTION. *On Animals.*—Bouchardat and Sandras[1] found that in two grain doses digitalin was fatal to dogs in a period varying from a few minutes to several hours, according to the vigor of the animals. The symptoms were staggering, vomiting, diarrhœa, irregularity of the heart, and an abrupt and strong pulse which was also rendered uniformly infrequent without having first been accelerated. Stannius[2] performed a number of experiments with digitalin on cats, dogs, &c. He concluded that in the former animals large doses of it acted directly upon the heart, destroying at once its motility and vitality. In half-grain doses it was promptly fatal when thrown into the bloodvessels, and annihilated the irritability of the heart. When introduced into the stomach, or so employed as to be only gradually absorbed, the following symptoms were observed: the tongue was alternately protruded and retracted, there was retching, vomiting, diarrhœa, and a discharge of urine, dilatation of the pupils, irregularity, and then complete arrest, of the heart's movements; convulsions and death. Stannius observed a remarkable difference in the susceptibility of dif-

[1] Annuaire de Thérap., 1845, p. 60.

[2] CANSTATT'S Jahresb. f., 1851, p. 81; Archiv. f. Phys. Heil., x. 178.

ferent classes of animals to this agent. Frogs bore it well, rabbits were unaffected by a dose which was rapidly fatal to a small cat, and carnivorous animals generally were more powerfully affected than the herbivorous.

On Man.—According to the experiments of MM. Homolle and Quevenne,[1] doses of digitalin varying from $\frac{1}{15}$ to $\frac{1}{11}$ gr. in the course of twenty-four hours, reduced the pulse to 55, 50, and even 40 beats a minute. The larger dose could not be exceeded without producing characteristic symptoms of poisoning. After eight or ten days' use of the medicine the pulse became unequal, irregular, and intermittent. Like digitalis, this proximate principle affected the heart differently, according to the existing state of the organ. When already irregular, moderate doses restored its normal rhythm, while large or long continued doses deranged the natural order of its movements. The impulse was uniformly increased by moderate doses, proving this agent to be rather a sedative than a debilitant of the heart, as was shown to be the case with digitalis. But the primary action of the latter was also proved to be that of a stimulant to the circulation, and at the same time diuretic, whereas digitalin displays its power as a direct sedative of the heart especially. The diuretic action of digitalin appears to have been but slightly manifested, as a physiological effect, either in the experiments just described or in those about to be detailed. Those of MM. Andral and Lemaistre[2] were performed with smaller doses than have been mentioned. They began by giving about $\frac{1}{66}$ gr. of digitalin once or twice a day, but even this dose produced considerable disturbance of the system after three or four days' continuance, and when repeated five or six times within twenty-four hours, gave rise to decidedly toxical phenomena. Such, at least, was the ordinary result; but in some cases as many as twelve doses a day were taken without inconvenience. As a general rule, the pulse was more uniformly reduced in frequency (by from 12 to 40 beats) when the patient had a non-febrile disease, such as organic disease of the heart, than when fever existed. The diuretic action of the medicine was not always distinct. Sometimes it was absent, and sometimes very decided, particularly in dropsy connected with heart disease, or with albuminuria. The apparently feeble diuretic operation attributed by these observers to digitalin, may have been due, as Dr. Christison suggests, to their regarding the sedative action of the medicine on the heart as a needful preliminary to its operation on

[1] Annuaire, &c., p. 71; Archives de Physiologie, Jan. 1854, pp. 248, 249.

[2] Am. Journ. of Med. Sci., Jan. 1853, p. 192.

the kidneys. But the former, instead of favoring, actually interferes with and may even suspend the latter. The interesting observations of M. Hervieux lead substantially to the same results as have been here set forth.[1] Like other observers, he found that the medicine caused irregularity in the normal pulse, but restored the irregular pulse to a healthy rhythm. The experiments of MM. Bouchardat and Sandras so nearly coincide in their results with those already cited, as to render a summary of them unnecessary.[2]

Several cases of poisoning by digitalin are on record. In one of these a robust female took sixteen granules (nearly a quarter of a grain) of digitalin. Two hours passed without sensible effects, and then she was attacked with a nervous chill and vertigo. For nine hours more nothing remarkable occurred, but then the rigor was renewed, with dyspnœa and sweating. After a night's sleep all of the symptoms had disappeared. She then swallowed forty granules more, and in an hour was seized with disorder of vision, vertigo, cold sweating, vomiting, and colic, after which she became extremely faint. Neither urine nor fæces were passed during the day, and the voice became very feeble. The thirst was urgent, the urine suppressed, the eyes very prominent, the skin cold, the pulse 46, and the epigastrium tender. In a week she had entirely recovered.[3]

Uses.—There is no doubt of the powerful diuretic virtues of digitalin in *dropsical diseases*. In a case of anasarca following labor, and complicated with pericarditis and hæmaturia, it quickly produced a copious flow of urine, and the patient recovered.[4] Several cases are related by M. Hervieux of dropsy accompanying valvular disease of the heart. Some of them were extremely aggravated by reason of the degree of cardiac derangement; but under the use of digitalin the breathing grew less anxious, or even became quite natural; habitual congestion of the face and head, with the accompanying headache, disappeared, and the patients were enabled to sleep quietly. At the same time, in all but very old and extreme cases, the dropsy was entirely removed, as well in those depending upon cardiac disease as in other cases.

Dr. Christison has remarked that the diuretic action of digitalin is never accompanied with albuminuria, and that sometimes, when albumen previously exists in the urine, it disappears, at least temporarily, under the influence of the medicine.[5]

It has been found that several of the more distressing symptoms of

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[1] Archiv. Gén., 4ème sér., xvii. 164.
[2] Loc. sup. cit.
[3] Annuaire de Thérap., 1858, p. 102.
[4] Homolle, &c.
[5] Month. Journ. of Med. Sci., Jan. 1855, p. 3.

phthisis are amended by this medicine. The breathing becomes freer, and the headache less severe; the cough is palliated; the sleep is less disturbed, and the whole condition of the patients is ameliorated.

ADMINISTRATION AND DOSE.—It is reckoned that one-hundredth of a grain of digitalin is equivalent to one grain of the best powder of digitalis; in other words, that the former is one hundred times stronger than the latter. The great potency of this principle requires it to be used with the utmost circumspection. It ought to be dispensed in such quantities only as will insure exemption from serious accidents. The form of granules prescribed below is a very eligible one for this, as well as for various other medicines which act powerfully in minute doses. Its union with sugar both preserves the medicine unchanged and secures its solution in the gastric fluids.

Formulæ.—℞.—Digitalin gr. iss; Syrup Oiv. Dissolve the digitalin in alcohol and add the syrup. *Dose.*—Four to six tablespoonfuls a day.

℞.—Digitalin gr. xvss; Sugar ℥iss; Water q. s. Make one thousand granules. *Dose.*—Four to six a day. Each granule contains about one-sixty-sixth of a grain of digitalin. Andral thinks it advisable not to exceed the daily dose of three granules on account of the danger of a sudden development of the toxical symptoms.

VERATRUM VIRIDE.—AMERICAN HELLEBORE.

DESCRIPTION.—American Hellebore is an indigenous species of veratrum, popularly known as swamp hellebore, meadow poke, Indian poke, itch weed, &c. It grows in all parts of the United States, east of the Mississippi, in damp and low situations. It has a stout stem several feet high, furnished with broad, oval, pointed leaves of a yellowish-green color, and its flowers are disposed in dense pyramidal panicles. The root, which is the officinal portion, consists of a thick, fleshy rhizome, tunicated above, fleshy below, and sending off numerous whitish radicles. It has a sweetish-bitter taste, and produces a persistent, acrid and burning impression upon the mouth and fauces, extending along the œsophagus even to the stomach. It yields its virtues to water and alcohol. Dr. Thayer, by treating it with alcohol, obtained from it a resin of a dark color, possessing the acrid properties of the root itself. A *fluid extract* was prepared by this gentleman by macerating the root in diluted and strong alcohol. It is of a dark brandy color, and each drop of it is estimated to be equiva-

lent to a grain of the root.[1] The medicine is more commonly used in the form of a *tincture*, made by digesting eight ounces of the dried root in sixteen ounces of diluted alcohol, for at least two weeks. The botanical affinities of the plant, and its action upon the animal economy, render it probable that its virtues are owing to *veratria*, the active principle of *veratrum album;* but the experimental proof of this supposition is still wanting, although it is stated that Mr. Worthington found in the root an alkaloid substance identical with veratria.

HISTORY.—Osgood states that this plant was known to the aborigines as a poison rather than as a medicine, and he adds, on the authority of Joselin, that it was made use of by them in the election of their chiefs, the individual whose stomach was least susceptible of its deleterious influence being regarded "as the strongest of the party, and entitled to command the rest." It was also popularly used by the farmers of New England to catch or destroy the birds which ravaged their cornfields.[2] It had long been employed by the late Dr. Tully, of New Haven, and other New England physicians, as a medicine, when attention was for a time particularly attracted towards it in 1835, by the essay of Dr. Osgood just referred to. It appears, however, to have been but seldom prescribed, when the emphatic proclamation of its virtues by Dr. W. C. Norwood, of South Carolina, in 1850,[3] once more caused it to be generally employed, and to be eulogized with that extravagant ardor, and judged with that want of discrimination, which are apt to attend the introduction of all new medicines capable of producing a marked, and, above all, an unusual operation, on the animal economy.

ACTION. *On Animals.*—It has been already mentioned that the farmers of New England have long been in the habit of resorting to green hellebore to protect their crops from the birds. They scatter upon the ground corn soaked in a strong infusion of the root, and a short time after the birds devour it, their muscular power becomes so much impaired as to prevent their flying or walking, and in this torpid state they are readily taken and killed. Unless caught in this condition, many of them recover and fly away.

On Man.—In its local action, American hellebore is an active irritant. Its powder snuffed into the nostrils excites long-continued and violent sneezing, and, applied to the skin in a moist state, it produces redness and burning. All observers agree that it is an emetic. Osgood found that two grains of the powder caused him to vomit, and observed

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[1] Bost. Med. and Surg. Journ., Aug. 1858, p. 77.

[2] Am. Journ. of Med. Sci., xvi. 296.

[3] Southern Med. and Surg. Journ., June, 1850.

that the act was at first unattended by nausea, and seemed to be performed by the contraction of the stomach and œsophagus alone. But in another person, who also presented this peculiarity, as well as in himself, emesis was subsequently persistent and violent, and attended with bilious ejections. Norwood speaks of it as one of the most certain and efficient emetics belonging to the materia medica, but also states that it often produces extreme nausea, as well as vomiting that is sometimes almost continuous. Yet he elsewhere describes the vomiting as full and free, with frequently little or no retching. A French physician, Robert,[1] seems to imply by the terms of his narrative that the sedative operation of the medicine, to be presently described, is an effect of the nausea which it excites; but Dr. Norwood, and many others, declare that by its careful administration, nausea and vomiting may be avoided altogether. He states, indeed, that the pulse may be reduced as low as thirty-five beats in a minute, without the occurrence of either of these symptoms. In general, the excessive vomiting may be controlled by aromatics and diffusible stimulants.

However close the analogy may be between the effects of the present medicine and of white hellebore in other respects, there is one in which they have been alleged to differ so radically, as to prove, if the statement is true, that they do not owe their virtues to the same active principle. It is usually said and believed, that the latter agent is a violent irritant of the bowels, uniformly causing purgation when taken in large or poisonous doses. Of American hellebore Osgood said, "It has not the slightest laxative effect," and Norwood declares "it is not cathartic by any means." To these accounts most of the reporters subscribe; but we find that in a case published by Dr. E. M. Pendleton, there were "copious watery evacuations *per anum*,"[2] and in two cases, reported by Dr. E. Platt, that "profuse watery evacuations from the bowels" and "looseness of the bowels," are mentioned among the toxical phenomena;[3] while in three cases, observed by Dr. Rayner, in which an infusion of white hellebore produced violent but not fatal symptoms, there was no purging.[4] It is therefore certain that if an absolute difference exists between the two medicines, it is not to be found in their cathartic operation. At the same time it would appear that this effect is most usual with white hellebore.

The most remarkable quality of American hellebore is its sedative action on the pulse. Osgood was the first to state that by the exhibition of full doses, the pulse, when ranging from 75 to 80 in a minute,

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[1] Bull. de Thérap., xliv. 415.
[2] Charleston Med. Journ., vii. 424.
[3] Am. Med. Gaz., April, 1859, p. 249.
[4] Pereira, Mat. Med., 3d Am. ed., ii. 184.

may be reduced to 35 or 40 in the course of a few hours, and become "small and creeping;" but Dr. Branch declares that "when used as it ought to be, it reduces the frequency but never the strength or volume of the pulse."[1] Upon this point Dr. Norwood is not very explicit, but it may be inferred from his statements that he admits the reduction of force as well as of frequency in the pulse, since he describes among the ordinary effects of the medicine "great coolness of the surface and often icy coldness." Yet he does maintain that the reduction of the frequency of the pulse is not dependent upon the occurrence of nausea or vomiting.[2]

The effects of this agent when given in an excessive dose have been described by Osgood, Pendleton,[3] Platt,[4] Colegrove,[5] and others, in nearly the same terms. They consist of faintness, somnolency, or coma, dimness of sight, dilatation of the pupils, vertigo, headache, rarely delirium, impaired muscular action, hiccup, a cold skin covered with clammy sweat, excruciating pain in the præcordia, profuse watery diarrhœa in some cases, and a small, infrequent, and generally feeble pulse. Alarming and apparently dangerous as these symptoms are, it does not appear that they have terminated in death. On the contrary, they have generally been dispelled with facility by suspending the use of the medicine and administering diffusible stimulants. The effect of alcohol in counteracting the sedative action of the poison was shown in the case of a physician who took, by mistake, an ounce of the tincture at one draught. Extreme nausea, vomiting, and some dyspnœa, were the only evil consequences of this large dose.[6]

This medicine is alleged to produce abortion in the pregnant female by Dr. W. A. Brown, of Georgia, and others. On the other hand, numerous cases might be quoted in which it was taken with the intent of producing this result, but ineffectually.[7] Undoubtedly, however, an agent which, like this one, usually excites prolonged and violent vomiting, ought not to be administered to a pregnant female by a prudent physician, although it may be true that it exerts no specific action upon the impregnated uterus.

The *mode of action* which veratrum viride displays in the cure of diseases has been variously estimated by different observers. Originally, besides its emetic operation and sedative influence upon the heart

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[1] Charleston Journ., viii. 168. [2] Ibid., vii. 768.

[3] Charleston Med. Journ., June, 1852, p. 423.

[4] American Med. Gaz., April, 1859, p. 247.

[5] Boston Med. and Surg. Journ., August, 1858, p. 96.

[6] North American Med.-Chir. Rev., ii. 930.

[7] Ibid., p. 929; Boston Med. and Surg. Journ., Nov. 1857, p. 299, and Dec., p. 436.

and nervous system, it was alleged to be deobstruent and alterative, in which last qualities were included resolvent, antipsoric, cholagogue, expectorant, diuretic, discutient, sialagogue, diaphoretic, and emmenagogue powers.[1] In other words, it combined in itself the virtues of nearly all the materia medica besides. Quite recently it is reported by various observers to be expectorant and diaphoretic; and while some, with Dr. Jameson and Dr. Hutchinson, of Indiana, assert that it "indirectly restores the depurating functions of the liver and kidneys," or that "its influence in cleansing the liver is greater than that of any other article," others, like Dr. Boerstler, have "never observed any influence on the glandular system" exerted by it.[2] Dr. Norwood maintains its expectorant, diaphoretic, and deobstruent virtues. He claims for it "powerful effects on the liver," and great efficacy as a nervine, in "allaying morbid irritative mobility in febrile and inflammatory diseases,"[3] while Dr. Branch maintains that "its greatest value consists in its adaptation to *asthenic* diseases," that it "is best adapted to adynamic or asthenic conditions of the system," and that it is "a great mistake to regard it as a good substitute for the lancet in phlogistic or sthenic disorders."[4]

It is evident that conclusions so diametrically opposed as these are to one another can furnish no ground for a rational theory of the mode of action of the medicine we are examining. It will be observed that the capital discrepancy is upon the question whether it is a stimulant or a sedative, and that while some regard it as having, under all circumstances, a lowering action on the system, involving a reduction in the frequency of the heart's pulsations, others appear to consider this effect, at least so long as toxical symptoms do not arise, as resulting from an augmented tone in the action of the heart. These opposite doctrines are analogous to those which we have seen to prevail in regard to the operation of digitalis, but the grounds upon which a choice should be made between them are not as well determined as in the case of the latter medicine. The only recorded fact which appears to bear directly upon the question is, that observers are agreed in stating that although the medicine reduces the frequency, it does not diminish the strength of the pulse, until nausea, vomiting, and the associated symptoms make their appearance, from which it may be inferred that debility and general sedation are secondary effects. More complete investigations of this point, and indeed of the whole subject, are, however, still required.

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[1] Osgood, loc. cit.

[2] N. Am. Med.-Chir. Rev., ii. 914.

[3] Charleston Journ., vii. 766; xii. 197.

[4] Ibid., viii. 168.

Remedial Employment.—American hellebore has been more extensively employed in *pneumonia* than perhaps in any other disease, but an examination of the records is far from warranting the encomiums which have been lavished upon its virtues. The first to eulogize them was Dr. Osgood, in 1835, who says that the medicine has been advantageously employed, "except in low typhoid cases," while Dr. Branch assures us that it is best adapted to this very form of the disease—viz., adynamic pneumonia. An examination of the cases published by Drs. Robert,[1] Livezey,[2] Handy,[3] Spalsbury,[4] Chapin,[5] Cutter,[6] Toland,[7] Watson, Murphy, and McGugin,[8] shows that the opinions expressed by the reporters are not always sustained by the facts on which they profess to be founded. It must be confessed that when we meet with such general expressions as that the medicine "is invaluable in pneumonia;" that it may be considered "as much a specific in pneumonia as quinine is for intermittent fever" (*Norwood*); and when we find it said of pneumonia with rusty sputa that "its further progress was subdued" by the medicine; and when curative virtues are claimed for it in cases for which bleeding, calomel, tartar emetic, blisters, and senega were also prescribed, the only rational conclusion to be drawn from such statements is that they are of no value in solving the question of the utility of veratrum viride in this affection. It should never be forgotten that pneumonia is a self-limited disease; that a comparison of various active and perturbative modes of treating it proves them to be all very nearly upon an equality as regards their curative power; and that the plan which has been attended with least mortality is, on the whole, one of pure expectation.

It is also said to be advantageous in *pleurisy*, but there is no sufficient evidence that it is so. In a case reported to demonstrate its value in this affection, depletion, calomel, and a blister dressed with mercurial ointment were first employed, and the veratrum having then been administered, the pulse indeed fell from 120 to 60, but the patient complained bitterly of distress, and hysterical symptoms supervened.[9] This and similar examples which have been published are very inconclusive, but it is quite possible that the medicine may, by its sedative influence, assist in moderating the pleuritic pain and the plastic or serous effusion, and subsequently promote the absorption of the latter.

In *acute rheumatism*, according to Osgood, it is more efficacious than

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[1] Bull. de Thérap., xliv. 416.
[2] Boston Journ., Mar. 1857, p. 138.
[3] Ibid., Apr. 1857, p. 256.
[4] Ibid., Mar. 1858, p. 113.
[5] Am. Journ. of Med. Sci., Oct. 1858, p. 311.
[6] Ibid., p. 315.
[7] Ibid., p. 576.
[8] N. Am. Med.-Chir. Rev., ii. 921, &c. New York Journ. of Med., Sept. 1855, p. 254.

any other remedy, if administered so as to sustain its impression, and at first without producing nausea. But this physician prescribed it in conjunction with opium, the best of all the remedies for the disease in question. In some cases of acute erratic rheumatism of the joints it would appear to have been occasionally useful.[1]

It is unnecessary to refer in detail to the alleged efficacy of American hellebore in *chronic rheumatism*, in *gout*, and in *dyspepsia*, or in *scarlatina*, *measles*, *yellow fever*, and *typhoid fever*, but it may be stated that Dr. Norwood says of it in the last-named disease, "We rely on it as *the* remedy, and administer it with every assurance of success." His plan is to reduce the pulse to between 55 and 75 beats a minute, and keep it at the point desired night and day. "By this kind of reduction the febrile and inflammatory symptoms vanish, and the patient is kept quiet and tranquil and comfortable;" and "it is out of the question for febrile and inflammatory action to exist and continue their ravages for any great length of time when the pulse is kept at 60 or 65 beats, or even less."[2] Dr. Branch is quite as well convinced of the utility of the medicine in all stages of typhoid fever; but he adds, "the disease never requires reducing agents," a class to which he denies that this medicine belongs; and while he lessens the rate of the pulse by its means, he administers paregoric, and sometimes brandy, to sustain the strength and allay agitation.[3] We can with difficulty persuade ourselves that typhoid fever, a disease eminently specific in character, and most dangerous when its type is most asthenic, could be profitably treated by a medicine which tends so directly as this to produce infrequency and then depression of the pulse, and ultimately collapse of the whole system. Even admitting, what appears not to be improbable, that its primary action on the heart is not debilitating in its nature, it is separated from its toxical action by so narrow a space, and the latter must be so hazardous in this disease, that we should feel very reluctant to run the risk of inducing it, without more substantial reasons than any which have yet been assigned by the eulogists of the medicine.

But there is another class of cases in which veratrum viride is represented to be beneficial, cases of an undue action of certain organs, independently of fever. Osgood recommended it in *nervous asthma*, and the analogy of the effects of nauseants and nervous sedatives in this affection would lead us to suppose that it might be beneficial, and not only in cases which are free from organic complication, but in some also in

[1] Am. Journ. of Med. Sci., Oct. 1858, p. 317.

[2] Essay, 1856, p. 9.

[3] Loc. cit., p. 169.

which emphysema and *organic diseases of the heart* coexist, as well as in those of *nervous palpitation* of this organ. The benefit experienced in several instances of both forms of cardiac disorder has been very decided, and tends to prove that the medicine did not produce such marked relief by any debilitating influence. The cases reported include examples of nervous excitability with muscular atony of the heart, and others of great embarrassment of the circulation from valvular disease;[1] but in all the relief was marked when the rate of the pulse diminished, although none of the toxical effects of the drug were developed. A case of *puerperal mania* is reported by Dr. A. B. Clarke, in which the remissions and exacerbations of the disease clearly coincided with the administration and suspension of the hellebore.[2] The pulse being rapid, although there was no fever, proves the attack to have been one of nervous excitement associated with true debility. In such cases it is that opium acts so beneficially, and we may presume that the hellebore in this instance did so by a sustaining rather than by a debilitant action upon the nervous system.

The medicine is also reported to have been used with advantage for *influenza*, *gout*, *femoral aneurism*,[3] *dysentery*, *jaundice*, and *puerperal peritonitis;* but, except in the case of aneurism, we should feel disposed to question its efficacy. In this disease, other sedatives of the circulation, and especially the preparations of lead, have occasionally effected cures.

Externally the tincture of green hellebore is useful as a discutient and anodyne application.

ADMINISTRATION.—The *powder* of American hellebore may be given in the dose of two grains, repeated every three hours, as a sedative; but more than that quantity will be apt to excite vomiting. An *extract*, prepared as described at the commencement of this article, may be prescribed in doses of a quarter or half a grain. Of Dr. Thayer's *fluid extract* the dose is one drop.

The *tincture* is the most usual form for administering this medicine. Six or eight drops may be given to an adult every three hours, and the dose increased by one or two drops at each administration, until nausea is felt or the pulse begins to fall. Females, and lads from fifteen to twenty years of age, should not exceed six drops for the first dose; and for children from one to five years old a sufficient quantity is one drop. The toxical effects of the medicine are best relieved by means of alcoholic stimulants and opiates.

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[1] Am. Journ. of Med. Sci., Oct. 1858, p. 312.

[2] Boston Med. and Surg. Journ., Oct. 1858, p. 237.

[3] BLACKMAN, Am. Journ. of Med. Sci., July, 1857, p. 190.

Class X.

NERVOUS SEDATIVES.

As it has been intimated elsewhere, the direct causes of sedation or depression necessarily originate in the nervous system, since all the phenomena of life in man depend directly upon its influence. In dividing sedatives, therefore, into arterial and nervous, we have only the intention of indicating the fact that certain of these agents display their influence more conspicuously upon the one or the other system. In the case of digitalis and veratrum viride, the phenomena directly dependent upon the nervous system are inconsiderable, while the arterial circulation is prominently affected. Aconitum, conium, cocculus, dulcamara, tabacum, lobelia, and veratrum album, act, indeed, as sedatives of the circulation, but exert more prominently and immediately a depressing or disturbing influence on the involuntary portions of the nervous system. Aconitum, conium, and veratrum album, affect the nerves of general sensibility, as well; but none of the group disturb the proper functions of the brain, perception and intellection. Arterial and nervous sedatives agree in producing a disturbance of the digestive function, when taken in large doses, vomiting, often purging, and a state of general prostration, with coldness of the surface, which is generally designated by the term collapse.

Regarding them from a therapeutical point of view, the classification of the articles included in the present division, would be widely different from that which we actually adopt. Aconite and white hellebore are peculiarly adapted to the palliation or removal of local pains and their causes; hemlock and bittersweet exert a peculiar influence upon the functions of organic life, and are applied chiefly to the treatment of chronic diseases involving defects or errors of nutrition; tobacco and lobelia are employed principally as nauseants to produce relaxation of the muscles, and sometimes increased secretion from the mucous membranes; and cocculus is seldom prescribed internally.

The special uses of these medicines, as of all others, have grown out of a long observation of their curative properties, and the facts just noticed may be added to many others, which have also been pointed out in this work, and which prove that however valuable as an explanation or as a commentary a knowledge of the modus operandi may be, it must nevertheless be always held as subordinate in value to the conclusions of direct experience.

ACONITUM.—Aconite; Wolfsbane; Monkshood.

Description.—Aconite is a plant of the Nat. Ord. *Ranunculaceæ*. The principal species are four, *A. anthora*, *A. lycoctonum*, *A. ferox*, and *A. napellus*. They do not differ materially from one another in essential qualities, but the last only is officinal. It is a native of, or has at least long been cultivated in Europe, as an ornamental as well as a medicinal plant, on account of the great beauty of its dark-blue or violet-colored flowers, which are helmet-shaped, and arranged in a terminal spike or panicle. The stem is erect and simple. The leaves, which are palmate, deeply cleft, pinnate, and serrated on the edges, are of a fine shining green color, and when fresh have a faint narcotic odor. In their recent state, and also when dried, they have a bitterish, acrid taste, which is followed by a tingling sensation, and even soreness in the mouth and fauces, which subsequently, however, grow benumbed. The root is fleshy and fusiform, resembling that of the wild turnip (whence the name *napellus*, a diminutive of *navus*, *navet*, Fr.), and is furnished with fleshy fibres; it is three or four or more inches long, and of a coffee-brown color without and white within. In its taste and effects on the mouth it resembles the leaves. Sometimes several roots are joined together laterally. On being dried it shrivels, and grows darker. Its active properties are most developed in the spring.

The properties of aconite depend upon an *aconitia*, an alkaloid, which is furnished by the whole plant, but most abundantly by the root. It is partially crystallizable, of a vitreous lustre, of a white color when pure, heavier than water, unchanged in the atmosphere, and soluble in alcohol and ether.

A specimen of a root sent from China, as that from which the arrow-poison of the Chinese is procured, has been pronounced by Prof. Christison to belong to a species of aconite.[1]

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[1] Edinb. Med. Journ., Apr. 1859, p. 869.

It is stated above that the effects of the non-officinal species of aconite do not differ materially from those of *A. napellus*. This has been fully shown, by the experiments of Schroff,[1] to be true of *A. ferox*, which, however, exhibits these effects in greater intensity.

HISTORY.—The word aconite is derived, according to Pliny, from ακονν, a rock, because the plant grows in dry and rocky places; although others fancifully imagine the name to be used figuratively, and to denote the power which the plant has of destroying life, as the grindstone wears away the edge of a knife.[2] Lémery and others state, after Theophrastus, that some derive the name from Acone, a port of Heraclea, where the plant grows abundantly.[3] Almost the only mention made by the ancients of aconite as a medicine is contained in the treatise of Dioscorides, who states that it is employed in collyria to relieve pain in the eyes,[4] and it is precisely for this and similar affections that its use has been of late revived. But its most ordinary employment by the ancients was as a poison for wild beasts, and others that were to be destroyed, lest they should overrun the country. For this purpose it was rubbed upon pieces of meat which were then scattered in the way of the animals. Medea is presented by Ovid as preparing her poisons from it; it was also used, like conium, as a State poison. The Gauls dipped their arrows in its juice, and at the present day some Eastern tribes are said to use it for the same purpose, as well as for poisoning the wells and water-tanks of their enemies in time of war.[5]

ACTION. *On Animals.*—Aconite appears to be poisonous to all animals and insects. The experiments of Wilcourten, Larrey, Wepfer, and Spræger, developed essentially the same phenomena as are described below, and after the death of the animals the vessels of the head, and the left side of the heart, were found distended with blood.[6] In like manner the more recent experimenters, Fleming, Shultz, Van Praag, &c., found that earth-worms, fish, serpents, frogs, and birds, were all affected with general loss of sensibility, and paralysis terminating in death.

In 1812, Sir Benjamin Brodie performed a series of experiments on the action of poisons, from which he inferred that aconite, alcohol, the essential oil of bitter almonds, the empyreumatic oil of tobacco, and the woorara, act as poisons simply by destroying the functions of the brain. Such a grouping of agents, and such an explanation of

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[1] Journ. f. Pharmakodyn., i. 335.
[2] MATTHIOLUS, op. cit., p. 399.
[3] Traité Universel de Drogues Simples, p. 12.
[4] Chap. lxxii.
[5] DIERBACH, iii. 1162.
[6] GIACOMINI, op. cit.

their operation is not admissible in the present state of our knowledge.[1] His own experiment with aconite amounted simply to this, that the animal experimented upon, a cat, lost the power of locomotion, was slightly convulsed, breathed slowly and laboriously, and so died. A minute and a half afterwards the heart was contracting regularly one hundred times in a minute. According to Pereira,[2] if a small quantity of the soft alcoholic extract of the root of aconite be introduced into a wound (as into the cavity of the peritoneum) in a dog, it usually causes vomiting (sometimes of a stercoraceous character), diminishes the force of the circulation, weakens the muscular system so as sometimes to cause the animal to stagger in walking, and destroys the common sensibility, without causing stupor. A dog under the influence of not a too strong dose, will sometimes follow its owner around the room, recognize him by wagging his tail when called, and yet be totally insensible to pinching, pricking with needles, &c. Slight convulsions sometimes occur just before death. The heart examined immediately afterwards does not pulsate. If too large a dose, in proportion to the size of the animal, be given, the phenomena detailed above are not witnessed, because death takes place so rapidly as to obscure the insensibility which depends directly upon the poison. Dr. Fleming noted essentially the same phenomena in his experiments.[3] When first introduced into the system, aconite produced weakness of the limbs and staggering, disordered breathing, paralysis and relaxation of the extremities, impaired general sensibility, blindness, slower and imperfect breathing, spasmodic twitching, and death. The heart was found to beat for some time after the death of the animal; the venous system was congested in all its parts. The results of twenty-five experiments performed by Dr. Robert Jackson on rabbits, cats, and dogs, differed in no respect from the foregoing; it is to be remarked, however, that the most rapid results were observed after the use of the fresh juice of the root.[4] From these experiments the force of the poison would appear to be expended upon the nervous system, attacking the organs of motility first, and then those of sensibility. The muscles of purely voluntary motion seem to be the first and principal, if not the only parts of the muscular system affected, if we may depend upon the uniformity of the phenomenon observed by Fleming and Brodie, and opposed to Pereira's observation, viz., the pulsation of the heart after the extinction of animal life.

On Man.—Among the earliest narratives which illustrate this subject,

[1] Ed. Med. and Surg. Journ., viii. 458.
[2] Mat. Medica, &c., 3d Am. ed., ii. 1087.
[3] Month. Journ. of Med. Sci., 1845, p. 506.
[4] Lancet, May, 1856, p. 478.

may be cited that of Matthiolus, who informs us[1] that for the purpose of testing certain alleged antidotes he attempted (A. D. 1561) to poison four criminals who were under sentence of death, two of them at Rome and two at Prague. One only of the number survived, the rest suffered a more terrible death than hanging. The symptoms of one of the culprits who perished, occurred in the following order: Lassitude, prostration, a sense of sinking at the heart, which did not prevent the patient from speaking and seeing clearly; a cold sweat succeeded, and the pulse grew feeble; convulsive twitches of the lips and eyes, and drawing of the head backwards, were followed by complaints of chilliness, looseness of the bowels, and vomiting, which seemed to afford relief; the man turned upon his side as if to sleep, but his face grew livid, and he was presently dead.

The most detailed account of the toxical properties of aconite is contained in the Inaugural Essay of Dr. Fleming, which received a gold medal from the University of Edinburgh, at the graduation of 1844. His experiments upon man were conducted in the infirmary of the town just named. The following is an extract from his Treatise:—

"*First Degree of Operation.*—In the course of twenty minutes or half an hour, after the exhibition of five minims of the tincture of aconite, a feeling of warmth in the stomach is usually experienced, which is occasionally accompanied by slight nausea, and oppression of the breathing. After the lapse of thirty or forty minutes, this sense of warmth is diffused throughout the body, and in a few minutes more, is attended by numbness, tingling, and a sense of distension of the lips and tongue. There is also tingling at the tips of the fingers, and a peculiar sensation is felt at the roots of the teeth. The feeling of warmth soon disappears, but the numbness and tingling of the lips and fingers continue for a period varying from one to three hours. Slight muscular weakness is generally experienced, with indisposition for exertion either mental or corporeal. In about half an hour more the pulse is found to be diminished in strength; and in another hour both the pulse and respiration have become less frequent. Thus, a pulse which in the normal state, beats seventy-two in the minute, will by that time have fallen to about sixty-four, and the respirations, supposing them to have been eighteen, to fifteen or sixteen.

"*Second Degree of Operation.*—Should a dose of ten minims be given at first, or the dose of five minims be succeeded in two hours by another of equal amount, these symptoms supervene more rapidly and

[1] Commentaire, p. 400.

with greater severity. The tingling extends along the arms, and the sensibility of the surface is more or less impaired. In an hour and a half the pulse will probably have fallen to about fifty-six beats in the minute, and become smaller and weaker than before, still maintaining, however, perfect regularity. The respirations will have diminished to about thirteen, presenting at the same time, a slow, laboring character. Great muscular debility is now experienced; and giddiness with confusion of sight comes on when the erect posture is assumed. The individual sinks into a lethargic condition, evinces great disinclination to be disturbed, although he rarely falls asleep, and complains much of chilliness, particularly in the extremities which are cold to the touch. These phenomena continue in their full intensity from three to five hours, when they gradually disappear; a sensation of languor, which lasts for several hours more, alone remaining. This is the utmost extent to which I would recommend the physiological effects of aconite to be carried, in order to obtain, with safety and success, its therapeutic action.

"*Third Degree of Operation.*—On the administration of five minims more, two hours subsequent to the last dose, the sense of warmth, and the numbness and tingling again spread rapidly over the body. The sensibility of the surface is still further diminished; lancinating pains in the joints are occasionally complained of; the headache, vertigo, and dimness of vision are aggravated; the countenance grows pale and anxious; the muscular feebleness increases; the voice becomes weak, and the individual is frequently impressed with the dread of approaching dissolution. Occasionally the pulse is reduced still further in strength and frequency, perhaps falling to 40 or even 36 beats per minute, but still maintaining its regularity. More frequently, however, it rises to 70 or 80, and becomes small, weak, and probably more or less irregular. The respiratory movements are also irregular, being either short and hurried, or deep and sighing. The surface is moist and still further reduced in temperature. Sickness may now come on; and, if formerly present, is much aggravated, and probably attended by vomiting. These symptoms do not entirely subside for one or two days.

"*Fourth Degree of Operation.*—On the administration of a fourth dose of five minims, two hours after the third, the symptoms assume a more alarming character. The countenance becomes pale and sunken; froth issues from the mouth, and the prostration increases. Some thus affected have stated that they felt as if dying from excessive loss of blood. Consciousness usually remains; or there may be slight wandering delirium, as occurs also after profuse hemorrhage. The voice is whis-

pering, or is altogether lost. The pulse becomes still smaller, weaker, and more irregular; and the breathing more imperfect; the surface is colder than before, and is covered with a clammy sweat. I have seen patients recover from this state under the administration of proper remedies.

"When the action of the drug is carried to a fatal extent, the individual becomes entirely blind, deaf, and speechless. He either retains his consciousness to the last, or is affected with slight wandering delirium; the pupils are dilated; general muscular tremors, or even slight convulsions supervene; the pulse becomes imperceptible, both at the wrist and heart; the temperature of the surface sinks still lower than before; and at length, after a few hurried gasps, death by syncope takes place."

From these experiments the author infers that aconite is a sedative of the cerebro-spinal system, by its direct action upon the nervous matter, and on the heart, and by its indirect action on both, through the congestion to which it gives rise. In the action of aconite on the pulse, a distinction is to be made. The direct and immediate influence of the drug administered in small quantities is to reduce the frequency of the pulse, according to the author just quoted, to 60, 48, 40, and even 36; but if the sedative action on the system is allowed to proceed much further, the pulse rises in frequency, becomes irregular and intermittent, and smaller and weaker. The latter characters are ascribed to the pulse in nearly every case of fatal poisoning by aconite.[1]

Several, and indeed most authors, mention a symptom which is scarcely alluded to in the narrative of Dr. Fleming's experiments, an increase, namely, of the cutaneous exhalation, with excessive itching, and formication, and an eruption of vesicles. Large doses of aconite are said also to leave behind them feebleness of digestion with bilious or bitter eructations, a yellowish tinge of the complexion, and, if the medicine has repeatedly given rise to its specific symptoms, sometimes to distinct jaundice.[2] Vogt places aconite in the same category with

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[1] The reader is referred to the following among other sources for illustrations of the present subject: Sayle, Med. Times, 1845; Pereira, Edinb. Journ. of Nat. and Geogr. Sci., July, 1830; Dix, Lancet, 1839, p. 450; Sherwin, ib., 1837, p. 13; Bird, ib., Jan. 1848, p. 14; Ramsay, Med.-Chir. Rev., July, 1844; Dierbach, Neueste Entdeck, ii. 449; Dévay, Bull. de l'Acad. Roy. de Méd., ix. 159; Headland, Lancet, Oct. 1843; Beck, Am. Journ. of Med. Sci., April, 1852, p. 553; Dévay, L'Experience, Dec. 1843.

[2] Vogt, Pharmakodynamik, ii. 248.

digitalis and tobacco, and between these agents and conium, as regards its influence on the economy.

The practical inferences which Dr. Fleming deduces from a consideration of the action of aconite on the circulation, are as follows:—

"1. That it is a powerful antiphlogistic.

"2. That it is calculated to be of great value in all cases where there is inordinate activity of the circulation.

"3. That it is contraindicated when there is obvious mechanical impediment to the passage of the blood, particularly through the heart or lungs.

"4. That it is contraindicated whenever there is irritability of the circulation, with great diminution of power, such as occurs after severe venous hemorrhage."

An analysis which we have made of twelve of the more recently published cases of poisoning by aconite, four of which terminated fatally, has furnished the following results, which coincide very nearly with those obtained by Dr. Fleming, and by others who have described individual cases of this occurrence, or have given summaries of their observations. It is also to be noticed that there is nothing except the *degree* of debility and coldness to distinguish the fatal cases from those which recovered. Retching and vomiting are mentioned in a majority of the cases, and in nearly all it was accompanied by a burning sensation in the fauces and throat, intense thirst, and burning pain in the stomach. The face was generally pale, and in two cases which recovered was slightly affected with spasms; the skin was pretty uniformly cold and clammy, or bathed in a copious perspiration, and was sometimes the seat of formication; in no instance is insensibility of the integument mentioned. A general feeling of heaviness of the limbs affected nearly all the patients, and in one fatal case paralysis of a lower extremity is mentioned. In four, there were more or less general convulsions, and in two, spasms and rigidity of the muscles upon the posterior part of the neck and trunk. In two cases the pupils were insensible to light, and in both of these cases, which, however, recovered, there was blindness. In three other cases, two of which were fatal, the pupils were dilated. In one case, only, the breathing is stated to have been stertorous, and in two others it is described as slow. In these three cases there was either coma, or deep sleep, and all of them terminated favorably; in the remainder, consciousness was not impaired until death, or immediately before it. In one of the four fatal cases no examination of the body was made; in the three others there were no uniform lesions; the stomach was pale, or dark-colored,

and the brain natural or deeply congested. The blood in the heart was liquid in two cases, and in the third its condition was not noted.[1]

The operation of *aconitia*, when taken internally, differs from that of aconite only in degree and in the rapidity with which its effects arise. Reil dissolved $1\frac{3}{5}$ grain of aconitia in 200 drops of alcohol, and took from 5—30 drops ($\frac{1}{25}$—$\frac{1}{4}$ grain), diluted with water, in gradually increasing doses. He experienced a feeling of fulness in the cheeks and temples, which by degrees was exchanged for a painful sense of tension, formication, and prickling; the temples throbbed, the head ached, the eyes felt strained, the pupils were dilated, the sight was obscured, there was oppressed and suspirious breathing, ringing in the ears, and increased urination. There was also a sense of heat in the stomach, with eructation, and, for three days following, nocturnal pollutions, to which the experimenter was not accustomed.[2]

When this substance in ointment or solution is applied to the skin, it produces itching and prickling, followed by insensibility of the part, and without reddening it in the least.

Remedial Employment. *Rheumatism and Gout.*—In these diseases aconite was from the first employed by Stoerck, and his numerous imitators soon popularized its use throughout Europe. This author remarks that what chiefly gives merit to the medicine is the rapidity of its effects, for it will, in the space of a few days not only alleviate, but cure, and that with certainty, those who had for months and even years, been afflicted with pains and deprived of the use of their limbs.[3] Nor was confirmation wanting for so extraordinary a statement, and many of Stoerck's contemporaries published accounts of not inferior success. But subsequent experience has proved them to have been exaggerated, while it has accorded a real and more definite value to the medicine. One of the first among more recent authors who have contributed to our knowledge upon the subject is Tessier, of Lyons, who in 1834,[4] recalled attention to aconite as a remedy for acute rheumatism. He alleges that it calms rheumatic pains, especially of the large joints, so rapidly that in an hour after its administration, a striking amendment can sometimes be observed, although more commonly twenty-four or thirty-six hours are required

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[1] The cases which recovered are reported by Brodie, Charleston Journ., viii. 170; Putnam, Am. Journ. of Med. Sci., July, 1853, p. 169; Perry, ibid., April, 1854, p. 345; Peet, Brit. and For. Med.-Chir. Rev., Oct. 1855, p. 505; O'Conner, Dublin Quart. Journ., Feb. 1857, p. 224: the fatal cases by Gray, New York Journ., Nov. 1848, p. 336; Simpson, Lancet, May, 1855, p. 467; Massey, ibid., July, 1856, p. 100; Hatfield, Times and Gaz., Feb. 1857. p. 228.

[2] Mat. Med. d. rein. chem. Planzenstoffe, p. 26.

[3] Apparatus Med., iv. 19.

[4] Bull. de Thérap., vii. 53.

to produce the effect. He found, moreover, that it hastened in a remarkable manner, the absorption of synovial effusions, and that without giving rise to any excretion by the skin or bowels. Dr. T. prescribed the alcoholic extract of aconite in doses of a quarter or half of a grain twice a day, which he increased until the daily dose reached six, or from that to nine grains. Pereira assures us that in rheumatic pains unaccompanied with local swelling or redness, aconite is frequently of great service as a local application. In painful affections of the intercostal and other respiratory muscles, occurring in rheumatic individuals, he also found this remedy most valuable both internally and topically. Sigmond indicates the very opposite condition as one in which aconite is useful, viz., when the joints are tumefied, painful, hot, and elastic to the touch, and he remarks that it is sometimes wonderful to witness the speedy relief of the pain, and the restoration of the health even when the whole joint appears to be involved in the disease. "In all the various seats of rheumatic inflammation, whether the disease have been of long or short duration, however great the agony which has been expressed, however incapable the limbs have been of bearing the slightest motion, aconite has been acknowledged to have proved of the most decided service."[1] But the most complete and accurate account of the effects of aconite in rheumatism, is contained in the essay of Dr. Fleming, already referred to. In the acute form of the affection relief was more speedily obtained than by any other means whatever; indeed, the author represents the duration of the treatment as less than half of that required under other modes. The improvement, too, appears to manifest itself very speedily, often within an hour after the first dose has been taken; no unpleasant symptoms follow; the heart seems less liable than usual to inflammatory complications; and the convalescence is extremely short. Dr. Fleming found also, like Lombard, that this mode of treatment contributes powerfully to the absorption of the fluid in articular rheumatism. In the chronic form of the disease he met with corresponding success, in the use of aconite, both internally and externally. It possesses, he remarks, the great negative advantage of not weakening the strength and impairing the constitution of the patient; a most important quality as every practitioner must acknowledge. Dr. Busse, of Berlin, has also witnessed its efficacy in rheumatism,[2] and more recently we find singularly rapid cures of both acute and chronic rheumatism ascribed to it by Balfour.[3]

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[1] Lond. Lancet, Aug. 1837.

[2] Month. Journ. of Med. Sci., May, 1843.

[3] Ibid., May, 1853, p. 432.

Aconite has been recommended in *gout* by most of the writers who have found it useful in rheumatism. It has been prescribed both locally and internally. There can be no doubt that in the former mode of using it aconite more than any other application is capable of mitigating the excruciating pains of gout. Internally, according to Ditterich,[1] it produces a very decided amelioration of the symptoms; from the first day of its use the pulse is calmer and softer, the local heat is assuaged, and often a general sweat occurs by night, after which the color of the urine is lighter. The third or fourth day the swelling subsides, the tenderness of the joint has very nearly gone, and the urine resumes its normal characters. Royer-Collard, from experiencing the benefits of aconite in his own person, strongly recommended it in gout; but the fits, which were once regular, lost this salutary character, and brought on a long train of sufferings, to which the eminent patient at last succumbed. If, as has been supposed, the medicine be chargeable in any degree with this result, it still may be employed locally without a fear of similar consequences.

Neuralgia.—In the treatment of this distressing affection, the benefits to be derived from aconite are unequivocal and precious. It is true that neuralgia is probably a symptom of various, and perhaps in other respects dissimilar, diseases, and is not uniformly cured, nor even relieved, by aconite; but its success is so direct and complete in many cases as to impart to it a decided value. Often it banishes the pain almost instantaneously, as well as permanently; but often, too, it only palliates the suffering of the patient, or puts an end to the present paroxysm without influencing the next. Undoubtedly the cases in which it most signally fails are those in which some previous local malady forms the starting point and cause of the neuralgia. While this remains, no permanent alleviation of the latter disease need be looked for from aconite. Cases illustrative of its anti-neuralgic virtues abound in the periodical literature of the profession. Mr. Curtis[2] reports several cases of immediate and permanent relief from neuralgia of the fifth pair, and of the nerves distributed to the hip and thigh, from the external application of aconite; Tessier[3] several of the same sort cured by aconite given internally; Masius, Rademacher, and others,[4] furnish similar accounts. Imbert-Gourbeyre

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[1] Annuaire de Thérap., 1852, p. 46. Compare, also, Andrea, Comment. de Re. Nat. et Med., xvii. 669. Barthez, in his Traité des Maladies Goutteuses, states that he has often seen aconite dissipate the disease even in obstinate cases, and quotes Schenckbucher, Quarin, and Van Swieten to the same purpose.

[2] Lancet, 1840–'41, ii. 474. See, also, Eades, Abeille Méd., Oct. 1845.

[3] Bull. de Thérap., xxxiii. 105.

[4] Dierbach, loc. cit.

prefers the inspissated juice of the plant preserved by alcohol, and ascribes to it almost magical powers;[1] and Dr. Stevens, of Cincinnati, reports its success in the cure or relief of "almost the entire range of neuralgic affections, and of those obscure complications of rheumatism and neuralgia in which there is freedom from local or constitutional trouble, independent of nervous derangement.[2] In *nervous headache*, a closely allied disease, Dr. Burgess states that aconite has been, in his hands, a successful remedy.[3] Dr. Fleming assures us that he has found the topical application of the tincture of aconite extremely serviceable in neuralgia of the intercostal nerves and their spinal branches, or what was once obscurely called *spinal irritation*, as well as in neuralgia of the extremities. Of *sciatica*, which is so generally an intractable disease, the same author informs us that he cured permanently seven cases out of twelve; of the remainder, also, two were relieved. Several cases of severe and obstinate neuralgia, of different forms, are reported by Dr. Storer, of Boston, to have been cured by the local use of tincture of aconite.[4] Mr. Hilton found the alkaloid aconitia, in an ointment, and in the proportion of two grains to the ounce of lard, competent to suspend violent pains in the ulnar nerve following an amputation of the hand. The same surgeon found very great benefit, in another case, from rubbing this ointment upon the loins and sacrum.[5] Many cases similar to the above are reported by Turnbull, Brookes,[6] Skey,[7] and, amongst others, by the Reverend and witty Sidney Smith,[8] who says that a certain Mrs. Sibley, who had been "for seven years living in a state of constant agony, and from intensity of pain was often deprived of her reason," had quite recovered under the use of aconitia ointment. The reporter truly and characteristically adds, "she may relapse, but such a holiday in such a complaint is not to be forgotten."

In other painful affections this medicine is often of service. Thus, Mr. Curling found a liniment composed of equal parts of soap liniment and tincture of aconite effectual in relieving the severe pain produced by *dry gangrene* of the foot, after various other anodynes had failed.[9] Mr. Long, of Liverpool, ascribes to the tincture a power of preventing the rigor which in certain cases follows the introduction of an instrument into the urethra.[10] In *diseases of the heart* attended by over-action

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[1] Abeille Méd., xii. 21. [2] Cincin. Med. Obs.; and N. Am. Med.-Chir. Rev., ii. 934.
[3] Lond. Med. Gaz., 1840, p. 765. [4] Amer. Journ. of Med. Sci., July, 1854, p. 100.
[5] Times and Gaz., Dec. 1854, p. 614.
[6] Lancet, Jan. 1844, p. 476. [7] Lond. Med. Gaz., Nov. 1836.
[8] Lancet, Jan. 1838, p. 531. [9] Times and Gaz., Nov. 12, 1853.
[10] Liverpool Med.-Chir. Journ., No. 3, p. 28.

of the organ, Lombard has derived benefit from the sedative property of aconite;[1] in *pulmonary* diseases attended by harassing cough and profuse expectoration;[2] in the *purulent diathesis*;[3] in *ulcers* of the limbs, connected with a bad habit of body;[4] in arresting bloody stools in *dysentery*;[5] in *amenorrhœa*;[6] and in *dropsy*.[7] The list of diseases for which aconite is alleged to be a palliative or a cure might be greatly extended, but in nearly all the published narratives the proof of its efficacy is far from satisfactory, or, if accepted, only shows it to be inferior to other medicines belonging to the class of narcotics.

ANTIDOTES.—The same as for conium.

ADMINISTRATION AND DOSE.—Aconite may be given in substance, extract, or tincture. Of the *powdered leaves* one or two grains may be used as a minimum dose; of the *extract* from half a grain to one grain; and of the *tincture* (*of the leaves*) twenty or thirty drops. But all of these preparations, which are officinal, possess inferior qualities to the *tincture of the root*, which should be prescribed in doses not exceeding, at first, three minims, and repeated three times a day. If, as the medicine is continued and the dose gradually augmented, there should arise nausea, numbness and tingling of the lips, muscular weakness, and infrequency of the pulse, it would be prudent to suspend it, and administer stimulants. Sometimes the medicine disagrees with the stomach and bowels, and occasions vomiting and diarrhœa. A small piece of dense sponge, fastened upon a suitable handle, may be used to apply the tincture of aconite externally. The finger would be preferable were it not for the benumbing influence of the fluid upon the skin.

Aconitia may be applied in an ointment made, according to Dr. Turnbull's formula, of two grains of the alkaloid to a drachm of lard; or in alcoholic solution, in the proportion of half a grain to one fluidrachm of the menstruum, and the proportion increased until tingling of the skin is produced. This preparation, owing to its uncertain strength, and fatal effects in an overdose, ought never to be administered internally.

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[1] Gaz. Méd. de Paris, 1835. [2] BERTINI, Annuaire de Thérap., 1847, p. 28 et seq.
[3] TESSIER, ibid., p. 22. [4] GRANTHAM, Ranking's Abstract, 1848, p. 106.
[5] MARBOT, Bull. de Thérap., xxxvii. 105.
[6] WEST, Arch. Gén. de Méd., 2ème sér., viii. 428. [7] FOUQUIER.

CONIUM.—Hemlock.

Description.—The leaves and seeds of *Conium maculatum* are officinal, but the whole plant contains a peculiar principle, *conia*, on which its medicinal activity depends. Conium is a plant of the natural order of umbelliferæ; and is a native of Europe, but is naturalized in the United States. It bears a general resemblance to parsley, has a white, fleshy, fusiform root, and an erect, herbaceous, and branching stem, from three to five feet high, smooth, and of a bright green spotted with purple, whence the name *maculatum* applied to the plant. The leaves are pinnate, with incised leaflets of a deep green color above, but paler below. The flowers are white, disposed in numerous compound terminal umbels, and the seeds, or fruit, are double, of an ovate form, the two portions adhering by the base, and are ribbed longitudinally on their convex surface.

The whole plant exhales a strong and fetid smell, which has been compared to that of musk, of copper, of mice, and of cat's urine.

Conia, when pure, is a yellowish, oily-looking, transparent liquid, lighter than water, of a penetrating smell, resembling the combined odors of tobacco and mice, and of an acrid, nauseous, and tobacco-like taste. It is very volatile, is slightly soluble in water, but less in warm than in cold water, and readily dissolves in alcohol, ether, and fatty and essential oils. Its reaction is alkaline, and with acids it forms combinations which crystallize with difficulty, are very soluble in water, and extremely poisonous.

Medical History.—Hemlock was well known in ancient times, although it does not appear to have been used as an internal medicine until very recently. It is familiar to scholars as the agent of certain governments for destroying political offenders, and, indeed, the clearest description of its effects that has reached modern times is contained in the narrative of its most illustrious victim's death. "Socrates, after swallowing the poisoned cup, walked about for a short time as he was directed by the executioner; when he felt a sense of heaviness in his limbs he lay down on his back; his feet and legs first lost their sensibility, and became stiff and cold; and this state gradually extended upwards to the heart, when he died convulsed."[1] This description contains substantially the symptoms ascribed by Dioscorides[2] to poisoning by hemlock, viz., vertigo, confused vision, hiccup, disturbance

[1] Adams, Comment. on Paul. Ægineta, ii. 212; Lancet, 1837, p. 612.

[2] Lib. vi. cap. xi.

of the mind, cold extremities, and at last convulsions. Paulus Ægineta adopts this account literally, but Nicander adds to it "a sense of suffocation."

Many doubts have been entertained whether the Athenian state poison was in reality hemlock, and not some variety of cicuta, but several considerations appear to sustain the more commonly received opinion. On the one hand, the failure of hemlock and its preparations to produce poisoning, or, indeed, any sensible phenomena, only proves that they who witnessed such failures must have experimented with an inert material; and, on the other hand, the stronger the preparation of the drug employed by other experimenters the more nearly did the phenomena resemble those recorded above. Dioscorides himself also declares that the powers of the plant differ very much according to its locality, and he mentions Athens as one of the places where it is most powerful, and Matthiolus states as a notorious fact that the Italian is inferior to the Greek conium.[1] A modern writer, Dr. Sibthorp, found *C. maculatum* growing most abundantly between Athens and Megara, but neither *Cicuta virosa* nor other analogous plants, whose effects might be mistaken for those of the spotted hemlock, were to be discovered in that region.[2] It may be added that this plant is called κώνειον by the modern Greeks, and that the discutient and sedative virtues ascribed to conium in modern times were also thought by ancient writers to belong to it.

It appears that, as different localities in Greece produced conium of unequal strength, so, in general, that which grows in the northern countries of Europe is very much feebler than the southern plant. This circumstance must be added to the others which explain the want of uniformity in the results of experiments made to test the virtues of conium, and the conflicting opinions respecting it of authors both ancient and modern.

Dioscorides directs that the juice should be obtained from the stalks and seeds before they are withered, and that it should be dried *in the sun*. This latter direction is of importance, for a very moderate degree of artificial heat decomposes and drives off the conia which they contain. The same author recommends conium as an anodyne for all pains, and as useful in erysipelas and phagedenic ulcers. The bruised plant he directs to be applied upon the genitals as a remedy for nocturnal pollutions, and upon the breasts of girls to prevent the development of these organs. Pliny makes almost identical statements, and

[1] Comment., lib. iv. cap. 74.

[2] Pereira; Mérat et De Lens.

Avicenna and Serapion propose a hemlock plaster to resolve tumors of the mammæ and testicles, and to restrain the secretion of milk.[1] In more modern times, several authors, among whom may be mentioned Ettmuller, Paré, Ray, and Lemery, extol this plant, especially when bruised and applied in the fresh state to scirrhous and other tumors. Rénéaulme, a physician of Blois, gave it internally to remove visceral "obstructions."[2] Wyer, de Heers, and Rathlaw, in the seventeenth and eighteenth centuries, employed conium in venereal and other cutaneous affections, but it was not until Stoerck, in 1760, published his treatise on the subject that it was much used as an internal remedy, nor all the advantages known that could be derived from its external use. In the first essay of the author just named numerous cases are reported of scirrhous tumors, chronic abscesses, and ill-conditioned ulcers cured by extract of conium, and in the second he affirms its power of removing cancer. This exaggeration of its merit caused a reaction of professional opinion against the remedy, and after enjoying for many years an almost unlimited popularity, it was proved to be nearly valueless in cancerous affections, and it therefore came to be neglected even in diseases in which it was really efficacious. Of late years the profession has to some extent recovered from the unjust prejudice entertained against the medicine, for it cannot be denied that such evidences of its curative virtues abound as entitle it to a prominent place in the materia medica.

Action. *On Animals.*—Some animals, it is said, such as the sheep and goat, can browse on conium without injury, but others are more or less affected by it. Rabbits and horses seldom experience mischief from its use; a horse has taken three pounds and a half of the plant without inconvenience, yet in another instance the decoction of four ounces proved fatal.[3] It caused dejection, stupor, dilatation of the pupils, trembling, salivation, nausea, spasmodic contraction of the muscles of the extremities, rolling of the eye, grinding of the teeth, and copious cold sweats. It is related that asses which feed upon the plant fall into so deep a stupor that they have been taken for dead, and even half flayed before the mistake of the operators was discovered.[4] Oxen, wolves, and dogs are said to be easily affected by conium, but dogs, because they vomit readily, generally escape with their lives, although they may remain tremulous for several days.[5] Dr. Christison is of opinion that conium does not destroy sensibility

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[1] Bayle, op. cit., iii. 559; Murray, op. cit.
[2] Sprengel, Hist., &c., v. 475.
[3] Pereira, Mat. Med.
[4] Matthiolus, loc. cit.
[5] Giacomini, op. cit.

but by paralyzing the muscles of expression prevents the subject of experiment from betraying any outward sign of pain. The toxical phenomena are recorded by him in the following order: Paralysis of the voluntary muscles, with occasional slight convulsions, then paralysis of the respiratory muscles of the chest and abdomen, and finally cessation of the action of the diaphragm. The properties of conium are most developed in summer.

Conia acts with vastly more energy than conium, and differently to it in some respects. According to Geiger's and Christison's experiments, it is a deadly poison for all species of animals.[1] Applied directly to the peritoneum or the conjunctiva it causes vascular injection, and upon all sensitive parts it produces signs of pain. But these local symptoms are speedily obscured by signs of general poisoning, which consist essentially of those detailed above, viz., a rapidly increasing paralysis first of the voluntary muscles, then of the respiratory muscles of the breast and abdomen, and finally death by asphyxia, or, as Van Praag expresses it, by "paralysis of the spinal marrow."[2] According to some experimenters, the heart beats strongly even when voluntary motion, respiration, and all the other signs of life are extinct. After death, it contains dark-colored blood in its left cavities. The external senses retain their activity almost, if not altogether, and even volition is preserved until the last breath. In its action, conia appears to be directly the opposite of strychnia; for while the latter destroys life by inducing universal muscular spasm of a tonic sort, the former brings on asphyxia by paralyzing the respiratory as well as the purely voluntary muscles.

No poison, except prussic acid, excels conia in the subtlety and rapidity of its operation. A drop placed on the eye of a rabbit killed it in nine minutes; by a like application of three drops, a strong cat was destroyed in a minute and a half; and five drops, placed in the gullet of a small dog, caused its death in one minute. Introduced into the veins, the fatal effect was almost instantaneous.

It will be observed that the symptoms to which conia gives rise are different from those produced by conium, in being much simpler and much more like what are ascribed to the Greek poison. Whether this depends upon the fact that the Athenian hemlock contained a larger proportion than the Western European of conia, or whether a second poisonous element is united with this principle in the plant, is at present uncertain, but the former supposition seems the more probable.

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[1] Dierbach, Neueste Entdeckungen, i. 278.

[2] Journ. f. Pharm., i. 44. Compare Kölliker's experiments upon frogs. Virchow's Archiv., x. 238.

On Man.—In such doses as are requisite to insure its *alterative* action, conium occasions no sensible phenomena, and hence the best evidence of its action is furnished by the subsidence of the disease for which it is administered. But as, owing to the very uncertain strength of its preparations, it is necessary to increase the dose of conium until some proof of its activity is obtained, it is expedient to know the various phenomena which have been observed. Of these the most important are now to be detailed. One of the earliest signs of its operation is an increase and viscidity of the urinary secretion, and sometimes the perspiration is augmented. The urine is said to be more abundantly secreted, to smart a little when passed, and on standing to deposit a glairy sediment, and to exhale a nauseous smell; but these effects are by no means constant, nor is vomiting or diarrhœa, both of which at times occur if a large dose is given from the outset. But in the absence of these symptoms, or after they have subsided, the continued use of the medicine seems to exert a tonic operation; the appetite grows stronger; the bowels, after having been constipated, become regular; the skin assumes a more wholesome aspect, and the patient gains flesh and strength. It is during this grade of action, continued for a long time, that several of the characteristic effects of conium are developed, such as the wasting of the mammæ and testicles, and of various glandular tumors, and the loss of venereal desires, effects which the ancients, as has already been mentioned, produced by the external application of the fresh plant, and which the experience of several modern writers has shown to be real.

A somewhat larger dose than suffices to produce the alterative action which has been described, gives rise to more appreciable symptoms. The pulse becomes somewhat slower and fuller, there is a papular or erythematous eruption, with itching of the skin, injection of the eyes, dryness of the throat, acute pains and slight spasms, a sense of fulness in the head, and loss of power in the extremities, some cloudiness of the sight, giddiness, and sometimes copious diaphoresis. One or more of these symptoms may be present, but it is rarely that they all concur in the same case. In fact, they are more apt to be met with together when the drug has been used in rapidly increasing doses, than when the first dose taken is an excessive one. Dr. Pliny Earle has published the results of an interesting series of experiments made upon himself for the purpose of determining the physiological action of conium.[1] In the practice of a large insane hospital, Dr. E. had never known conium to produce sleep even when the doses were raised to

[1] Am. Journ. of Med. Sci., July, 1845.

sixty and ninety grains three times a day; he therefore rapidly increased the dose which he himself took, from one grain three times a day, until, on the fifteenth day, he took at each dose twenty-five grains. The first of these doses was taken, as usual, before breakfast, and produced such a fulness in the head as might be caused by a ligature around the neck, together with some vertigo. The next day a dose of forty grains induced similar symptoms, and the eyes felt as if swollen. Forty-five grains on the following day caused a repetition of the same sensations, with the addition of weakness and weariness of the knees and a vacillating gait. On the succeeding day a dose of fifty grains was taken. Besides the preceding symptoms, which were renewed, there was a sense of debility in the flexor muscles of the arm, described as "not unpleasant." On the morrow, the whole preceding train of phenomena recurred, and, in addition, there was double vision, and extreme debility of the lower limbs. The pulse was at no time much depressed.

The enormous doses of conium required to produce the effects described in Dr. Earle's experiments render it certain that the preparation used by him was very feeble; and this supposition gains weight when the results obtained by Dr. Fountain are compared with them.[1] Dr. Fountain used an extract prepared from the seeds at a temperature below the boiling point. Of this he took twelve grains, and within an hour set out to ride on horseback. He thus describes the result: "In a few minutes I observed a dimness of vision, with bright points scintillating, or rather quickly moving, in the distance. This caused me to turn from side to side to notice them; and from this cause, I suppose, I found myself reeling in the saddle. There was no vertigo or unpleasant sensation about the head to produce this effect, save a slight feeling of lightness. Very soon a numb pricking sensation was felt in the fingers, extending gradually to the elbows, producing a stiffness of the muscles of the parts, making it difficult to move the forearm and hand. In a few minutes the same sensation was observed in the feet, creeping slowly upward until it reached the upper part of the thigh. The eyes now began to feel uncomfortable, causing me to brush them frequently to clear apparent obstructions from the lids. The pulse was soft and feeble, but not more frequent than usual. In dismounting, about an hour from the commencement of the symptoms, I found so much difficulty in walking as to require assistance to reach the house, the inferior extremities appearing nearly paralyzed. . . . I tried what effects smoking tobacco would produce. . . . Whether

[1] Am. Journ. of Med. Sci., Jan. 1846.

from this cause or from rest and composure, I soon felt very much relieved. Vision became clearer, the limbs less troublesome, and, whilst sitting, little or no apparent effects of the poison remained. On rising, however, the inferior extremities persisted in their unwillingness to move; but much less so than before. The whole day passed away without my being entirely rid of these feelings, and it was not until I enjoyed my usual sleep that perfect vision was restored. I will observe that the intellect appeared unaffected, the bowels and kidneys were not disturbed, neither was any soporific effect produced."

A very similar train of symptoms is related by Whyte[1] of himself. "In a little more than half an hour after swallowing fifteen or twenty grains of the *extractum cicutæ*, I have often been affected with a weakness and dazzling of my eyes, together with a giddiness and debility of my whole body, especially the muscles of my legs and arms; so that, when I attempted to walk, I was apt to stagger like a person who had drunk too much strong liquor."

John Hunter relates that in a case of phagedenic ulcer resulting from bubo he administered extract of hemlock in doses gradually increased to two ounces and a half a day. "It produced indistinct vision and blindness, loss of voice, falling of the lower jaw, a temporary palsy of the extremities, and once or twice loss of sensation," but nearly cured the disease. Some time after having suspended its use the sores reopened in consequence of some irregularities of diet, and the patient of his own accord took ten drachms of conium in one morning. This produced "great restlessness and anxiety; he dropped insensible from his chair, fell into convulsions, and expired in two hours."[2]

In a still higher grade of its influence, conium often gives rise to essentially the same symptoms that have been detailed, and they may even terminate in death. An illustration of this statement is to be found in a case reported by Dr. Bennet.[3] A poor tailor, named Gorr, ate for dinner some vegetables prepared by his children. Half an hour afterwards he left his house, but staggered in walking. On reaching another house he faltered in his gait, and sat down hastily. He conversed sensibly, drove a hard bargain in selling some trifles, did not complain of pain, and was not at all excited. His face was very pale. He rose from his chair with difficulty, and staggered out of the house and through the street, but was soon obliged to sit down. A policeman who came up thought him drunk, but Gorr told him

[1] On the Nature, &c., of Nervous Disorders (Edinburgh, 1765), p. 22.
[2] Hunter's Works (Am. ed.), ii. 234. [3] Edinb. Med. and Surg. Journ., July, 1845.

where he lived, and asked to be taken home, adding that he had lost his sight and the use of his limbs, and indeed he was quite unable to stand. He was conveyed to the police office, and here again correctly gave his address. A physician soon saw him—about two hours and a half after the ingestion of the poison—and found him sensible, but unable to speak, completely paralyzed in all his limbs, and with occasional spasmodic movements of the left leg. His pulse and breathing were natural. About half an hour later the heart was very feeble, the pupils were fixed, and life was soon extinct. On examination of the body, hemlock was found in the stomach; the blood was fluid, and the veins of the head and the lungs were congested.

Another case, presenting almost identical phenomena with the foregoing, is thus recorded.[1] A man forty-three years of age having eaten some conium by mistake, began to stagger, and walked but a short distance. He then fell down, and in a short time his inferior and then his superior extremities became paralyzed. In three hours he ceased to breathe, although his pulse still continued to beat. He was quite sensible and conversed until the last moment.

The case related by Haaf, of a soldier at Torrequemada, in Spain, and quoted in all the books, is much to the same purpose.[2]

In none of the illustrations which have now been presented is any allusion made to delirium or other mental disorder as an effect of poisoning by conium; when, therefore, we read of "constant restlessness and furious delirium" among the symptoms of cases supposed to be those of poisoning by this substance, we may conclude that an erroneous opinion of the cause of the poisoning has been formed.

The action of *conia*, the alkaloid principle of conium, has been illustrated by Christison, Geiger, Orfila, Pöhlmann, Leonides van Praag, and still more completely by Schroff, whose experiments were performed upon three healthy male adults, with doses of conia varying from 0.003 to 0.085 grm. ($\frac{1}{20}$ to $1\frac{1}{3}$ gr.), or two drops of recently prepared conia. The taste was very acrid; there was intense burning in the mouth, with irritation in the fauces, and salivation; in some places the buccal epithelium was abraded, the lingual papillæ projected, and the tongue was benumbed and paralyzed. In three minutes heat of the face and head was felt, with oppression of the latter, giddiness, inability to think or fix the attention on one subject, drowsy hebetude, great impairment of the common sensibility, and a sort of general discomfort which lasted during the following day. The sight was confused, the pupils dilated, and surrounding objects seemed to swim; the hearing was dull,

[1] Gazette des Hôpitaux, Nov. 1847.

[2] Journ. de Méd., Mars 21, 1812.

as if the ears had been stuffed with cotton; the sense of taste was also impaired, and formication affected the entire skin. General debility was marked, the head seemed too heavy, the arms were moved with difficulty, and the gait was staggering at first, and unsteady even on the morrow. The muscles of the legs were also readily affected with spasms, on any exertion of them, and the same phenomenon was observed in the muscles of the thumbs. Eructation, colic, and flatulent distension of the abdomen, nausea, retching, and in one case even vomiting, were experienced, with more or less tendency to diarrhœa. The tips of the fingers and the hands were moist, cold, and bluish, the countenance sunken and pale; large doses at first increased and then diminished the frequency of the pulse, but not in proportion to the dose, and it was uniformly small and feeble.[1]

It will be observed that the cases and experiments which have been related present a remarkable uniformity and simplicity of symptoms, viz., vertigo, impaired or double vision, loss of power and slight spasms in the extremities, especially in the lower, and, in the fatal cases, death by paralysis of the respiratory muscles; the action of the heart being but little affected, and the mind remaining clear to the last. Kölliker thus sums up the results of his experiments with conia, "it produces paralysis of the nerves of motion, but leaves the brain and nerves of sensation unaffected."[2] These symptoms are precisely such as are recorded of the death of Socrates. When Dr. Bennet, on reporting to the Medico-Chirurgical Society of Edinburgh the case which has been quoted from him, drew attention to this identity of the phenomena in the most ancient and the most recent case, and inferred that the Athenian poison must have been derived from the conium maculatum, Dr. Christison observed "that he was inclined to adopt this conclusion; and he felt the more pleasure in stating this, because he had formerly expressed a different opinion."[3] We may now repeat, with Dioscorides, "conium is fatal by its coldness;" that is, by its power of depressing and paralyzing the system.

It is very difficult, if not quite impossible, after this review, to admit conium to have been the poisonous agent in several cases which have long been referred to as illustrations of its effects. Such is the often quoted instance of the vine-dresser and his wife, who, having eaten some hemlock-roots for supper, awoke after the first sleep, and began to run wildly about the house, bruising one another and themselves against the walls;[4] that also of two priests, who, in consequence of

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[1] Reil, Mat. Med. der chem. Pflanzenstoffe, p. 135.

[2] Virchow's Archiv., x. 238. [3] Month. Journ. of Med. Sci., June, 1845.

[4] Matthiole, Comment., liv. vi. chap. xi.

eating hemlock, became raving mad, imagined they were geese, and plunged into the water;[1] such are others by Ray[2] and Watson,[3] in which vertigo, raving madness, epileptic fits, convulsions, and coma preceded death; and such, finally, the case related by Bergius of some children who, after eating the hemlock root, were seized with intoxication, vertigo, great heat and pain in the stomach, convulsions, hemorrhage from the ears, trismus, singultus, violent ejaculation of the urine, and retching, and so died.[4] The symptoms in the last case resemble those of poisoning by *cicuta virosa*, and in the previously quoted cases the phenomena have a strong analogy with such as are produced by *œnanthe crocata*, or hemlock dropwort.[5]

REMEDIAL EMPLOYMENT. *Cancer.*—Conium had long been used as an external application in the treatment of this disease when Stoerck published his account of its remarkable curative powers as an internal remedy. He also at first employed the plant externally as a fomentation for various tumors and ulcers, and from witnessing its good effects was led to prescribe it internally in the form of an extract. In 1760, this author published fifteen cases described as "scirrhus" or "cancer," of which he affirmed that thirteen were cured and the remaining two improved.[6] There must have been great self-deception or else exaggeration on the part of Stoerck, for such results as he reported have never since been obtained; yet we are none the less indebted to him for the introduction of a remedy into the treatment of cancerous affections which is capable of mitigating the pains of the disease, of suspending its progress, and in some instances, it may be, of removing the suspected deposit entirely. For, although we must admit, with Velpeau, that "at certain stages and in certain forms cancer is as readily diagnosticated as tubercular consumption in its third stage," yet the line of distinction between malignant and non-malignant tumors, at certain earlier stages, and in the living body, is not always demonstrable; there is even reason to believe that the former may become converted into the latter by accidental circumstances. It would seem, therefore, to be a dictate of humanity to embody in the treatment of both classes of tumors an agent which exerts an unquestionable control over the less malignant. Thus we may almost certainly mitigate pain and prolong life, and very possibly even exclude a cause of death. As Oesterlen remarks, we are not so rich in other remedies for this class of diseases as to be warranted in forsaking conium. We should remember that the various affections

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[1] WIBMER, Wirkung der Arz., ii. 172. [2] BECK, Med. Jurisprudence, ii. 630. [3] Ibid.
[4] SIGMOND'S Lectures. [5] Compare TAYLOR on Poisons.
[6] Translated by JOHN ANDREE, M. D.

grouped together as cancer are not all equally incurable; that there is not that clear line of distinction between cancerous tumors and such as are the product of simple inflammation which systematic writers describe; and that, in recent times, there are well established cases of the spontaneous cure of cancer. I have myself, remarks this author, seen tumors, which I and others had determined to be cancer of the lip, spontaneously get well under the application of simple spring water.[1] That such results are real, a fair estimate of the whole testimony in the case will show.

Fothergill was the first, in the North of Europe, who began to employ conium for the purposes which Stoerck had pointed out, but the results of his experience were very different. "I cannot," he says, "produce one instance of cancer cured by the *cicuta*, yet I can recollect several in which the pains have been mitigated for a time, the progress checked, and the discharge changed for the better in respect to color, smell and consistence."[2] To these signs of its utility Rutty adds that it lessens the tumors and disposes the ulcerated portions to heal.[3] Farr, Nicolson,[4] and Douglass,[5] report precisely the same conclusions, and later authorities, such as Vogt, Alibert, Grunther,[6] and Mérat, confirm their correctness in a greater or less degree. M. Trousseau states that he has seen a tumor of the breast in an old lady of seventy-one years of age, and which was pronounced cancerous by Cloquet and Bérard, entirely removed during the application of conium poultices; it is true, the author admits that the iodide of lead and the tincture of iodine were also applied, and that arsenic was given internally.[7] Dr. Walshe thinks that it is impossible to read the narratives of numerous cases on record without receiving an impression that the disease may be permanently arrested in its advance. But he has found that patients are with difficulty persuaded to persevere in the use of the medicine, and states that the only benefit he has effected by its administration in the uncombined state has been alleviation of pain and irritability, especially in cases of cancer of the stomach.[8] Devay asserts that he has resolved engorgements of the mamma having all the characters of atrophic scirrhus by means of this medicine. He commenced by giving the powdered seeds in doses of one-sixth of a grain twice a day, and increasing daily by the same proportion of a grain. This author estimates the dose of conia at one-hundredth of that of

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[1] Op. cit., p. 658.
[2] Med. Obs. and Inq., vol. iii., 1767.
[3] Ibid., p. 234.
[4] Ibid., iv. 89 and 358.
[5] Ibid., v. 113.
[6] Sobernheim's Arzneim.
[7] Mat. Méd., 3ème ed.
[8] On the Nature and Treatment of Cancer, p. 195, Lond. 1846.

conium[1]. Reil, in the same disease, gave one-twelfth of a grain of conia every three hours, and found that it decidedly soothed the pain. In a case of induration of the mamma from injury, it appeared to remove the tumor.

Scrofula. Glandular Enlargements. Eruptive and Ulcerative Diseases.—The much more efficient preparations which are now in general use render it unnecessary to dwell at length on the employment of conium in scrofula. Fothergill, Rutty, and Farr,[2] attribute to it anti-scrofulous virtues, but Vogt has pointed out with more precision the conditions under which it is useful.[3] Thus, he affirms that while the medicine may be relied upon in scrofula of the skin and external lymphatic glands, and in the cutaneous eruptions and indurations that affect persons of light complexion, delicate skin, and irritable temperament, it is not advantageous in those forms of the disease in which cachexia and an inflammatory tendency of a low grade are combined, producing emaciation, debility, dyspepsia, &c. Indeed, it is not to be thought of in such cases, except in conjunction with bark and iron. Mere scrofulous suppuration of an acrid or ichorous description, even with some hectic fever, is not in itself a contraindication to its use. A somewhat analogous view is given by Neumann, but he restricts still further the agency of the medicine to scrofula of vascular organs, and praises it especially in strumous ophthalmia.[4] Dr. Baudelocque, Physician to the Children's Hospital in Paris, reports very favorable results in the cure of five out of seven cases of children affected with enlarged and ulcerated glands with fistulous sinuses, abscesses, &c. He prescribed an alcoholic extract of conium in gradually increasing doses until the specific symptoms appeared, which he maintained in a slight degree for a week or more. Once a week each patient was purged. A child with scrofula of the bones derived no advantage from the treatment.[5]

Under the indefinite title of *obstructions* authors have described a variety of affections as being cured by conium. Some of them are evidently scrofulous, others appear to be simple hypertrophy, and others enlargement with interstitial fibrinous deposit, especially of the secernent glands. Tumors of the liver, the mesentery, the uterus, the mamma, and the stomach, are among the affections alluded to. In the cases of jaundice which this medicine is reported to have cured,[6] the result must, in all probability, be attributed to its power of promoting the absorption of the adventitious substance which invaded the

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[1] Bull. de Thérap., xlii. 529. [2] Loc. cit. sup. [3] Ibid.
[4] Heilmittellehre, p. 200. [5] Bull. de Thérap., ix. 126.
[6] Thacher's Dispensatory.

liver and prevented the escape of the bile from its acini and ducts. Gataker, Wenzel, Recamier, and Dufresnoy, are quoted by Eberle[1] as certifying to its efficacy as a deobstruent. Trousseau assures us that by the long-continued use of conium poultices to the belly he cured two cases of ascites, the one dependent upon chronic peritonitis, and the other on several tumors in the abdomen. The cure was accomplished in three months, and in the last-mentioned case the tumors disappeared entirely.[2] The mammary gland has been known to cease secreting and to become atrophied under the influence of conium. D'Outrepont relates cases of the sort,[3] and even asserts that the breasts will never again secrete milk. This opinion, indeed, was held anciently, for plasters of conium were directed by Avicenna against the secretion of milk, and, according to Guersent, the drug given internally has produced a like effect.[4] Richter recommends it for the same purpose.

The most interesting cases of mammary disease cured by conium are those of Dr. S. W. Williams, of Deerfield, Mass.[5] Some of them are indeed reported as cancerous, but admitting it to be doubtful that they were really so, it is still certain that they afford strong evidence of the curative powers of conium. Where the tumor had not ulcerated, it is described as indurated, knotty, and discolored; where it had advanced to ulceration, there was in one instance induration, abscesses, sinuses, fungi, and a discharge of sanious pus. Another case is described as "real open cancer." "There was an open, ragged ulcer nearly the size of the palm of the hand. It was discharging a thin, ichorous, and highly offensive matter, in large quantities, and occasionally blood. It had somewhat the smell of old brass or copper when exposed to heat and moisture. The edges were jagged and callous, and the whole breast was of a scirrhous hardness. It had been open for several months, and there had been an induration in the breast for several years. The constitution was much affected, and the pain in the breast intolerably severe. The stench was so great that the attendants of the patient could not stay with her." In this and the other cases which were perfectly cured, the treatment consisted in the application of a poultice of carrots or of the pond-lily sprinkled with the powdered leaves of conium, and the internal use of the extract of conium, of which the dose was gradually increased until constitutional symptoms were produced. Six cases are reported by Dr. W., of which all got quite well but one, which ended in death.

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[1] Eberle, Therapeutics.
[2] Op. cit.
[3] Am. Journ. of Med. Sci., viii. 491.
[4] Dict. de Méd., en 60 vol., art. Cigue.
[5] Am. Journ. of Med. Sci., ix. 77.

Other examples of the curative power of conium in "corrosive and malignant" ulcers are to be found, and they deserve to be remembered at the present time, especially when a resort is had to surgical operations with perhaps undue alacrity. Two cases are reported by Rutty, in one of which the sore extended from below the eyelid to the angle of the mouth, and in the other from the ear to the lip and the nose, destroying a part of each; the discharge from both was sanious and fetid. Both were cured by conium in doses gradually increased until its characteristic intoxication was produced.[1] Sir Everard Home, in his tract on tumors, observes, that many which were formerly by violent applications rendered true cancers, now never take on the disease. The treatment he employed was the internal and external use of conium, and he states, in proof of its efficacy, that in some cases where the medicine was left off the symptoms became more violent, and, when it was resumed, abated.

Cutaneous Diseases.—Those which are connected with a constitutional scrofulous taint are said to be most amenable to the influence of conium, and instances are not wanting in which it appears to have been curative.[2] An author, quoted by MM. Trousseau and Pidoux, Fantonetti, has published cases which show that baths of the infusion of conium are very efficacious in the treatment both of chronic and acute diseases of the skin. The day before the bath is to be given, this writer directs eight or ten handfuls of conium to be infused in as many pints of water, which, at the proper time, is poured into a bath kept at a temperature of about 90° F. The patient should bathe for an hour or two, and be protected from breathing the vapor by a sheet covering the bath-tub and passed around his neck. The share of the warm water is not to be overlooked in estimating the value of this treatment. In tinea capitis a decoction of hemlock leaves has been used with perfect success.

Diseases of the Nervous System.—A valuable application of conium was introduced a few years ago by the late Dr. Woodward, Superintendent of the Massachusetts Insane Hospital.[3] In some forms of *melancholy*, and especially in chronic disease of the stomach and digestive organs attended with uneasiness, restlessness, watchfulness, and nervous pains, it often affords great relief, and is an auxiliary in accomplishing a cure. A lady, under the care of Dr. W., was in the deepest melancholy, imagining that she had a hole in her stomach,

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[1] Med. Obs. and Inq., iii. 237. See also Douglas, ibid., 113; and Bayle, tom. cit., 622.

[2] Valentin, Med. Repository, vi. 377; Trousseau and Pidoux, &c.

[3] Annual Report of the Mass. State Lunatic Hospital, 1845.

and that all the food she took was impacted in her abdominal cavity. Her menses were suspended, and she had a uterine tumor as large as a quart bowl. After using for some months extract of conium with carbonate of iron, her delusion vanished, her menses returned, and the tumor gradually diminished, and finally disappeared.

Conium has been regarded by some writers as *anaphrodisiac;* such was the opinion of Aretæus and others among the ancients. St. Jerome states that the Egyptian priests controlled their sexual passions by drinking every day a potion of which hemlock was an ingredient.[1] Bergius, on the other hand, relates a case in which this medicine restored one who was impotent, and Stoerck, after citing a like instance, protests against its being thought in any wise to abate the virile powers.[2]

In *neuralgic* and *rheumatic* affections, but especially the former, conium was strongly recommended by Fothergill, who cured with it a singularly violent case of *tic douloureux;* also by Chaussier, Dumeril, Rowland, and Dr. James Jackson, of Boston, who states that his experience coincides with that of Dr. Fothergill.[3] Dr. Neligan affirms that in both of these diseases, and in senile gangrene, he has employed it extensively both in hospital and in private practice, and has met with very few instances, indeed, in which it failed to afford relief. Dr. N. employed in his practice the *succus conii*, a preparation made by adding one-fifth part by measure of alcohol to the clear and supernatant portion of the expressed juice, and which he declares to retain its virtues much longer than an extract prepared by evaporating the fluid part of the same compound. Thirty minims, three times a day, are stated by him as the average dose of this preparation.[4] Reil mentions conia as a very successful application in *toothache*, when the nerve is exposed. Conium has been found by many authors useful in *photophobia*, especially in that distressing form of it which exists in scrofulous ophthalmia; Dzondi, Kopp, and Otto have reported numerous cases of the sort.[5] In *whooping-cough*, conium has been, like all the other reputed narcotics, employed with a certain degree of success, by Butter, Odier, Roe, Spengler, and others; but the evidence of its usefulness is not such as to entitle it to much confidence.[6] In *asthma*, *epilepsy*, *chorea*, *hysteria*, and even *tetanus*, there are reports of the advantages to be derived from conium, but no sufficient proof of their

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[1] Guersent, Dict. de Méd., v. 212. [2] Stoerck, On Hemlock, 2d Essay.
[3] N. E. Journ. of Med. and Surg , 1813, p. 118.
[4] Dublin Journ. of Med. Sci., Nov. 1844, and Nov. 1845. [5] Sobernheim, loc. cit.
[6] Gibb on Hooping-Cough, p. 289.

correctness; the medicine can hardly act as more than a palliative in the mildest of these diseases.

Conia has of late been used internally for the diseases to which conium is applicable; and cases are reported by German practitioners of its successful employment, both internally and externally, in painful and convulsive affections and glandular disorders. The doses varied from one-sixtieth to one-twentieth of a grain; or from one-twentieth to one-fifteenth of a grain was dissolved in six ounces of distilled water, and three tablespoonfuls of the solution given daily.[1] As contraindications for the use of conium, and especially of its active principle, may be stated a tendency to paralysis, organic diseases of the heart, an apoplectic constitution, and great debility resulting from chronic disease.

ANTIDOTES.—In several of the most authoritative works emetics are recommended for poisoning by conium and its preparations, and cases are reported in which tartar emetic was administered according to these general directions, and the patients died.[2] If it is judged proper to evacuate the stomach, a stimulant emetic, such as mustard, is to be preferred to one whose tendency, like that of the poison, is to produce fatal sedation. Warm oil, with a small portion of ipecacuanha, may also be employed. Bloodletting, which is also recommended, probably on account of the supposed congestion of the cerebral vessels, has no experience in its favor. The ancients regarded wine as the proper counter-poison of conium. Mercurialis says: "Sicut cicuta homini, sic cicutæ vinum." Dioscorides advises the same remedy after the evacuation of the stomach by emetics, and of the bowels by clysters, and further directs milk or whey to be administered along with aromatic stimulants. Matthiolus adds to these precepts that the patient should be kept warm, and in motion as much as possible. Indeed all the ancient authorities agree in the opinion that stimulants are the essential remedies for poisoning by hemlock, and the same treatment has been revived by physicians of the Italian school, who direct wine, brandy, and other agents of the class of diffusible stimuli.[3]

ADMINISTRATION AND DOSE.—Conium may be given in substance; the expressed juice, the extract, and the tincture are the preferable forms. The dried leaves are, in general, quite inert, and ought not to be depended upon unless very recently gathered. The dose is from one grain upwards. The inspissated juice, when it can be procured and

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[1] OESTERLEN, loc. cit.

[2] Journ. de Méd., xxiii. 107. In the case here referred to, twelve grains of tartar emetic were administered.

[3] Annales de Thérapeutique, iv. 75.

has been carefully prepared, is one of the best forms of administering conium. When prepared according to the method of Dr. Neligan, thirty drops may be directed three times a day in the beginning. This preparation may with advantage take the place of the simple expressed juice, which is active only during the summer months. Of the extract from one to two grains may be prescribed for the first dose; and of the tincture, which is an ineligible form on account of the quantity of alcohol that must be taken as the doses are augmented, half a fluidrachm. But, whatever form is preferred, the dose of the medicine should be gradually but rapidly increased until unequivocal symptoms of its operation are manifested; then, and not before, should the daily increase of the dose be suspended or diminished. In no other manner is it possible to have assurance that the preparation employed is really active. Conia, on account of its tendency to decomposition, is recommended to be mixed with twice its volume of muriatic acid, and excluded from the light. Its maximum dose is stated to be one grain (*Van Praag*), but the average dose is generally said to be from $\frac{1}{100}$ to $\frac{1}{25}$ of a drop.

The conium plaster is used upon indurated, swollen, or painful parts, but its efficacy, beyond what is due to the gentle excitation it maintains on the spot where it is applied, may well be questioned. It is made by melting together yellow wax ℔j; rosin and sweet oil, of each ℔ss; and to this, when half cold, is added powdered hemlock ℔j.[1] It is not officinal, and should not be confounded with the plaster of hemlock (*Pix Canadensis*).

Hemlock cataplasms, made with the fresh plant bruised, or, in default of this, with the extract or ointment laid upon the surface of emollient poultices, are not to be neglected in those forms of external disease in which this medicine has been recommended for internal use, and especially in malignant and foul ulcers. Conium baths may be directed in cases of rheumatic and cutaneous disease.

COCCULUS.—Cocculus Indicus.

Description.—The fruit or seeds of *Cocculus suberosus*, or, as it is called by others, *Menispermum cocculus*, and *Anamirta cocculus*. This plant is a native of Southern Malabar and Amboyna. It is a large, climbing plant, with a very thick stem, covered with a wrinkled, corky bark; the leaves are cordate, the flowers, which are in lateral

[1] Sobernheim, op. cit.

compound racemes, have an unpleasant smell. The fruit is a one-celled berry, of a dark purplish color, with a soft pulp, and a single seed or nut. When dried, the berry is about the size of a pea, of a dark grayish color, wrinkled and inodorous. The seed is of a semi-lunar form, oleaginous, and very bitter. It was known to the Arabian physicians. The active properties of the plant are derived from an alkaloid principle, *cocculin*, or *picrotoxin* (bitter poison), which is described as white, transparent, crystallizable, inodorous, and of a bitter, and burning taste; it is partially soluble in cold, but more readily in hot water, and wholly in acidulated water, alcohol, and alkaline solutions, but less so in ether. This principle was discovered by Boullay in 1812, and more recently by Couerbe, in the kernel of the fruit.

ACTION. *On Animals.*—Cocculus has been used by the orientals from ancient times for the purpose of catching fish. When half ripe, the bruised berries are formed into little pellets, which are cast upon the water, and are eagerly devoured by the fish. The animals are soon seized with dizziness, and, after whirling round, remain motionless and float upon the surface of the water, where they are readily captured. According to Goupil the flesh of these fish acts as an irritant to the stomach of animals that eat it, and especially that of the barbel, which resists its operation longer than others, and probably, therefore, becomes more thoroughly impregnated with its active properties. It is notorious, however, that fish taken by means of cocculus are eaten without harm, and Neumann says that in the course of his long life he never met with an instance of mischief from its employment.

Boullay found that one grain of picrotoxin was enough to kill a large frog. Orfila gave from twelve to sixteen grains of finely powdered cocculus to dogs, and immediately tied the œsophagus. The animals soon made repeated attempts to vomit. After twenty or thirty minutes their attitude and movements were unsteady; their eyes wild and staring; a trembling of the muscles, slight at first, but gradually increasing, seized them; presently the muscles of the face were thrown into violent convulsive action; they then of a sudden took several steps backwards, and stretched their fore paws stiffly out but barely avoided falling; the head was thrown backwards with a sudden and violent motion, strong enough at times to make the animals fall upon the back, and then roll in every direction. If these phenomena were suspended for a minute or two, they got up and attempted to walk forward, but were attacked anew; the paroxysms grew more frequent and violent, the animals lying on the side and moving their paws backwards and forwards with astonishing rapidity.

The head and tail were more or less bent upon the spine. The animals seemed to have lost all sensibility; they could be moved, struck, or cried at without betraying the least consciousness. There was foam upon the lips, the tongue and gums were livid, the conjunctiva injected, the breathing hurried and labored, and sometimes there was a discharge of urine and fæces. This state was of two or three minutes' duration, and was succeeded by alternate paroxysms and quietness until death took place, which was generally about half an hour after the poison was administered. Nothing peculiar was discovered on examining the bodies of the animals. From the experiments performed by him, M. Orfila concludes: 1. That powdered cocculus is poisonous to dogs. 2. That, like camphor, it acts upon the nervous system, and principally on the brain. 3. That its active principle is picrotoxin. 4. That vomiting is the best antidote to its effects.[1]

Dr. Glover[2] administered to an ass one hundred and twenty grains of picrotoxin, and, an hour afterwards, one hundred grains more. The dose had hardly been administered for a few minutes, when the animal salivated profusely; she then began to strike the ground with her fore feet. The breathing became laborious; she suddenly ran backwards for at least twenty paces, fell on her side, and expired after a terrible fit of tetanus which lasted about five minutes.

A pigeon had ten grains of picrotoxin put under the skin of the axilla. In fourteen minutes, convulsive backward movements of the head and neck were observed. At the sixteenth minute, the animal vomited from its crop; strange motions of its feathers, very difficult to describe, occurred; it seemed as if they were agitated in all directions. The animal fell on its side; in this position, by movements of one wing, it contrived to turn itself round in a circle, as if rotating on a pivot, and this lasted for some minutes. It exhibited, also, spasms of opisthotonos, and picked at the ground with its bill.

A small gold fish was put into a dish of water with five grains of picrotoxin. In half an hour the fish seemed excited; it sprang twice out of the glass; it then gradually lost the power of keeping the belly vertical, and inclined sideways. In about forty-seven minutes it could be taken out of the water without struggling; it gradually lost the power of motion, and in about six hours was dead. In several of Dr. Glover's experiments, the animal temperature was greatly elevated.

The experiments of MM. Bonnefin and Brown-Séquard have led them to several conclusions, of which the most interesting is that,

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[1] Toxicologie, 5ème éd., ii. 648. [2] Month. Journ. of Med. Sci., April, 1851.

"picrotoxin does not appear to excite convulsions directly or by stimulation, but indirectly, or by increasing the reflex power of the cerebro-spinal axis." Thus, for example, if the brain and medulla oblongata be removed from a frog, annihilating its power of voluntary motion, it remains quiet under the influence of picrotoxin so long as it is undisturbed, but, if stimulated, is seized with irregular convulsive movements, and tetanic rigidity. The same phenomena were produced in a guinea pig.[1] Such effects are closely analogous to those of veratria.

The experiments of Tschudi present the following comparative results of the administration of strychnia and picrotoxin; both substances being given in two grain doses:—

Strychnia.	Picrotoxin.
Causes tonic spasms.	Tonic and clonic spasms alternating.
Kills in three minutes.	Kills more slowly, *e. g.*, an hour and a half.
Does not act upon the brain.	Acts in some degree as a narcotic on the brain.
Never causes vomiting.	Excites frequent vomitings.
Does not act upon the secretion of saliva or bile.	Increases both in a very remarkable manner.[2]

The subsequent experiments of Falck on various animals do not differ materially in their results from those given above, and they all tend to prove that cocculus and picrotoxin expend their action chiefly upon those portions of the nervous system which control muscular movements.[3]

On Man.—The action of cocculus Indicus in moderate doses does not appear to be well ascertained. But the chief symptoms are slight giddiness, a feeling of lightness in the head, and a partial loss of power in the lower limbs, which seem to require unwonted exertions to move them. In larger doses it may produce death, for at least two cases of this effect are on record. A sickly, cachectic looking boy, twelve years of age, ate about two scruples of cocculus with cheese. A few minutes afterwards, he complained of a disagreeable taste in the mouth, with burning in the throat and stomach, and vomited several times without relief. Three days afterwards, he presented the following symptoms: Fulness and heaviness of the head, dizziness, anxiety, and restlessness; forehead hot, and covered with slimy sweat; the eyes turned outwards, &c. The remaining symptoms were those of gastritis; and, on the nineteenth day from the ingestion of the poison, the patient died. On inspection of the body, the vessels of the pia

[1] Thèse pour le Doctorat en Médecine. Par F. W. Bonnefin, 1851.

[2] Canstatt's Jahresbericht, 1848, p. 137.

[3] Ibid., 1853, p. 157.

mater were found filled with dark-colored liquid blood. There was serous effusion in the ventricles of the brain, and the right lung was congested. In the abdomen, there were all the marks of peritonitis in an advanced stage.[1]

USES.—Cocculus Indicus is very generally employed, according to oriental example, for destroying lice and other human parasites, and for this purpose is used in decoction or in an ointment. The latter should be prepared from the kernels alone. It is also a very successful remedy in ringworm of the scalp. Dr. Christison recommends it for this purpose, and directs the ointment to be applied twice a day after well washing the skin with soap and water. The same author has found an ointment of picrotoxin made with ten grains of the alkaloid to an ounce of lard of service in bad cases of porrigo. A tincture of the fruit applied to the scalp for the cure of tinea has occasioned death preceded by tetanic spasms.

Dr. Taylor states that "it is employed by unprincipled brewers for adulterating porter, being unblushingly recommended by Childe and by Morris in their books 'on Brewing.'" It is said to prevent the secondary fermentation of malt liquors.

The resemblance between the action of picrotoxin and strychnia led Tschudi to suggest the use of the former in paralysis of the extremities and of the sphincters; and Reil, acting on this suggestion, employed a tincture of the seeds with success in chorea, hemiplegia from cold, and paralysis of the bladder from the same cause.[2]

DULCAMARA, vid. *Narcotics.*

LOBELIA.—INDIAN TOBACCO.

DESCRIPTION.—*Lobelia inflata*, from which this medicine is derived, is an annual or biennial plant, which is common throughout the United States, and grows in neglected fields, along road-sides, and at the edges of woods. It has an erect, angular, and hairy stem, one or two feet high; ovate, serrate, and hairy leaves; and numerous pale-blue flowers in terminal racemes, which are succeeded by ovoid, inflated, and striated capsules, containing in two cells numerous small brown seeds. The whole plant is endowed with active properties, but the leaves and capsules are to be preferred. It has a somewhat irritating odor, and, "when chewed, though at first without much taste, soon produces a

[1] Frank. Mag. für Arzneimittellehre, i. 717.

[2] Mat. Med. der rein. Pflanzenstoffe, p. 229.

burning, acrid impression upon the posterior parts of the tongue and palate, very closely resembling that occasioned by tobacco, and attended in like manner with a flow of saliva and a nauseating effect upon the stomach."[1] It yields its properties to water and alcohol; but heat in a great measure destroys them. It contains an active principle, which was discovered by Dr. S. Colhoun, but first isolated by Prof. Procter, of Philadelphia, in 1834, and by him called *lobelina*. Subsequently, in 1843, Reinsch gave the name of lobelina to a compound body which he regarded as containing the active principle of the plant, and in 1850 Mr. Bastick more perfectly isolated it by employing the process recommended by Liebig for procuring hyoscyamia.

Lobelina is a clear, volatile liquid, of a white or light yellow color, which emits but slightly the characteristic odor of lobelia, except upon the addition of ammonia. It is soluble in water, but more so in alcohol and ether. Its reaction is alkaline, and it unites with acids to form salts which are very soluble.

Action on Animals and on Man.—The effects produced by lobelia and its alkaloid are almost identical with those of tobacco and nicotia, but larger doses are required to produce them. Mr. Procter administered a grain of *lobelina* in solution to a cat. In less than two minutes it occasioned violent emesis and much prostration, from which the animal fully recovered in three hours. Again, one grain of the substance in an ounce of water was introduced into the stomach of a cat by means of a tube. Immediate and total prostration was the consequence, which in half an hour rendered the animal almost motionless; its pupils were much dilated. It gradually recovered its strength, but the effects of the poison were evident for fifteen hours afterwards. No emetic or cathartic operation was produced.[2] Thacher asserts that horses, which are very fond of the plant, have been fatally poisoned by it.

According to Noack,[3] the symptoms of poisoning produced by lobelia in the human subject are, pain in the back of the head, increased secretion of saliva and mucus, dryness, burning, and rawness in the throat, malaise, nausea, vomiting, irritation in the œsophagus and oppression at the præcordium, eructation, flatulent discharges from the bowels, and an increased flow of urine; to which may be added great general relaxation, and, when the doses are excessive, extreme prostration, anxiety, and distress, contracted pupils, insensibility, and occasionally death, preceded by convulsions. A large number of cases

[1] U. S. Dispensatory. [2] Pereira, Am. ed.

[3] Die Neuen Arzneimittel. Stuttgart, 1842.

have been published of death from the maladministration of this drug by ignorant persons assuming to be practitioners of medicine. Some of these have taken place in the United States, but the greater number in Great Britain. In 1853, Dr. Letheby testified "that thirteen cases of poisoning by lobelia had occurred within the last three or four years, and that in six of these the coroner's jury had brought in a verdict of manslaughter."[1] On trial, however, the culprits generally managed to escape, until in 1856 one was convicted and sentenced to three months' imprisonment.[2]

REMEDIAL EMPLOYMENT.—The first mention made of the medicinal properties of lobelia was by Shoepf, who travelled in this country about the middle of the last century, and who merely states that it possesses astringent qualities, and is used in ophthalmia. This statement is clearly erroneous. Van Swieten furnishes a much juster appreciation of its virtues when he speaks of his having learned it to be a certain and safe remedy for the venereal disease, and that a decoction of the root of lobelia, drunk upon an empty stomach, in a large dose, brings on a vomiting, in a less dose purges, and in a smaller still brings on a sweat.[3] For its later introduction to the notice of the profession we are indebted to the Rev. Dr. Cutler, of Massachusetts, who used it successfully in his own case for attacks of *asthma* to which he was subject. He acquired a knowledge of it from Dr. Drury, of Marblehead, who was also subject to asthmatic paroxysms, and whom it permanently cured. Dr. C. had a saturated tincture of the plant prepared, of which he took a tablespoonful in one of the worst paroxysms he had ever experienced, and after it had continued a considerable time. "In three or four minutes," he declares, "my breathing was as free as it ever was. In ten minutes I took another spoonful, which occasioned sickness. After ten minutes I took a third, which produced sensible effects on the stomach, and a very little moderate puking, and a kind of prickly sensation throughout the whole system, even to the extremities of the fingers and toes. Since that time I have enjoyed as good health as perhaps before the first attack." It is in this disease that the virtues of lobelia appear to have been chiefly tested by physicians, although, as is well known, they have been made the subject of extravagant eulogy by a notorious charlatan and his sectaries, held up as a panacea, and employed with blind rashness in almost all complaints.

Dr. Bigelow, in the account which he gives of lobelia,[4] quotes Dr.

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[1] Times and Gaz., May, 1854, p. 491.
[2] TAYLOR, Med. Jur., 2d Am. ed., p. 732.
[3] Comment. on Boerhaave, xvii. 337.
[4] Med. Botany.

Randall as stating that it is as successful in asthma as any article that he has tried, and that he has found it to remove the paroxysm in a short time, and restore the patient to quietude and ease. Although the prejudice against the medicine inspired by the mischief it was inflicting in the hands of rude and ignorant practitioners has limited the sphere of its usefulness, there can be no doubt that it deserves more confidence than it has yet received. In support of this opinion the statements of European practitioners may be interesting to the reader. One of the first to employ lobelia in England was Dr. Elliotson, who states that it is by far the best medicine in spasmodic breathing he was acquainted with, and that even if the cause of the attack be not removable, still it will do good. Even in asthma produced by, or at least complicated with, an aneurism which ultimately bursts into the trachea, he found the greatest advantage from this medicine.[1] "With many," says Dr. E., "it acts as a charm, and in ten or twenty minutes they will be perfectly relieved, so that all the other remedies used in asthma are nothing when compared with it." But this author very properly distinguishes the cases in which it is appropriate, and would restrict its use almost entirely to those in which the nervous element is the predominant one. A very similar opinion is set forth by Mr. Bower,[2] who professes to have had much experience in its use. In all cases, he remarks, where dyspnœa is a leading and urgent symptom, the lobelia is applicable. I say in *all* cases, because I have never observed any unpleasant symptom to supervene upon its administration, though many are the cases, of opposite characters, which give rise to this distressing symptom. Neumann[3] announces lobelia as one of the most valuable medicines in diseases of the lungs. According to him, it relaxes the spasm of the respiratory muscles with incredible rapidity, and even in cases depending upon organic causes—disease of the heart, for example—it often affords speedy relief. Even in organic diseases of the lung itself, when a tormenting dry cough and an insufferable tickling in the throat rob the patient of rest, it is in the highest degree beneficial. Nothing approaches the direct and specific action of lobelia upon the motor nerves of respiration. It is speedier and more certain in its operation than digitalis, and more direct than ipecacuanha. The language of Schlesier[4] is even more laudatory. He thinks it cannot be sufficiently commended in spasmodic asthma; when the patient is panting with sudden and extreme oppression, when he strives to cough

[1] Lancet, Oct. 27, 1832, and Jan. 26, 1833.
[2] Ibid., Nov. 23, 1838.
[3] Heilmittellehre; and Dierbach, ii. 234.
[4] Dierbach, ii. 235.

but cannot, and feels every instant ready to suffocate, lobelia dissipates these terrible symptoms like magic. Like Neumann, Schlesier employed it even when the asthma was connected with disease of the heart, and found not only that it relieved the existing paroxysm, but that it made the intervals between the attacks longer. He also prescribed lobelia in two cases of *chronic bronchitis* with copious purulent expectoration, and found it a reliable palliative. On the whole, Schlesier pronounces it a true anti-asthmatic, a most valuable sedative of tormenting, dry, and irritative spasmodic cough, and a genuine alterative of the vitality of the bronchial mucous membrane. Behrend, of Berlin, employed the ethereal tincture of lobelia in a case of pure nervous asthma, and in one depending upon organic disease, and obtained from it relief in both. Andrews, Morelli, and others, testify to its usefulness not only in asthma, but in whooping-cough, spasmodic croup, &c., and in all the pulmonary affections in which it is desirable to promote the natural secretion of the bronchia.[1] Tott relates the case of a shoemaker who for many years suffered from humid asthma, and for whom assafœtida, belladonna, blisters, &c., had been tried in vain. For two years after taking lobelia he remained perfectly well. Another case, the subject of which was a sailor, presented the same conditions, and was in like manner speedily and permanently relieved.[2] Dr. Eberle states that he has had several very striking examples of the good effects of this article in asthma. "Its operation," he remarks, "is often surprisingly prompt and effectual. I have known the most frightful paroxysm completely allayed in less than fifteen minutes. Even where the disease depended on organic affection of the heart, it has generally speedily mitigated the distressing difficulty of respiration." The same writer has used lobelia in *whooping-cough* with unequivocal advantage. For the latter purpose he recommends that it be united with syrup of squills, or with belladonna. These examples might be still further extended, and might be corroborated by some drawn from the personal experience of the author; but they are perhaps sufficient to show the high degree of utility of lobelia in asthmatic affections, whether dependent wholly, or in part only, upon nervous derangement. There can be little doubt that it fulfils indications in asthmatic attacks which no other medicine is so well able to meet, and that its properties deserve to be carefully tested by physicians, in order that humanity may not suffer by leaving an instrument apparently of such energy and value to the hands of unskilful and ignorant men.

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[1] Dierbach, i. 160.

[2] Bull. de Thérap., xxx. 382.

As an *emetic* lobelia has been recommended by Bidault de Villiers, and others, especially in *croup*. Dr. Bigelow is of opinion that in this application the medicine has no especial claim to confidence, but Eberle employed it in several cases with very great benefit. As these opinions were put forth at a time when spasmodic laryngitis was not well distinguished from the membranous form of the same disease, the dissidence may be readily explained. In the former disease an agent is required merely to relax the laryngeal spasm, and this indication is completely fulfilled by lobelia, but in the plastic and inflammatory affection, a sedative is needed to abate the inflammatory action, but also, and above all, an emetic capable, by provoking violent efforts at vomiting, of expelling the fibrin which obstructs the larynx. In *spasmodic* or *stridulous laryngitis*, therefore, lobelia perfectly fulfils the conditions of cure.

ADMINISTRATION.—Lobelia may be given in *substance*, *infusion*, or *tincture*. Of the powdered leaves, the dose as an emetic is from ten to twenty grains, and as an expectorant, from one to five grains. But a more eligible form is an infusion, which may be made according to the following formula: ℞.—Lobelia ʒj to ʒiss; add enough boiling water to make when strained fʒiij to iv; syrup fʒj. *Dose.*—A tablespoonful every two hours, in catarrhal affections of adults.

The preparations most frequently employed are the tinctures: *Tinctura Lobeliæ* (U. S.) and the *Tinctura Lobeliæ Ætherea* (E.), of which the dose, as an expectorant, is ♏x to fʒj. A *syrup* of lobelia is proposed by Mr. Procter, and would probably be a superior preparation to the rest.

TABACUM.—TOBACCO.

DESCRIPTION.—Tobacco consists of the prepared leaves of *Nicotiana tabacum*, an annual plant of the Nat. Ord. *Solanaceæ*, which is indigenous to America, but is cultivated in all parts of the world. It has a round viscid stem five or six feet in height, and which, like all other portions of the plant, is covered with a short down. The leaves are very large and long, and of a pale green color; the flowers are monopetalous, of a pale greenish color, expanding above into rose-colored segments. The calyx, like the leaves, is somewhat clammy and pubescent.

Tobacco, when simply dried, is destitute of the peculiar narcotic and pungent odor which belongs to the prepared leaves. This quality is developed by moistening the leaves with salt water, and heaping them together until fermentation has taken place. During this process the nitrogenous element of the plant is decomposed and forms ammonia,

which appropriates a portion of the acid in the tobacco, and liberates a certain proportion of nicotia, and this, along with the ammonia, develops the characteristic odor of prepared tobacco. As a consequence, it contains much less nicotia than the leaves in their natural state. Indeed, according to Boutron and Henry, the proportion of this alkaloid in the latter is from two to three times greater.[1]

Nicotia was first obtained in an impure condition, by Vauquelin, Robiquet, and Warden, in 1809, but the pure alkaloid was procured by Reimann and Posselt, in 1827, by distilling the leaves with potassa or soda. It is a thin, colorless, transparent liquid, which gradually grows yellow on exposure to the light and air, but is not entirely decomposed; it has, when warm, a moderately strong odor of tobacco, and a burning and persistently acrid taste. It is soluble in water, ether, alcohol, and the volatile and fixed oils. Heated on a platina plate, it is entirely driven off. It has an alkaline reaction, and with acids, forms salts which are soluble in water and alcohol, but not in ether. It contains no oxygen.

HISTORY.—The specific name of the tobacco plant is derived by Neander, one of the earliest of the numerous writers upon the subject, from "*Tabaco*, a province of New Spain, situated about forty-four leagues from the city of Mexico, and which afterwards was called 'Our Lady of Victory,' in commemoration of a battle there won by Cortez, in 1519."[2] The generic title was conferred in honor of John Nicot, of Nismes, ambassador of France, at the court of Portugal, in the year 1560. At Lisbon he was presented with a specimen of the plant, recently brought from Florida, and caused it to be cultivated in his garden. On returning to France he presented some of its seed to the Queen, who encouraged its culture. From these circumstances it was named *The Ambassador's Plant*, *The Queen's Plant*, &c., and, indeed, it was called by many other titles which have been forgotten, in favor of his whose influence chiefly promoted its cultivation in Europe. It would appear that the luxurious uses to which tobacco is at present chiefly applied, were but little regarded, until the return of Sir Francis Drake from Virginia, in 1586. This officer brought with him some of the pipes used by the aborigines, and so introduced the practice of smoking, which soon became fashionable under the patronage of Sir Walter Raleigh, and the gentlemen of the court. From thence, according to Murray, the practice was carried into the Low Countries by some young men who went thither to pur-

[1] GUIBOURT, Drogues Simples, 4ème éd., ii. 455.

[2] Tabacologia: hoc est Tabaci seu Nicotianæ Descriptio, &c. Lugd. Batav., 1622.

sue their studies, and it soon spread itself throughout Europe. Cigar smoking was, however, already practised in Spain. The custom was introduced by the companions of Columbus, who had learned it from the inhabitants of Cuba, on the first discovery of the island, in 1492. The use of the plant appears to have been common throughout the American continent. It was found, by Cartier in Canada, in 1535, to be held in great esteem by the Indians, and a century later, Hawkins describes it as a favorite luxury of the natives of Florida. Although the use of tobacco rapidly became general, there were not wanting many writers to decry it, and attribute to its use a multitude of mischiefs. The Pilgrim Fathers of New England and their descendants, distinguished themselves by enactments against the use of the weed. In the early days of the colonies, all minors were prohibited from using it, unless sustained by a physician's prescription; and to consume it in public subjected the offender to a fine. In Portsmouth, N. H., it was "ordered that a cage be built, or some other means devised, to punish such as take tobacco on the Lord's day in time of public service."[1] Even the royal pedant, King James, thought it matter of moment enough to employ his pen, and produced a violent diatribe against the offensive object, which proved his majesty a passed master in scurrility. Less exalted personages have emulated his example in our own times, and with like results; in the present, as in the earlier age, fanaticism, by its excesses, kindles an excess of opposition, and aggravates the very evils it professes a desire to cure. Among other absurd stories which circulated in the earlier days of its history, tobacco was accused of producing a sort of sooty deposit within the skullcap or in the brain itself![2]

Tobacco is now cultivated in almost every part of the world, and after having been rigidly interdicted by several governments of Europe, has become one of the most fertile sources of their revenues. In France, for example, where the preparation and sale of tobacco is a government monopoly, the annual revenue was equal, in 1844, to twenty millions of dollars, of which sum three-fourths were clear profit, being nearly equal to the receipts from the tax on drinks, and exceeding that of the impost on sugar. From 1811 down to the period mentioned, the receipts at the treasury from this source alone amounted to more than three hundred millions of dollars, or a contribution voluntarily made to the State, increasing constantly, and averaging more than nine millions per annum. The consumption of tobacco in France, at

[1] An Essay on the Influence of Tobacco on Life and Health. By R. D. Mussey, M. D., Boston, 1836.

[2] Mangetus, Bib. Pharm. Med., ii. 940.

the latest date mentioned, is estimated at one pound for every inhabitant, of which one-third represents the proportion of snuff used, and two-thirds that of smoking tobacco.[1] Except sailors, scarcely any one chews the weed. In France it is still true, as Mérat wrote in 1821, that "the habit of chewing tobacco is confined to a small number of vulgar people who are, for the most part, addicted to intemperance."[2] These facts are of interest when it is attempted to estimate the mischief which the use of tobacco is alleged to produce, and throw into stronger relief the evils which its abuse entails.

In recent times a renewed interest has been given to the inquiry concerning the operation of tobacco on the human system, by the trial of the Count and Countess of Bocarmé, in Belgium, for the murder of the brother of the latter, by means of nicotia. This tragical event, which terminated in the execution of Count Bocarmé, took place in 1850.

ACTION. *On Plants.*—M. Mélier found that plants, such as the rose and orange, lost their foliage in the rooms where the fermentation of tobacco is carried on during the manufacture of snuff.

On Insects.—Nearly all insects shun tobacco; hence its use to preserve clothing, &c., from their ravages.

On Animals.—Herbivorous animals are not readily acted upon by tobacco; yet in excessive doses it appears in some instances to affect them, rendering the circulation irregular. Horses are said to be extremely fond of it, but in an overdose it poisons them. Dr. Mussey states that the infusion of tobacco has been known to destroy the life of a horse when forced into the stomach; and that a calf, washed with this liquid on account of vermin, died. Schubarth, in a series of twenty-two experiments,[3] upon horses chiefly, found that the action of tobacco in these animals was most strikingly indicated by the infrequency of the pulse, which fell from thirty-seven beats to twenty-six after the administration of about four ounces of powdered tobacco, and remained depressed for twenty-four hours. Murray relates that frogs placed in a glass vessel filled with tobacco smoke soon became intoxicated, panted, grew dull, and then soporose, and so died. A sparrow and magpies were killed in like manner. Brodie found that a strong infusion of tobacco produced death in dogs by arresting the action of the heart, while the empyreumatic oil killed the animals without at first, or immediately afterwards, arresting the pulsations of this organ. The symptoms produced by the tobacco were retching, vomiting, faint-

[1] MÉLIER, Rapport a l'Académie de Médecine. Bull. de l'Acad., x. 572, 1845.

[2] Dict. de Méd. en 60 vol., art. Tabac.

[3] Originally published in Horn's Archiv., 1824.

ness, trembling, and, when the oil was employed, spasms and convulsions also, before death.[1] In 1833, Dr. Mussey, now of Cincinnati, performed a number of experiments on animals with the distilled oil of tobacco. He found that rats were far less susceptible than cats to the action of the poison, and, in general, that young animals were more so than the full grown. On examining the bodies of those which were rapidly killed by the poison, the blood was in no instance found to be coagulated.[2] In other respects his results coincide with those already detailed. Dr. Wright, of Birmingham (Eng.), found that from two to five grains of the essential oil of tobacco, given to dogs two or three times a day, induced gradual and complete marasmus; a peculiar dragging action of the hind legs, and loss of venereal power; softening and shrivelling of the testicles, shedding of the hair, and, before death, sloughing of the eyelids and blindness.[3] After death, the blood was invariably found fluid, deficient in fibrin, and particularly so in red globules; the heart was pale, soft, and smaller than natural; the body never stiffened, and decomposed very rapidly. The gums began to swell and bleed early in the experiments, and the teeth loosened and sometimes dropped out. The mucous membrane of the mouth, nose, and trachea was softer, more tumid, and more vascular than usual.

Nicotia acts poisonously on all animals. In fish it causes slow respiration, muscular paralysis, dilatation of the pupil, injection of the gills and also of the brain. Frogs resist its action longer, but gradually their breathing grows slow, and the heart loses its excitability; the fore feet are spasmodically retracted, the hind feet lay wrinkled and folded on the back.[4] Some tobacco juice thrown into the mouth of a black snake, six feet in length, caused it to writhe spasmodically for a few moments, and then became rigid, in which state it remained after death.[5]

The following are results of a carefully conducted series of experiments by M. Mélier: Nicotia was given to dogs or cats, generally by introduction into the subcutaneous cellular tissue, and in doses of from one to eight drops. The breathing was, in most of the cases, affected first, and is noted as difficult and anxious; the pupils were dilated, and the animals staggered in walking; violent efforts at defecation were observed in several cases, and a copious discharge of urine, apparently followed by relief; at a more advanced period there was vomiting and a slavering of frothy or ropy mucus; at variable stages from the com-

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[1] Med. Repos., from the Philos. Magaz., Aug. 1811. [2] Op. sup. cit.

[3] Am. Journ. of Med. Sci., Jan. 1847, from Med. Gazette, Oct. 2, 1846.

[4] Haughton, Dublin Hosp. Gaz., Dec. 1856.

[5] Bost. Med. and Surg. Journ., Oct. 1856, p. 216.

mencement, agitation and trembling, and in several instances, a lively movement of the ears; when death occurred it was immediately preceded by signs of complete exhaustion, and more remotely by convulsions. The exhaustion or paralysis appeared to affect the posterior extremities chiefly.

More recent and very carefully conducted experiments were subsequently instituted, amongst others, by Albers, Kölliker, Bernard, and Van Praag. They agree in their main results, which may be thus epitomized:—

It is not true, as has sometimes been alleged, that nicotia acts as an irritant, and still less that it acts as a caustic, when applied to the skin, or even to the mucous membrane. It uniformly renders the respiration slower, after having, in some instances, increased its frequency. But the larger the dose administered the more speedily does the former effect ensue. The breathing has generally a very characteristic peculiarity, which consists in a hissing sound, and which is probably owing to a spasmodic contraction of the larynx and air-tubes.

The pulse, like the respiration, becomes slower after having been accelerated.

The muscular apparatus of various parts of the body is affected with alternately tonic and clonic spasms, and the eyeball generally protrudes, and is spasmodically drawn upwards and outwards. General relaxation succeeds these phenomena, with a tremulous movement of particular muscles, or of the whole body. In some cases which are more rapidly fatal, no spasmodic movements are observed, but immediate and complete prostration, with the tremulousness before mentioned. And when the poison acts most promptly, the animal sometimes perishes without any convulsive or muscular agitation whatever.

In general, the application of the poison does not elicit signs of pain, and its effect in some instances is to destroy sensibility. The pupils are uniformly dilated under the primary action of the poison, but sometimes are afterwards contracted. Sometimes, but not generally, there is abundant salivation. In experiments which did not destroy life, and in those only, was there vomiting or purging, yet recovery is possible without these symptoms.

These results, which supply the deficiencies in the experiments performed by Mélier, without contradicting them, may be briefly stated as follows: Nicotia primarily lowers the circulation, quickens the respiration, and excites the muscular system, but its ultimate effect is general exhaustion both of animal and organic life.[1]

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[1] Leonides van Praag, Virchow's Archiv., viii. 56.

The dose of nicotia required to destroy life is extremely small. A single drop has killed a rabbit in three minutes and a half.

On Man.—The following phenomena, representing the physiological action of nicotia were observed by Schroff in the experiments performed by his associates Dworzak and Heinrich. They correspond with those described by Reil in his own case. The dose of the alkaloid varied from $\frac{1}{32}$ to $\frac{1}{16}$ gr. diluted with a drachm of water. Even the minutest doses occasioned a burning sensation in the tongue, a hot, acrid irritation in the fauces, and, when larger quantities were taken, the entire length of the œsophagus felt as if it had been scraped with an iron instrument. Salivation was abundant. Even when very small quantities were taken, a sense of heat diffused itself from the stomach to the chest and head, and as far as the finger ends, accompanied by general excitement; even the smaller doses occasioned headache and a sensation, as of an *aura*, in the upper jaw; and the larger implicated the brain still more evidently, causing heaviness, giddiness, torpor, and sleepiness, indistinct vision, which was nevertheless attended with unusual sensibility of the eye to light, imperfect hearing, and a feeling as if the ears were stuffed with cotton, frequent and laborious respiration, oppression, and dryness of the throat. In forty minutes after the larger doses, a sense of unwonted debility and weariness was perceived, the head could scarcely be held erect, the face was pale, the features relaxed, the extremities became as cold as ice, and the coldness gradually advanced towards the trunk, and turns of faintness ensued with commencing insensibility and loss of consciousness. A disagreeable sensation in the stomach diffused itself upwards and downwards, accompanied by eructations, nausea, and even vomiting, which last generally procured some relief; a similar feeling extended through the bowels, the abdomen was distended, an urgent desire to go to stool was felt, and a discharge of wind and of some urine procured general relief. This was, however, of short duration. One of the experimenters was attacked, in the first half of the second hour, with peculiar clonic spasms of the whole body which increased in violence during forty minutes, and lasted for an hour. The spasms began by a tremulous movement of the limbs, and gradually involved the whole muscular system, including, and chiefly affecting, the muscles of respiration. This act was oppressed and short, every respiratory movement being composed of a number of short and incomplete inspirations. The other experimenter, at this period of the operation, was affected with unusual muscular debility, very laborious respiration, and a rigor. In other respects his symptoms were the same. Both persons, on their return home, felt extremely weak,

walked with ill-assured steps, and were very chilly; one of them had a return of the spasms and a frequent desire to pass urine, which was also very copious. The following night both were restless and almost sleepless, and the next day were still unwell, unable to apply the mind, tired, sleepy, and without appetite. The pulse continued weak and irregular, and three days elapsed before the effects were entirely dissipated.[1]

It might be expected that the workmen engaged in the manufacture of tobacco would exhibit on a large scale the action of this substance upon the economy. Happily there exist authentic documents illustrative of the subject, and which may be regarded as conclusively proving that many of the statements which have been made respecting it are either exaggerated or groundless. Ramazzini[2] describes the rude method of preparing snuff, which in his time was used in Tuscany, as occasioning violent headaches, nausea, and continual sneezing, among the workmen *who were not used to the occupation;* and Patissier, in his abridgment of the Italian author's treatise says,[3] "The workmen in tobacco are generally thin, asthmatic, and of a pallid or yellowish complexion, yet some there are who experience no evil consequences from their trade." Parent Duchatelet and Arcet published a very interesting memoir upon this subject,[4] which has been considered as presenting it under too favorable a light, but without sufficient reason. The following statements contain the conclusions of these observers. They allege that in the greater number of manufactures there is no instance of a workman being unable to habituate himself to the emanations of tobacco. The breaking up of the bales is injurious to some of the workmen during the first two or three months of their employment. It is denied that the effects upon the functions of digestion and nutrition, described by Ramazzini and others, are in reality produced, unless in altogether exceptional cases, and that nervous affections are equally uncommon among the workmen. Manufacturing tobacco, it is maintained, in conclusion, neither injures the health nor shortens life. Dr. Ruef, physician to the government tobacco factory at Strasburg, affirms that the health of those among the workmen even who are used to live in the open air does not suffer any injury. Only one process, that of fermentation, affects the less experienced among them, with headache, dizziness, tremulousness, vomiting, sweating, urgent thirst, and loss of appetite; but these symptoms, it is alleged, are transitory and occasion no ulterior mischief. Diseases

[1] Mat. Med. der rein. chem. Pflanzenstoffe, p. 234.

[2] Essai sur les Maladies des Artisans, Trad. de Fourcroy.

[3] Maladies des Artisans, 1822, p. 202. [4] Annales d'Hygiene, &c., Avril, 1829.

among the workmen are rare, and the average duration of their life fully equal to what is observed amongst other persons belonging to the same class of society. As an evidence that the emanations from tobacco are not injurious even to the fœtus, Dr. R. relates the case of a woman belonging to the factory who went to lie-in at the Clinic of Strasburg. During her labor the waters, which were evacuated slowly, were observed to exhale a peculiar, strong, and penetrating odor, like that of fermenting tobacco. The patient, on being questioned, stated the nature of her employment, and thus furnished a probable explanation of the circumstance. The child was alive and vigorous. According to Dr. Ruef, chronic pulmonary affections are infrequent among tobacco workers, and he even affirms that some among them who enter the factory with emaciation, hæmoptysis, and cough, have there got rid of their pulmonic symptoms.[1]

A very interesting report on the sanitary relations of tobacco manufactories was made to the French Academy of Medicine by MM. Mélier and Loiseleur de Longchamps,[2] of which the prominent points are here presented in a summary form. The first impression upon those who become operatives in these establishments is always disagreeable, but especially so for the women; but this effect is transitory. After the acclimation, however, the health of many is, to a certain degree, impaired, and, in the course of two or three years, not a few acquire a dull, grayish tinge of the complexion, somewhat like that of anemia, and remediable by the same means. It is in the fermenting rooms, where tobacco is prepared for making snuff, that its action on the health is chiefly, if not exclusively, shown. Nor is this surprising when it is considered that the workmen are obliged to separate masses of fermenting tobacco at a temperature of 144° F. Fatigue and heat are evidently here very prominent as morbific causes. The workmen believe that their occupation protects them from rheumatism and intermittent fevers, but Dr. Ruef, in a subsequent paper to that quoted above, discredits this notion. As respects the salutary influence of the tobacco manufacture on consumption, five of the ten physicians attached to the national manufactures of France express an affirmative and two a negative opinion. At Bordeaux, according to M. Ruef in his later essay, consumption is unusual amongst the operative, and the disease advances less rapidly in them than in patients placed under different circumstances. In nearly all the other establishments it is far less frequent than among the surrounding population, and, indeed,

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[1] Dierbach, op. cit. from Arch. Med. de Strasburg, 1835.

[2] Bull. de l'Acad. de Méd., x. 569, Avril, 1845.

is in some quite unknown. The tobacco manufactures of Sardinia have been the subject of an interesting report by Dr. Berutti, professor of physiology in the University of Turin. The author comes to the conclusion that there is no disease among the workmen which can be fairly attributed to the peculiar influence of tobacco. He regards the cachexia described by the Parisian observers as independent of this cause, and concludes that inflammatory affections are really less frequent in tobacco factories than in others placed under like hygienic conditions.[1] M. Chevallier, in a statement relative to the tobacco workers in Belgium, presents the following summary of his researches: 1. It very rarely happens that the new hands in the factories do not become accustomed to their work in a few days. 2. The exceptions to this rule are quite inconsiderable. 3. Other things being equal, the tobacco workers enjoy the average duration of life. 4. There is no example of a workman in the factories of Antwerp having perished from the exhalations of tobacco.[2]

The habitual use of tobacco by chewing, smoking, and snuffing is productive of peculiar effects, and, when carried to excess, of certain definite morbid states. *Chewing* tobacco in moderation has not been shown to be mischievous, however repugnant it may be to persons of refinement and delicacy. It is confidently believed by many to promote digestion; and they find that a *small* piece taken after meals protects them from the unpleasant sensations in the stomach which, without this aid, they are apt to suffer. Very possibly the saliva which is discharged more abundantly under this stimulus may account for the alleged salutary effect. But if so large a portion of the weed is taken as to induce frequent and excessive spitting, the very reverse effect must ensue; the stomach is robbed of its natural excitant and chief agent in digestion, the whole body is enfeebled by the waste of its fluids, and the nervous system sinks into debility under the constantly renewed alternation of stimulus and depression. And if the saliva is swallowed instead of being rejected, whatever is gained in cleanliness is lost in health, for the stomach and the entire system cannot long resist the impression of such doses of a virulent poison. In general, the excessive use of tobacco becomes mischievous both by the waste it causes of a precious animal fluid and by its direct influence upon the nervous and digestive apparatus. In both respects, chewing tobacco is infinitely the most hurtful mode of using it. The records of medicine, and especially those of America, abound in illustrations

[1] Bibliotheque du Médecin Practicien, xiv. 479.

[2] Bulletin de l'Académie de Méd., x. 787.

of the subject, for in this country alone is the habit in question at all prevalent, except amongst sailors and others employed in the coarsest toil.

It would extend this notice unduly were the observations of all the respectable authorities to be cited at length who have contributed to show the deleterious effects of the abuse of tobacco. Allusion will only be made to some of the most modern and complete.

In the publication referred to above, Dr. Mussey presents a summary of the symptoms which he had himself observed, and illustrates it by the detail of several cases. A still more recent and complete description is contained in the narrative of nine cases published by Dr. Shipman.[1] The morbid symptoms were manifested chiefly by the nervous and digestive organs. The operations of the mind were neither so vigorous nor so clear as in the natural state; low spirits, irresolution, hypochondria, and gloomy anticipations beset the patients at all times, but were least tolerable during the process of digestion; nightmare, with an unusual exaggeration of its horrors, deprived them of repose at night, and by day, a fear of sudden death assailed them. The first slumber, instead of being the soundest and calmest of the night, was often postponed for several hours, and even was then unrefreshing. A singular sensation experienced by most of the patients immediately after going to bed, is described as a "shock" at the epigastrium, such as a rush of blood to the part might be supposed to produce, or as one person described it, like a discharge of electricity. This symptom is regarded by Dr. S. as pathognomonic. When the stomach was empty the patient experienced an intolerable sense of sinking at the epigastrium. Along with these symptoms palpitation of the heart, vertigo, and rushing of blood to the head, were commonly observed. Nearly all of the patients were emaciated and pale, and victims to the well-known symptoms of dyspepsia, acidity, cardialgia, gastrodynia, acid or watery eructations, and constipation. It is very remarkable that this frightful array of symptoms should gradually yield, and in a short time be entirely dispelled after the habit of using tobacco was abandoned. Several of the wan and wasted patients acquired a ruddy complexion, and became quite stout. Dr. Chapman relates several striking instances of the pitiable results of the abuse of tobacco, some of which, indeed, exhibited a form of delirium like that produced by alcohol, although no spirituous drinks had been used.[2] One reason in addition to those mentioned, why the habit of chewing should be so much more mischievous than that of smoking tobacco is, that a

[1] Boston Med. and Surg. Journ., 1844.

[2] Lectures on the Diseases of the Thoracic and Abdominal Viscera, p. 214.

very large proportion of the cigars in use are either made in the Havana, or out of the same varieties of tobacco which grow there. Now it results from several analyses that nicotia, the poisonous principle of the plant, exists in the Havana tobacco in the proportion of less than two per cent., while the Virginia, Maryland, and several European varieties, contain from three to eight per cent. of this virulent poison. (*Orfila.*)

The influence of *smoking* upon the system has been partially made the subject of accurate investigation by Dr. W. A. Hammond, who obtained the following general results:[1] It does not affect the secretion of carbonic acid through the lungs; it lessens the amount of aqueous vapor given off in respiration; diminishes the amount of the fæces; lessens the quantity of urine, and the amount of its urea and chlorine; and increases the amount of free acid, uric acid, and phosphoric and sulphuric acids, eliminated through the kidneys. Hence, it would seem to be probable that tobacco does not lessen the consumption of fat, but that it does retard the metamorphosis of the nitrogenous tissues. The increase of phosphorus and sulphur in the urine, is probably derived from the nervous system which tobacco so sensibly affects. Some of the morbid effects of smoking tobacco, when carried to excess, have been well depicted by Dr. Laycock.[2] He describes an inflammatory, but what is probably rather a congested, state of the mouth and fauces, in which sometimes the buccal epithelium exfoliates. If the throat be examined, it will be observed to be slightly swollen, with congested veins meandering over the surface, and here and there a streak of mucus. This author thinks, also, that the posterior nares are probably in the same condition, and that the irritation is transmitted to the eye; undoubtedly this organ is frequently injected, and watery in smokers, and often presents a spasmodic twitching of the orbicularis muscle. Mr. Lizars enumerates ulceration of the lips, tongue, gums, mucous membrane of the mouth, tonsils, velum, and pharynx, among the effects of this habit, and states that he attended a captain of the Indian navy, who fell a victim (from smoking cheroöts) to ulceration of the mucous membrane of the left cheek, which extended backwards to the tonsils, velum, and pharynx, and which exhibited all the characters of carcinoma.[3] Dyspepsia is occasionally met with as a consequence of excessive smoking, yet rarely in the aggravated form so common among chewers of the weed. Loss of appetite, constipation, hæmorrhoids, acne, and gum-

[1] Am. Journ. of Med. Sci., Oct. 1856, p. 315.
[2] Lond. Med. Gazette, Oct. 1846.
[3] Times and Gaz., Aug. 1854, p. 146.

boils are ascribed to the same cause; it is more apt even than "chewing" to render the voice coarse, deep-toned, or smothered, and to prevent clear articulation by causing an excessive secretion of mucus in the fauces. Smoking tobacco also weakens the nervous system, inducing palpitation of the heart, tremulousness of the limbs, neuralgia, and morbid susceptibility, with diminished tone and power. When too much indulged in, or when the nervous system is rendered impressionable by ill health, by losses of blood, or of any other fluid, or by over-excitement, smoking aggravates the already existing symptoms, and may induce that state of hypochondriasis which has already been described. Mr. Lizars alleges that it destroys the virile powers and sexual desire. The common practice of smoking immediately before going to bed is certainly soothing to those who have toiled all day, and it perhaps affords them the only hours of really calm enjoyment in life. But to one excited by annoyances, weakened by ill-health, or rendered susceptible by a too close application to study, the evening cigar is a certain foe to sleep, the restorative which he stands most in need of, he remains helplessly awake, or, after passing a restless and dreamy night, he rises enfeebled and unrefreshed. It is often objected to the practice of smoking that it begets a fondness for strong drinks. Water seems mawkish to the palate of the smoker, and he moreover feels instinctively that whatever is unpleasant in the effects of tobacco is neutralized by alcoholic beverages, while the stimulation of these liquids is moderated by the sedative action of tobacco. The two articles mutually counteract each other. It does not appear, moreover, that either of them, used to excess, leads to a corresponding intemperance in the use of the other.[1]

Snuffing is a form of using tobacco which, however it may offend delicacy, is not chargeable with the same mischiefs as those which have been considered. It blunts the senses of smell and taste, and alters the voice, and, further, by passing into the stomach, the particles of snuff may give rise to dyspepsia, yet seldom in a very aggravated

[1] Willis in his *Practice of Physic*, alludes to this double operation of tobacco. He says: "It doth not only procure sleep alone, but sometimes also the contrary of it, which is watchfulness."—*On the Operation of Medicines*, 1684, p. 140.

In the *Bibliotheca Pharm. Med.* of Mangetus, the following rational conclusion is stated. After rehearsing some of the alleged mischiefs of smoking, the author concludes "non inde tamen sequitur fumum nocivum esse, cum multos novimus qui hodie et copiose per plures annos eo usi sunt, sanos tamen et validos vitam ad extremam senectutem produxisse, nec ullum inde incommodum sed potius maxime juvamen percepisse: aliis enim ventriculum refocillat, et concoctionem promovet, aliis alvum leniter solvit; alii nullum inde commodum at neque damnum sentiunt quibus usus ejus adiaphorus est."

form. Dr. Prout, however, goes so far as to assert that he has seen this affection terminate in malignant disease. Snuff is sometimes adulterated with acetate of lead for the purpose of giving it more piquancy. Four examples are reported by M. Meyer, of Berlin, in three of which the specific form of colic, and in all the paralysis of the extensor muscles, were present.[1] A more recent case of colic and general lead poisoning from this cause is also related by E. Mayer, of Halle.[2] Snuffing is a habit more inveterate, perhaps, than either of the remaining modes of using tobacco. A singular illustration of its empire is furnished by Merat.[3] I was walking, he relates, in the forest of Fontainebleau, when I found a man stretched upon the ground. I supposed that he was dead, but on approaching him he asked me in a plaintive tone if I had any snuff, and on my replying in the negative, he fell into his original state. It did not cease until I brought to the spot a wood-cutter, who gave him several pinches of snuff in succession. He then related that he had set out in the morning supposing his snuff-box to be in his pocket, and that after he missed it he had walked on as long as possible, but at last his longing for it became so intense that he was unable to move a step further.

In estimating the influence of tobacco upon the health, the power of habit is not to be neglected. It is this, doubtless, which explains in part the striking difference between the effects it produces upon the novice and upon the expert in its use. But it should also be borne in mind that the former out of awkwardness is apt to allow the juice of the tobacco to enter his stomach, or the smoke to penetrate his lungs, while the adept seldom does either, but expectorates the one, and by an automatic action of the muscles of the fauces excludes the other from the trachea. To really inspire the smoke of a pipe or cigar may be learned and practised with impunity, but there are few even among veteran smokers who can accomplish the feat without serious inconvenience.

The *poisonous* action of tobacco might be illustrated by a great number of cases, but the following summary of its symptoms will render the subject clearer. An overdose gives rise to malaise, nausea, vomiting, a burning heat in the throat and stomach, colic, diarrhœa, urination; extreme giddiness, great anxiety, with a disposition to faintness, pallor, coldness of the extremities, spasmodic trembling; the pulse is small, weak, tremulous, and intermittent; the breathing labored and stertorous; there is a paralytic relaxation of the voluntary muscles,

[1] Virchow's Archiv., xi. 209.

[2] Journ. f. Pharmakodyn., ii. 221.

[3] Dict. de Méd., tom. liv.

and clonic spasms of the limbs. The pupils are but slightly affected, and the eyes seem to be sensible to light. This state is succeeded by a general torpor, or utter prostration, which is not coma, but which may terminate in death. It was, perhaps, the fact that these symptoms are so directly the opposite of those produced by nux vomica which led to the suggestion of tobacco as a remedy for poisoning by this agent and its preparations. In the West Indies it is said to be employed to prevent and cure the tetanus which is so fatal among the negro infants.[1] Upon certain persons, and under certain circumstances, the mere emanations of tobacco produce alarming symptoms. A Mr. Howison went to sea in a schooner laden with tobacco, and in the evening was shown to his sleeping place in the cabin. He felt its atmosphere close and suffocating, but went to bed. About midnight he awoke in a cold sweat, and unable to speak or move, but his mind remained clear. In this state of conscious trance he is stated to have continued until the following afternoon, when a storm took place and roused him so that he was able to reach the deck, where the cold dash upon his head restored him to himself.[2] Ramazzini saw a girl present symptoms of poisoning, and discharge blood from the bowels in consequence of her having remained too long among packages of tobacco; and another one is stated by Fourcroy to have died in convulsions from a similar cause.[3]

The *external* use of tobacco and its preparations has also occasioned alarming accidents. Dr. Mussey assures us, on the authority of a medical friend, that the latter "was once thrown into a state of great prostration and nausea from having a part of his hand moistened, for a few minutes, in a strong infusion of tobacco." The same author relates that, during the last war with England, "the soldiers under hard service on the Canada frontier, not unfrequently disabled themselves for duty by applying a moistened leaf of tobacco to the armpit. It caused great prostration and vomiting."[4] Alston mentions a similar case, and adds that he knew a small bit of tobacco put into the nose only, cause sickness, vomiting, and purging pretty severely.[5] An interesting case of poisoning by the application to a ringworm of the "strong juice" of a tobacco pipe, is related by Dr. Mussey. The instant the oil was applied the eyes of the little patient were rolled up in their sockets, and she reeled and fell backwards. The usual symptoms followed, yet the child survived, but continued feeble and sickly, and during four or five years was subject to pro-

[1] Sobernheim, op. cit. [2] Sigmond's Lectures, Lancet, May 13, 1837.
[3] Mérat and De Lens, op. cit. [4] Op. sup. cit. [5] Materia Medica, ii. 190.

longed fainting fits. Dr. Westrumb met with a case almost precisely similar, except that the patient was a man, and the symptoms, which were also less violent, were dissipated in a few hours by a strong infusion of coffee.[1] Calosi reports that a young man affected with *herpes tonsurans* applied some empyreumatic oil of tobacco to the eruption, at the suggestion of a quack, and in the course of two hours was seized with a chill, cold sweat, and faintness, followed by diarrhœa, vomiting, and delirium. Under the use of diffusible stimulants he recovered.[2] Other preparations of tobacco employed to cure eruptions of the scalp, or to remove vermin, have sometimes occasioned grave and even fatal results. Such an instance is that of three children whose heads had been rubbed with an ointment of the sort; they were presently attacked with vertigo, excessive vomiting, sweating, and fainting, and for twenty-four hours staggered like drunken persons. They were restored by rest, and the use of lemon syrup.[3] A similar case is related by Dr. Truchsess in which snuff was strewn upon the scalp of a girl affected with tinea favosa; in about eight or ten hours the characteristic symptoms of tobacco poisoning made their appearance, and brought the little patient within a hair's breadth of death.[4] Several authors narrate examples of an analogous description of poisoning, namely, by tobacco lotions employed to cure the itch. One of the mildest of these deserves notice on account of the diuresis which characterized it. The patient had his body and extremities bathed every night and morning with a decoction of half an ounce of tobacco in a pint of water. The second day nausea and diuresis occurred, and the amount of urine discharged greatly exceeded that of the patient's drinks. There was a constant taste of tobacco in the mouth, and occasional vomiting.[5] A patient of Dr. Wright, of Birmingham, was induced by an acquaintance "to sit over a chamber-pot containing half an ounce of tobacco with some burning coals thrown upon it to ease himself of piles." After sitting a few minutes he fell in a state of utter prostration, pale, and perspiring abundantly, and without any sign of life except a deep sigh every fifteen or twenty seconds. On his recovery he stated that he was perfectly sensible, during the greater part of the time, to all that was passing around.[6]

The *internal* use of tobacco in excessive doses gives rise to still more

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[1] Dierbach, op. cit., ii. 889. [2] Abeille Méd., xv. 311.

[3] Murray, Apparat. Med., i. 686.

[4] Dierbach, loc. cit. See also for another case Sigmond's Lectures.

[5] Barbier, Mat. Méd. iii. 463. For other cases see Murray, loc. cit., and Duncan's Med. Comm., xi. 327.

[6] Lond. Med. Gaz., Oct. 1846, and Am. Journ. of Med. Sci., Jan. 1847.

marked symptoms of poisoning than occurred in the above recited examples. A fatal case is reported by Mr. Skae,[1] of a man who swallowed a large mouthful of crude tobacco. He became suddenly insensible, motionless, and relaxed, with contracted pupils, and a scarcely perceptible pulse. There succeeded to these symptoms convulsions, loud cries, and dilated pupils; active vomiting and purging took place, but death by syncope, or exhaustion, ultimately occurred. On dissection, the body was found to be rigid, the stomach ecchymosed, in the intestine a bloody liquid, and dark fluid blood was in the heart, veins, and aorta. Several other cases produced by a similar cause, and which terminated in recovery, differ from the above chiefly in the absence of convulsive movements.[2] Even smoking has been known to produce dangerous and even fatal illness. A man in a single afternoon smoked twenty pipes for a wager, and fell into a lethargic condition; and two brothers, one of whom smoked seventeen and the other eighteen pipes, died in a condition resembling apoplexy.[3] A remarkable case, which fell under the notice of Dr. Marshall Hall, was that of a young man, a novice in the practice, who had smoked one and part of a second pipe, but without the usual precaution of spitting out the saliva. He became affected by alarming syncope, retching, and vomiting, soon after which he returned home, went to bed, and was seized with stupor and laborious breathing. Then followed pain in the head, congestion of the face; the right pupil was exceedingly contracted, and the left much larger than usual, and both were insensible to light. The whole muscular system was affected with spasmodic contraction. The breathing was stertorous, the pulse natural.[4] It is difficult to account for the symptoms observed in this case, without supposing that those which occurred after the patient reached his bed were attributable to an attack of congestion of the brain accidentally developed by the sickness which the tobacco originated. They certainly bear very little resemblance to the poisonous effects of this drug, which, as may be inferred from what has been already stated, are singularly uniform and characteristic. Yet there is another case on record which presented symptoms closely resembling those just described, and it is the more remarkable because the same poisonous cause acted at the same time and equally upon two persons of whom the one was affected after the wonted manner, but the other presented the following symptoms. She fell insensible from her seat, was seized with convulsions, her cheeks were

[1] Edinb. Med. Journ., i. 643.

[2] N. Jersey Med. and Surg. Reporter, x. 187. Journ. f. Pharm., &c., i. 568.

[3] Murray, loc. cit. [4] Practical Observations and Suggestions, 1845, p. 171.

deeply suffused but cool, the carotids throbbed, and the jugular veins were distended; the eyes were wide open, but the white only was visible; the pupils dilated and insensible to light; the conjunctiva injected; the head drawn spasmodically backwards; the respiration slow; the pulse slow, hard, and full; the toes and fingers cold; from time to time there were clonic spasms of the extremities, with a tendency to opisthotonos; and insensibility was complete.[1] The patient is here described as being of a *sanguine* temperament; her symptoms were closely analogous to those in the previous case, and, like them, are quite exceptional in the history of poisoning by tobacco.

The greater number of *fatal accidents* from tobacco are to be found among the cases in which it has been used as an enema in strangulated hernia and other obstructions and affections of the bowels. An instance is related in which a strong enema was administered for tapeworm, and immediately after receiving it the patient died; in another the same result took place in fifteen minutes; in a third in three-quarters of an hour, &c. In these, and in many equally disastrous examples which it is unnecessary to relate, the quantity of tobacco used in preparing the clyster was generally large, from half an ounce to two ounces, but much less has sometimes proved fatal. A case was submitted to judicial investigation in which two drachms destroyed life;[2] Dr. Copland witnessed a fatal result where *thirty grains* infused in a pint of water were administered to a patient in an advanced stage of ileus;[3] and Dr. Tavignot a like event in the case of a robust man, fifty-five years of age, for whom an enema containing *fifteen grains* of tobacco was prescribed for the purpose of destroying ascarides.[4] Dr. Eberle says:[5] "I have known an empiric destroy, in less than twenty minutes, the life of a charming little boy by an immoderate injection of the infusion of tobacco."

Nicotia is one of the most potent of poisons. Its physiological action, as has been shown already, presents no essential points of difference from that of tobacco itself, or of its essential oil; but when administered in sufficient quantity to destroy life, its fatal effects are produced in less time than those of any other poison, except prussic acid. In the famous case of Count Bocarmé, his victim appears not to have survived more than five minutes the administration of the poison; and Orfila affirms that perfectly anhydrous nicotia in sufficient quantity may destroy the life of man in two or three minutes.[6] Mr. Taylor, in

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[1] Dierbach, op. cit. See also a case in Barbier, iii. 462.

[2] Ibid., ii. 888.

[3] Dict. of Pract. Med., Am. ed., i. 443.

[4] Gazette Méd. and Rev. Méd., Nov. 1840.

[5] Therapeutics, p. 389.

[6] Toxicologie, 5ème éd., ii. 513.

commenting on a case of suicide by this substance, concludes that the person "became insensible and powerless within a few seconds, and that he died in from three to five minutes."[1] In this case death took place quietly and without convulsions.

Remedial Employment.—The distressing symptoms which, even in moderate doses, it occasions, the risk of fatal consequences, and the uncertainty in regard to the degree of its influence upon individuals, have tended to restrict the medicinal employment of tobacco within comparatively narrow limits. Yet, as the virtues of the drug cannot be denied, and as it is not more dangerous to life than several of those which are commonly prescribed, it ought not to be excluded from use on account merely of its repulsiveness. Its virtues are both peculiar and unequivocal.

External Use.—Preparations of tobacco have for a long time been used for cutaneous eruptions and parasites. In Hungary, a strong decoction of the plant is a popular remedy for the itch among sheep, and for the scab to which these animals are subject. An infusion, decoction, or ointment of tobacco has been successfully employed by numerous physicians as a remedy for the *itch*. Dodoens, Boerhaave, Coste, Fournier, Beçu, and others, have recommended it strongly, and Dubois, from whom this statement is borrowed, affirms that he has found it very efficacious in the form of a decoction in which sal ammoniac and sea salt had been dissolved, and which he applied three times a day.[2] Unless the eruption were very limited, this method is scarcely to be recommended while so many more efficient ones exist. That it is dangerous is attested by numerous cases, of which several have been already cited. *Prurigo*, *pityriasis*, and some other cutaneous eruptions, have also been treated by tobacco. Bruised leaves of the fresh plant have been recommended as an application in urticaria, and in several painful disorders. They also speedily relieve the stinging of nettles. In *gout* this is an old remedy, but physicians of our own time have found it useful. Dr. Vetch, of London, highly recommended it as a palliative of the pain in this disease and in *articular rheumatism*,[3] and other authorities have given it a like commendation. The fumes of burning tobacco have been employed for the same diseases, and commended by Réveillé Parise,[4] and by Hinard,[5] in gout. The affected part is directed to be held over a pan of burning coals upon which portions of tobacco are thrown from time to time, while the inflamed joint is gently rubbed with flannel. The

[1] Guy's Hosp. Rep., 3d ser., iv. 352.
[2] Mat. Méd. Indigène, p. 225.
[3] Sigmond, op. cit.
[4] Bull. de Thérap., ii. 79.
[5] Ibid., xxiv. 287.

operation should continue for eight or ten minutes, and be repeated two or three times a day. The palliation of the pain is asserted to be immediate and very considerable. Tobacco applied to the epigastrium has been employed to excite vomiting in *poisoning with opium*, when the stomach had become insensible to the action of emetics given by the mouth. *Nasal polypus* has been gradually but thoroughly cured by the use of strong snuff. A remarkable example of the sort is reported by Dr. Townsend, of New York.[1] The same agent has been employed to palliate chronic inflammations and discharges from the nasal passages, as well as to destroy the worms which, in tropical climates, sometimes breed in the antrum highmorianum and adjacent cavities, causing intense suffering and destruction of the bones.[2] In some experiments upon these animals with various liquids, Dr. Kilgour found that a decoction of tobacco was instantly fatal to them. Catarrh of the Eustachian tube and of the tympanum may sometimes be improved by the patient's forcing tobacco smoke through the former passage while the mouth and nose are securely closed.[3] Chronic inflammations of the eyes are occasionally benefited by the habit of snuffing, which promotes the flow of tears and nasal mucus.

Internal Use.—Diseases of the Nervous System. It is in this class of diseases that tobacco has gained its greatest reputation as a remedy. In purely nervous or spasmodic *cough*, which comes on with a sense of heat or tickling in the windpipe, the paroxysms can generally be warded off by inhaling two or three draughts of tobacco smoke. According to Pittschaft, Fischer, Wolfsheim, and others, whooping-cough is efficiently treated by this agent, which is alleged to shorten the paroxysms and render them less violent.[4] But these effects, at least, can be obtained from belladonna and other medicines, without the concomitant inconveniences of tobacco. In *spasmodic croup*, smoking a cigar has been found adequate to arrest the paroxysm by producing nausea.[5] Vanderburgh and Godman have found the same disease to yield to a plaster made by strewing Scotch snuff on a piece of greased linen, and applying it to the throat and sternum.[6] This application is said to cause neither vomiting, vertigo, nor any other distressing symptom; nevertheless it is hardly to be recommended either when the patient is very young or of feeble constitution. Dr. Wood[7] informs us that one of the worst cases of *spasm of the rima glottidis* which he

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[1] Med. Recorder, iv. 147.

[2] Duncan's Med. Comm., viii. 75. Compare also Simonis Paulli, Comm. de Abusu Tabaci. Argentorati, 1665, p. 3.

[3] Trousseau and Pidoux, op. cit.

[4] Dierbach, loc. cit.

[5] Dr. Chapman, Am. Journ. of Med. Sci., i. 477.

[6] Ibid., ii. 480.

[7] U. S. Dispensatory.

had seen, and which resisted powerful depletion by the lancet, yielded to the application of a tobacco cataplasm to the throat. In a case of chronic *singultus*, in which all the usual remedies had failed, the patient was directed to swallow tobacco smoke, which soon arrested the symptom. The spasmodic muscular contraction which retains a *dislocated jaw* in its new position has been overcome by causing the patient to inspire tobacco fumes until nausea was produced. Tobacco has been included in the long list of cures for *epilepsy*. Dr. Pitschaft regards it as a precious remedy in epilepsy, catalepsy, hysteria, and idiopathic tetanus; but his opinion is derived from theoretical considerations, and is not supported by experience. It is possible, however, that when epilepsy is produced by onanism it may sometimes be cured by tobacco, for, as previously stated, and as Dr. Fischer, of Dresden, has remarked, the use of tobacco allays the sexual lust.[1]

Tetanus. Tobacco should rank next to opium in the treatment of this affection, for its success is hardly less equivocal, although its mode of action renders it perhaps less eligible. Tobacco appears to have been used in the last century, and indeed in the early part of the seventeenth century, for idiopathic tetanus, but the first authentic mention, it is believed, of its successful employment in the traumatic affection was made by Mr. Duncan in 1815,[2] who, while in Grenada, cured this disease in a negro whose foot had been lacerated by an iron cylinder. He employed tobacco smoke. In 1822, Dr. Anderson, of Trinidad, cured five cases of traumatic tetanus by the use of tobacco in fomentations, cataplasms, and injections.[3] In 1825, Dr. B. Smart, of Maine, reported a very interesting case of tetanic spasm produced by an accumulation of *clay* in the intestines, and which was at first relieved and ultimately cured by tobacco enemata.[4] Dr. O'Beirne[5] cured a case of this affection, after six weeks' treatment, chiefly by the use of tobacco; in 1826 a case was published by Dr. Briggs,[6] which was reported to him as somewhat rudely, but successfully, treated by the same agent; and in the same year Dr. Jackson (of Northumberland, Pa.) published an equally fortunate result in a case of traumatic tetanus, obtained by the application of tobacco to the wound and to the epigastrium of the patient.[7] Mr. Bullock reports the cure, by means of tobacco enemata, of a very severe case of the disease, occasioned by a blow upon the side, which made no external wound.[8] More recently an instance of traumatic tetanus cured by tobacco enemata

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[1] Dierbach, loc. cit.
[2] Edinb. Med. and Surg. Journ., xi. 198.
[3] Trans. Med. Soc. Edinb., i. 184; ii. 365.
[4] Am. Journ. of Med. Sci., vi. 337.
[5] Dublin Hospital Reports, iii. 343.
[6] Ibid., xxv. 303.
[7] Med. Recorder, x. 315.
[8] Lond. Med. Gazette, July, 1841.

has been reported by Mr. Pridie,[1] and another under the care of Mr. Simon, in which nicotia was used. The dose of this remedy employed was at first one-twelfth of a minim, which was gradually increased to one-sixth of a minim.[2] The share of the medicine in the cure is not very evident. Several of the above cases are included in the nineteen which the table published by Mr. Curling contains.[3] Of the sensations caused by tobacco this author remarks that they are so peculiarly distressing that, after its full effects have been produced, patients will hardly submit to a repetition of them. Of the nineteen cases collected by Mr. Curling, nine recovered, and the remainder were for the most part too feebly impressed by the remedy, or were brought under its influence at too late a period of the disease. He recommends that the dose at first should be just sufficient to act upon the system, and that afterwards it should be increased in order to maintain the impression; and he assures us that he has not succeeded in finding a single case in which, when fully and fairly tried before the powers of the constitution had given way, it has been known to fail. Without maintaining that the remedy will always avail, Dr. C. holds it, with good reason, to be the best that we at present possess. He is of opinion that not more than a scruple of tobacco leaf, infused in eight ounces of water, will be enough for an injection, which must afterwards be increased in strength in proportion to its effects. In the very year when Mr. Curling's essay was published, a memoir "On the Employment of Tobacco in the Treatment of Tetanus" was transmitted to the Royal Academy of Medicine by M. Cavenne, of Martinique.[4] The writer appears to have been quite ignorant of what had already been written upon the subject, and to have thought of tobacco as a substitute for opium at a time when none of the latter was at hand. A portion of his cases were of idiopathic and a portion of traumatic origin, and the form he adopted of administering the medicine was by injection. It would appear that all of the cases terminated favorably. In deciding whether to employ opium or tobacco in a case of tetanus, the safest guide would appear to be the constitution of the patient. If he is of a robust and healthy constitution, the speedier and safer course of cure would be by tobacco; but in opposite conditions the use of this remedy would involve some risk. It is probable, also, that tobacco is more especially indicated at the commencement of the attack, before the powers of life have begun to fail; in an advanced stage the propriety of using it is very questionable.

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[1] Month. Journ. of Med. Sci., March, 1846, p. 650.

[2] Times and Gaz., July, 1858, p. 112. [3] A Treatise on Tetanus. London, 1836.

[4] Bull. de l'Acad., i. 193.

Diseases of the Digestive System—Constipation, Hernia, &c. Authors have described the virtues of tobacco in "constipation," in "ileus," and in "hernia," but, if we except external strangulated hernia, without clearly distinguishing the anatomical conditions to which they applied these names. It is not easy, and perhaps is not possible, to determine what was the actual condition of the intestines in any of the cases which terminated favorably, since the symptoms presented in all of them do no more than indicate an obstacle to the passage of their contents through the bowels, and in some cases inflammation of the peritoneum besides. Yet in all of the forms of obstruction elements exist for the removal of which tobacco forms an appropriate agent; for should the obstacle consist of that somewhat hypothetical condition called spasm of the bowels, nothing could promote its thorough relaxation better than tobacco; is an accumulation of fæces the impediment to a normal action of the intestinal canal, the same remedy must operate favorably by promoting the relaxation of the bowel, and at the same time dissolving its contents by an augmented secretion; should a true hernia exist within the abdomen, or appear externally, tobacco must contribute to making the protruded bowel resume a natural condition, not by relaxing the spasm which has been imagined to account for its stricture and incarceration, but by exhausting the protruded portion of its fluids, diminishing its bulk, therefore, and consequently facilitating its return; or, finally, when the bowel is contracted by a twisting upon itself, by intussusception, by an interstitial deposit, by the pressure of a tumor, by fibrinous deposits and adhesions between adjacent surfaces of the peritoneum, or when it is occluded by a foreign body, the several modes of action enumerated may concur in overcoming the obstacle to the passage of the intestinal contents. The only remaining condition which produces symptoms of intestinal obstruction is simple and passive dilatation, tending to softening or to gangrene of the bowel, a state which has been well described by Abercrombie, but has no distinctive symptoms. In it, doubtless, the operation of tobacco would either be negative, or, more probably, mischievous, for the essence of the disease seems to be paralysis of the muscular coat of the intestine.

Sydenham was one of the first authorities to recommend tobacco in obstruction of the bowels, but he seems to have employed it only as a last resort, and after the failure of bleeding, purges, and opiates. He directs tobacco smoke to be forced up the bowel through a pipe from a large bladder, and to be repeated after a few hours.[1] A physician of

[1] Works (ed. of Syd. Soc.), ii. 269.

Paris, who was paralytic during the last seven or eight years of his life, found the only effectual means of procuring an evacuation from his bowels to be a tobacco enema, which he took at intervals of ten or twelve days.[1] An interesting case is related by Turner,[2] of a sailor who, in consequence of a penetrating sword wound of the belly, was unable to have any movement of the bowels, in spite of various emollient and laxative clysters, until the fumes of tobacco were injected into the bowel, which presently procured an evacuation. In his admirable work on diseases of the abdomen, Abercrombie says of the tobacco injection: "As far as my observation extends, it is the remedy of most general utility in all forms and stages of ileus;"[3] and he adds that, with the precautions laid down by him, he has never seen any unpleasant effect from the free use of this powerful remedy. Dr. A. recommends as the best mode of employing it, that not more than fifteen grains, infused for ten minutes in six ounces of boiling water, should be given, and, after an interval of an hour, if no result occurs, that it should be repeated in the quantity of twenty grains, and so on, until such effects are produced as show that its peculiar action is taking place upon the system. Meanwhile it is advised to administer mild purgatives, and if the patient is plethoric, if the pulse rises, or if fixed pain is felt in any part of the abdomen, to employ one or two bleedings. Heister, De Haen, Conradi, and Hufeland have all reported favorably of this mode of treatment, and Cullen advises the use of tobacco smoke and of the tobacco clyster in obstinate costiveness. Dr. Bartram has reported the case of a lady affected with aggravated *tympanitis*, who was entirely relieved by smoking tobacco freely.[4] In *strangulated hernia* the relaxing effects of tobacco have been repeatedly invoked with success. Of late years, it is true, its use has been discountenanced, and the operation advised as soon as the taxis, warm bath, and bleeding have failed;[5] but it has not, perhaps, been sufficiently considered that tobacco produces the proper effects of both of these latter remedies with more certainty and with a less expenditure of the patient's strength. Mr. O'Donovan, who speaks highly of the use of this treatment in constipation of the bowels and hernia, and who publishes several striking illustrations of its utility, recommends that the enema, made by infusing half a drachm or a drachm of tobacco in a wineglassful of hot water for twenty minutes,

[1] Dict. de Méd. en 60 vol.

[2] Medical Observations and Inquiries, ii. 307.

[3] Diseases of the Stomach, &c. (Edinburgh, 1828), p. 144.

[4] Trans. Coll. Phys. of Philad. (1798), i. 197.

[5] South's ed. of Chelius, Am. ed., ii. 290.

should always be administered by the medical attendant himself, who should not leave his patient until all symptoms of tobacco sickness have ceased, and that brandy or other diffusible stimulant should be at hand for administration in case of need.[1] Cases of the same sort are reported by Ronzier-Joly.[2] Dr. Jackson (late of Northumberland) has furnished several examples which illustrate the excellent qualities of this remedy.[3] One mode in which he employed it deserves attention, for cases of obstruction may occur when none of the needful appliances for preparing or administering an enema are accessible. Dr. J.'s patient was furnished with a cigar, and directed to swallow the smoke. He soon became nauseated, relaxed, and covered with a cold sweat. The bowel was then easily reduced, and the free use of ammonia soon restored the patient to his ordinary feelings. To give an enema of tobacco smoke, a homely but simple expedient suffices, which was first suggested by Th. Bartholinus.[4] An empty pipe is inverted over one in which the tobacco is already alight, a strip of paper is thickly wound around the juncture, and when the stem of the second pipe is inserted into the anus, an attendant, by blowing through the first, drives the smoke into the bowel. Another equally simple expedient was suggested by Gaubius: the nozzle of a pair of bellows is introduced into the rectum, and the smoke drawn into the instrument from a funnel placed over the vessel containing the burning tobacco. But whatever mode is selected for applying this remedy, the proper period for doing so is as nearly as possible after the symptoms of strangulation have appeared, while the patient is still strong, and when the protruded bowel is free from adventitious adhesions. At a more advanced stage he may be unable to bear the amount of sedation requisite for reducing the hernial mass, even should adhesions not already render this impossible.

In *cholera morbus* and *lead colic* the smoke and the infusion, as well as fomentations, of tobacco have been recommended by various authors, but their success is not such as to inspire confidence in so violent a remedy. *Ascarides* have been very successfully treated by tobacco enemata, and even round worms have been expelled after the injection of tobacco smoke, as happened in Mr. Turner's case alluded to above. In *poisoning* by mushrooms, tobacco is said to be a certain antidote.[5] Their mode of action appears to be, in many instances, to produce congestion of the brain and narcotism; in these, at least, the salutary power of tobacco is explicable. Two cases are recorded by Dr. Emer-

[1] Dublin Quart. Journ., Aug. 1858, p. 44.
[2] Bull. de Thérap., liii. 385.
[3] Am. Journ. of Med. Sci., xxv. 302.
[4] Boneti, Thesaur. Med. Pract., ii. 555.
[5] Szerlecki, loc. cit.

son, in which tobacco appears to have acted as an antidote to arsenic, and some experiments on dogs were made by W. Schultz, which seem to bear the same interpretation; but Dr. Florio, on the other hand, asserts that his trials with rabbits do not furnish any ground for adopting the conclusions of the previous observers.[1]

Dropsy. Towards the close of the last century the virtues of tobacco as a diuretic were highly extolled by Fowler, who reported a large number of cures of dropsy and dysury through its use.[2] Of dropsy he states that he had treated seventy-nine cases, of which twenty-eight were cured and thirty-two relieved. In his work a great many of the cases are described, but with such scanty details that it is quite impossible to decide how many of them were examples of simple anasarca and serous effusion, and in how many the dropsy was merely symptomatic of some organic affection, and in its nature incurable. Dr. F. employed chiefly the following preparation: ℞.—Tobacco ℥j; boiling water Oj. Macerate for an hour in a covered vessel placed in a sand-bath; strain off fourteen ounces, and add to them two ounces of alcohol. Of this infusion about forty drops twice a day was the dose for an adult to begin with, but it was rapidly increased until a slight degree of vertigo or nausea was felt after each dose. The quantity was then diminished slightly, so as to prevent these disagreeable symptoms, especially if the discharge of urine was augmented, which seems to have been generally the case. The immediate effect of the medicine is described as a pungent and transient sensation of heat in the throat, which was sometimes followed by a sense of warmth at the stomach, and generally by diuresis, with a slight degree of squeamishness and giddiness. In large doses it was usually laxative. The effects of the medicine were always most marked in weak, delicate, and irritable constitutions. On the whole, it seems probable that tobacco might with advantage take the place of digitalis in the treatment of many dropsies for which that uncertain and unsafe medicine is now prescribed. The cases of *dysury* in which Fowler derived benefit from tobacco appear to have been those in which the urine was scanty and high colored, and often contained sabulous deposits. In these, by its diuretic properties, tobacco was probably useful, though less so than saline medicines would have been. Later writers have recommended tobacco enemata in cases of retention of urine; and in suppression of the same excretion the tincture of tobacco, taken internally, has been found efficacious.[3]

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[1] Dierbach, op. cit., p. 901.

[2] Med. Reports of the Effects of Tobacco, &c. 2d ed. London, 1788.

[3] Mérat and De Lens, op. cit.

The infusion of tobacco has been recommended by Pittschaft for *nocturnal pollutions*, and the medicine in substance by Fischer against involuntary seminal emissions.

Pulmonary Affections. The palliative influence of tobacco fumes in nervous *asthma*, and even in the paroxysms proper to emphysema, is well known; but unfortunately the habit of smoking dulls their power over these affections. If, however, the smoke is swallowed or drawn into the lungs while yet the attack is slight, its benefits may be enjoyed even by habitual smokers. Dr. Sigmond relates that at the time when lobelia inflata was the subject of extravagant praises in the English journals, there "was not a particle of it in the drug market." The druggists dispensed tincture of tobacco instead, and probably without any abatement of the patient's profit. More recently, several instances of the powerful effect of tobacco smoke in this affection have been published by Dr. H. Salter.[1] The infusion of tobacco has been employed in *pneumonia*, *hæmoptysis*, *whooping-cough*, &c., but with no results entitling it to especial notice. *Asphyxia* produced by drowning and other causes has been treated with singularly happy results by tobacco smoke or infusion, if the narratives relating to the subject are entitled to credit. The practice is alleged to have originated among the aborigines of this country, but it so far acquired the confidence of Europeans that in Paris station-houses along the Seine were furnished with appropriate apparatus for administering this succor to drowned persons. Although the practice seems to have fallen into discredit, it may possibly have been efficacious, conjointly with other means, in cases of insensibility produced by cerebral congestion.

Mode of Administration and Dose.—Tobacco may be given in *substance* in the dose of five or six grains; but it is rarely prescribed in this form. An *infusion* and a *wine* of tobacco are officinal, the former of which may be used as a wash where the skin is unbroken, or administered *per anum*, eight fluidounces at a time; if its appropriate effects do not show themselves in half an hour, the remainder may be given. These officinal doses are as large as some that have produced serious symptoms. The *wine* of tobacco is very seldom used. Its dose is from ten to thirty minims. Fowler's infusion, described above, is probably a better preparation. Tobacco *ointment* may be applied to eruptions, tumid glands, and to bruised parts, with the cautions already mentioned. The fresh plant may be used for several of the medicinal purposes of tobacco, but, from not having yet undergone fermentation, its properties are far less active than those of the prepared leaves.

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[1] Lancet, Sept. 1858, p. 279.

VERATRUM ALBUM.—White Hellebore.

Description.—Veratrum album is a native of Europe, where it abounds in Switzerland and some adjacent countries. It is a very beautiful plant, measuring from two to four feet in height. It is surrounded near its base with large, broad, plaited, and somewhat hairy leaves, and bears on the summit of its stem large panicles of greenish-white or greenish-yellow flowers. The rhizome is fleshy, cylindrical, and furnished with numerous separate radicles. This is the officinal portion of the plant, and, as found in the shops, is generally denuded of its radicles. It is about the thickness of a man's little finger, blackish and wrinkled without and whitish within, and the radicles, when they exist, are about the size of a crow-quill, and yellowish externally. In its fresh state the root has a strong and nauseous smell, which is nearly lost by drying. The taste, even of the dried root, is at first sweetish, but afterwards is persistently bitter, acrid, and burning. Its virtues depend chiefly upon *veratria.*

Action. *On Animals.*—The white hellebore plant is said to be very injurious, and often fatal, to flocks and herds that browse upon the grass where it grows and to domestic fowls that eat its seeds. The older writers describe vomiting and spasms with gastric inflammation as its chief effects upon animals, and they state that in Spain arrows dipped in its juice were formerly used in hunting. The wounded animals perished from the effects of the poison, but their flesh was not rendered unfit for eating.[1]

Gohier made use of a decoction of white hellebore to bathe dogs affected with the mange. They became lethargic, howled piteously, vomited, had a frequent pulse and injected eyes, and appeared to be epileptic or rabid.[2]

Wibmer has given an abstract of the experiments of Wepfer, Courten, Viborg, Schabel and Emmert, Orfila, Hertwich, and others, with this substance upon various animals both large and small. The effects were nearly the same whether it was introduced by the skin, the stomach, the rectum, the bloodvessels, or any other part, and consisted of straining to vomit or actual vomiting, salivation, general debility, a small, feeble, irregular, or rapid pulse, slow and labored respiration, spasms of the abdominal muscles, general tonic or clonic convulsions, tremulousness and a tottering gait, an increased discharge of urine or perspiration, contraction of the pupils, and insensibility.

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[1] Murray, Apparat. Med., v. 145. [2] Mérat et De Lens, Dict., &c., vi. 858.

After death the lungs were usually found congested, and, when the poison had been introduced into the stomach, the mucous membrane of this organ was red.[1]

On Man.—Bergius, Brückmann, Ettmüller, and others, have described the operation of the medicine when taken internally. There was often swelling of the tongue and soreness of the mouth, and in all cases a burning heat in the stomach and vomiting were observed, with anxiety, tremor, vertigo, weakness of the limbs, faintness, syncope, aphonia, interrupted respiration, a feeble pulse, convulsions, distortion of the eyes, dilated pupils, blindness, mental derangement, sometimes prolonged insensibility, and cold sweating of the whole body. In not a few cases death resulted, and inflammation of the stomach and congestion of the lungs were found. When the effects were not fatal, there often remained for several days debility, tremulousness, muscular twitching, and a sense of constriction and distress in the præcordial region. Powdered hellebore applied to the epigastrium may produce vomiting, and, if the cuticle is broken, the further constitutional effects of the drug may be experienced.

Uses.—It is undetermined whether or not the white hellebore (*helleborus albus*) of the ancients was identical with veratrum album. Pliny, however, says of the former that it affects the head and acts as an emetic, but black hellebore purges; and he adds that the former is by much the most powerful.[2] It appears to have been used in the treatment of chronic diseases, rebellious to ordinary remedies, and which it was attempted to cure by making a powerful perturbative impression upon the system. Such were insanity, especially in its melancholic forms, dropsy, chronic diseases of the skin, tetanus, hydrophobia, gout, tic douloureux, coxalgia, quartan ague, chronic coughs, &c. Avicenna refers to convulsions and extreme heaviness of the head as among the poisonous effects of white hellebore. As appears from Dioscorides and other writers, it was always administered in conjunction with diluent or lenitive medicines for the purpose of moderating the harshness of its action.

It gradually fell into disuse either on account of the accidents occasioned by its imprudent use, or, what is more probable, because new remedies were introduced to supplant it under the dominance of new medical theories. Yet in dropsy, epilepsy, and insanity it was not entirely abandoned, in spite of the harshness of its operation, which was fully recognized; and it was also applied externally for the destruction of vermin in men as well as beasts.

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[1] Wibmer, Wirkung der Arzneimittel u. Gifte, v. 411. [2] Hist. Nat., xxv. 21.

The irritant properties of the medicine led to its use as an *errhine* when finely powdered and diluted with starch or other inert substance, or with snuff. Under the name of cephalic snuffs such mixtures have been used to relieve the headache which attends the onset of coryza by promoting a discharge of the nasal mucus.

Its hostility to the life of the lower animals has led to its being employed in the cure of itch, either in a simple ointment (UNGUENTUM VERATRI ALBI) or associated with sulphur, ammoniated mercury, sulphuric acid, and nitre, in the compound sulphur ointment (UNGUENTUM SULPHURIS COMPOSITUM); but equally efficacious and less disagreeable remedies have supplanted these.

VERATRUM SABADILLA.—CEVADILLA.

DESCRIPTION.—Veratrum sabadilla is a native of Mexico. Its Spanish name, which is a diminutive of the word *cebada*, barley, is said to have been given it from the resemblance it bears to this plant in its leaves and fruit. The ensuing description, which follows after that of Guibourt, Neligan, and others, answers more closely to *Asagræa officinalis*, Lindley. The root is bulbous, and from it springs an annual stem five or six feet high, garnished with numerous long, linear, grassy leaves, and terminating in a long spike of small white flowers, which are succeeded by seed-pods forming an ear resembling that of barley. The fruit consists of three oblong, delicate capsules, coalescing by the base, and about half an inch in length, in each of which are contained several shining black seeds, about three lines long, hard, inodorous, and of an exceedingly acrid and permanently bitter taste. Their active properties are derived from the *veratria* which they contain.

ACTION AND USES.—Murray quotes[1] several authors to show that this substance is capable of destroying dogs and cats, and of occasioning in them vomiting and convulsions.

Monardes, who was the first person to furnish an account of its virtues (1572), says that it acts like a cautery upon ulcerated or gangrenous flesh. Until the close of the last century it was almost exclusively employed as an external application, and chiefly for the purpose of destroying vermin in bedding and other furniture, and also the lice infesting the persons of soldiers, sailors, paupers, and a certain order of friars. From the last-named usage it was popularly known in France as the *Capuchin's powder*. Cases were not wanting in which its appli-

[1] Op. cit., v. 170.

cation to the sore head produced alarming symptoms, and even death. Its tincture has been found efficient as a remedy for the itch by M. Bourbousson. Lhuillier declares that, in the course of a large experience with the remedy during fifteen years, he never once failed to effect a cure by means of frictions made with powdered cevadilla mixed with sweet oil and brandy immediately after the patient had taken a prolonged warm bath.[1]

As a *vermifuge* for tænia this medicine has been vaunted by Schmucker and Herz, and for ascarides of the rectum by Hufeland. By the former two physicians it was also alleged to be efficacious in *amenorrhœa*, *chlorosis*, *mania*, *melancholy*, *epilepsy*, and *chorea*,[2] and Foulhioux claims to have cured *hydrophobia* by its means.[3]

The dose of the powdered seeds is stated as half a drachm; it should be followed by barley-water sweetened with honey, and repeated daily, but in smaller doses. Half a drachm in two ounces of boiling water is mentioned as the proper dose of the infusion.

Veratria.

Description.—To a distillate and decoction of the seeds and capsules of cevadilla in alcohol sulphuric acid is added, which forms a sulphate of veratria in solution. On the addition of magnesia, the veratria is precipitated in an impure state, and is then collected and redissolved in alcohol. By evaporation of the latter, the veratria is partially purified, and still further by boiling in water acidulated with sulphuric acid and containing animal charcoal, and then straining the solution. On the addition of ammonia, the veratria is precipitated and is then washed with cold water and dried. It is a white amorphous powder, which fuses at a moderate heat, turning light yellow, and at a higher temperature it becomes reddish, brown, and then black. It restores the blue color of litmus paper reddened by acetic acid. It is slightly soluble in cold, but more freely in boiling water, and is perfectly soluble in alcohol and ether.

History.—Veratria was discovered by Meissner in the seeds of veratrum sabadilla in 1818, and in the following year it was also extracted from the same source and from the root of V. album by Pelletier and Caventou. In 1821 it was first employed in physiological experiments by Magendie and Andral, and soon afterwards by the former in the treatment of disease. In 1826 Bardsley used it in

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[1] Abeille Méd., ii. 220.

[2] Richter, Ausfür. Arzneim., ii. 226.

[3] Revue Méd., lxxxiii. 381.

rheumatism and dropsy, and more general attention to it as a remedy for neuralgia was excited by Turnbull's essay in 1834.

ACTION. *On Animals.*—The original experiments of Magendie and Andral, which, however, were not made with pure veratria, led them to conclude that this substance is a powerful local irritant; that, however introduced into the economy, it occasions gastro-intestinal irritation; and that, in large doses, it gives rise to tetanus.[1] More complete and accurate experiments have since been performed. Among them the most valuable are those of Esche,[2] which were performed on dogs, cats, rabbits, and birds, and of which the following is a summary: A few minutes after the administration of veratria the animals manifested anxiety and restlessness, saliva flowed from the mouth, the action of the heart became irregular, slow, and intermittent, and the respiration deep and labored; there was violent retching or vomiting, a copious discharge of liquid with mucus and even blood from the bowels, with spasmodic retraction of the abdominal walls. The respiration gradually became slower and more difficult; the animal appeared by its restlessness to be in great distress, and its eyes were dull and projecting. The voluntary muscles were evidently feeble and unable to support the body, and spasms affected the pharynx, the muscles of the face, and the lower limbs. The functions of the brain were wholly undisturbed. After smaller doses had occasioned vomiting and purging, and transient convulsive movements, with loss of muscular power, and a slow pulse, the animal gradually recovered, but the last symptom, with general debility and want of appetite, remained for some time longer. Very large doses affected the whole nervous system with loss of power and tone; the respiration and circulation gradually became extinct, the convulsive movements passed into tetanus, and the animal died. On dissection, the only changes found were those which attend death by asphyxia; the lungs, heart, and liver were gorged with blood; the tongue, throat, and gullet were pale; the stomach sometimes contracted, but free from all traces of inflammation; and the bowels were also contracted and somewhat reddened. In the brain nothing abnormal was discovered.

From his experiments Esche drew the following among other less important conclusions: 1. The more directly veratria enters the blood, the more rapidly are its effects developed. 2. It is not in a high degree a local irritant. 3. Moderate doses act by producing vomiting, diarrhœa, increased excretion of bile, a slow pulse, impeded respiration, diminished animal temperature, impaired common sensibility, and an

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[1] ORFILA, Toxicologie, 5ème éd., ii. 460.

[2] De Veratriæ Effectibus, 1836; VIRCHOW's Archiv, vii. 260.

altered condition of the blood. 4. Large doses, in addition, occasion debility, then spasm, and finally tetanus of the voluntary muscles. 5. The functions of the brain are undisturbed. 6. It differs from the various vegetable products from which it is extracted by the constancy, rapidity, and extent of its operation, and in its not producing inflammation of the stomach and bowels. Van Praag's experiments led him to similar conclusions; but he drew attention to the fact that the primary impression of veratria on the nervous system, and through it upon the circulatory and muscular system, is that of a stimulant, while its ultimate effect is to produce spinal paralysis.[1] Analogous results were obtained by Faivre and Leblanc.[2]

The experiments of Kölliker appear to show that veratria exerts through the blood a directly paralyzing action on the muscles, which thereby lose their irritability, and become tetanic. This action was demonstrated in a frog by tying the artery of a hinder extremity, and severing all connection of the limb with the trunk except through the ischiatic nerve, and then administering veratria. The usual succession of symptoms was presented in all of the body except the disconnected leg, whose muscles retained their irritability after this property had been lost in every other part of the muscular system. Again, the ischiatic nerve having been divided in another frog, veratria was administered, and the muscles of the whole body became tetanic.[3] Thus, positively, as well as negatively, it was proved that the poison exerts its power directly upon the muscles, or upon the nerves distributed to them, and not necessarily through the intervention of the spinal centre.

On Man.—Veratria has a bitter taste, and even the least portion of it, placed upon the tongue, produces a peculiar and persistent irritation of the fauces. The minutest quantity of it, introduced into the nostrils, and even the casual approach of a vial containing it to the nose, occasions protracted irritation and sneezing.

Applied in an ointment to the sound skin, it occasions slight redness and a prickling sensation; or, if the integument be tender, as around the umbilicus, the pain may be severe, and is compared by Van Praag to that which might be produced by hot needles thrust into the skin. After a few minutes this pain subsides, and is followed by a sense of coldness in the part. If the frictions are repeated, according to Turnbull, particularly upon the face, slight twitchings of the muscles are sometimes observed, and more rarely formication extends from the point of application over the whole body. In some cases where an ointment composed of twenty grains of veratria to an ounce of

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[1] Virchow's Archiv, vii. 286.

[2] Archives Gén., 5ème sér., v. 258.

[3] Virchow's Archiv, x. 257.

lard was rubbed into the skin, severe pain was experienced, and an eczematous eruption followed. When used by Ebers[1] as an endermic application to the epigastrium, it excited acute pain in the superficial nerves, a dragging pain seated in the spine, muscular twitchings compared to slight electric shocks, and, in addition, the symptoms usual after the internal administration of the medicine.

The effects of veratria, taken internally, are described in nearly the same terms by those who have employed it, including Turnbull, Forcke, Roëll, Ebel, Ebers, Gebhard, and others. In medicinal doses, the sensible phenomena consist of a sense of tingling, first felt in the fingers and toes, but diffusing itself over the whole body, and followed by a sense of numbness and coolness in the same parts, and occasionally by a diminished frequency of the pulse. Somewhat larger doses occasion twitching of the muscles, and this symptom is most striking in muscles which are partially paralyzed. If the usual limit of medicinal doses is exceeded, and $\frac{1}{10}$ gr., for instance, is administered, nausea, distress, faintness, loss of appetite, and perhaps some looseness of the bowels may be observed; and if this dose is repeated, or exceeded, nervous symptoms are developed, such as tension and pain in the spinal nerves and along the spinal column, jerking of the muscles, great anxiety, dyspnœa, nausea, and vomiting. The proper poisonous effects of veratria in man have not been described. Dr. Taylor, indeed, refers to a case in which it is said that a lady who had taken $\frac{1}{16}$ gr. of this substance "was found insensible, the surface cold, the pulse failing, and there was every symptom of approaching dissolution."[2]

Remedial Employment. *Neuralgia.*—Bardsley was the first to employ veratria in *sciatica*, an affection which is usually regarded as neuralgic, but which is much more frequently of a rheumatic nature—*i. e.* produced by cold, and consisting of an inflammation of the fibrous investment of the nerve, as it passes through the ischiatic notch. He reported six cases of this affection, two of which were cured and four relieved by the administration of a quarter to half a grain of the medicine three times a day.[3] In 1833 Turnbull claimed to have perfectly cured twelve out of thirteen cases of different forms of neuralgia by the external use of veratria ointment;[4] but the evident exaggeration of his statements only served to discredit the remedy with judicious men. Dr. James Johnson furnished, however, a partial confirmation of them, by reporting that it had, in his hands, afforded relief in three cases of facial and two of crural neuralgia.[5] Similar effects were re-

[1] Dierbach, Die Neuste Entdeck., ii. 488.
[2] On Poisons, 2d Am. ed., p. 510.
[3] Hospital Facts and Obs., 1830, p. 115.
[4] Brit. and For. Rev., ii. 499.
[5] Med.-Chir. Rev., xxi. 163.

ported by Brück, Ebers, Roëll, who points out that the remedy is only efficacious in functional neuralgia, and Cunier,[1] who cured forty-one out of a hundred and twelve cases of the same affection. Gebhard's experience somewhat resembled that of Roëll, for he found the frictions useful when the pain was diffused in the terminal branches, rather than when it was confined to the trunk of the nerve;[2] and Lafargue regarded its effects, when inoculated, as extraordinary.[3] Like the physicians already cited, Forcke and Reil[4] found the remedy very efficient, both in frictions and when introduced by punctures into the skin, provided the disease were wholly functional. The latter regarded veratria and aconitia as the best substitutes for one another. It is somewhat remarkable that in opposition to this positive and authoritative testimony we have Dr. Henry Hunt declaring that he "never succeeded in giving even temporary ease with veratria," although he used it in the proportion of ten grains of the alkaloid to half an ounce of ointment.[5] We believe that general experience accords decided virtues to the medicine as a local remedy, although it is probably inferior to aconitia, employed for the same purpose and in the same manner.

Rheumatism.—Of nineteen cases of *chronic rheumatism* which Bardsley treated by the internal use of veratria, three only are stated to have been cured, nine were relieved, and seven were unimproved. In so obstinate a disease, this degree of success is not without merit. Turnbull reports more cases of cure, but does not allude to those of failure. In *acute rheumatism* the medicine has been more successful. Among others, Piedagnel employed it alone in the articular form of this disease, with decided advantage, in doses varying from $\frac{1}{10}$ to $\frac{1}{2}$ gr.,[6] and gradually increasing the dose until the medicine was no longer tolerated. M. Trousseau assures us that during two years he made use of this method with generally satisfactory results. He describes the most usual effect of it, as a reduction of the fever and pain in the course of a few days, so that in a patient of unimpaired constitution it frequently triumphed over an acute attack of the disease in the space of a week. Not, however, that it always accomplishes a cure; for sometimes, after having reduced the febrile symptoms to a subacute type, they continue their usual course for the space of two or three weeks. It acts, therefore, in the same manner as sulphate of quinia and nitrate of potassa. The former of these two medicines also appears

[1] Bull. de Thérap., xiv. 8; xv. 329. [2] Ibid., xxxiii. 255. [3] Ibid., p. 353.
[4] Mat. med. der rein. chem. Pflanzenstoffe, p. 308.
[5] On the Nature, &c., of Tic Douloureux (London, 1844), p. 184.
[6] Bull. de Thérap., xliii. 141.

to be preferable when the patient is feeble, anemic, or exhausted by other diseases.[1] M. Aran reports that of eight cases of acute articular rheumatism, the cure by veratria was very rapid in four, that the treatment was ineffectual in two cases, and that in two others it had to be abandoned, on account of the intolerance of its effects, by the patients. The duration of the disease, after the commencement of the treatment, was eight days, on an average, in the cases which were cured. On the whole, as M. Aran remarks, this result is far from being a very favorable one, particularly when it is considered how much distress the remedy occasions in nausea, vomiting, epigastric pains, prostration, &c. But this writer is of opinion that when articular rheumatism is complicated with pericarditis, the danger of the attack is sensibly lessened by the sedative operation of veratria.[2]

Pneumonia.—In this disease M. Aran, who was induced by Dr. Norwood's publications concerning veratrum viride to experiment with the medicine under notice, observed that when it was given in such doses as developed its irritant and sedative effects, a rapid and decided amelioration took place in several of the symptoms, and particularly in the dyspnœa, cough, and expectoration, and, what is peculiarly important, it caused the physical signs of hepatization to disappear with unusual rapidity.[3] But the number of his cases, six in all, were insufficient for determining the precise value of the remedy. Fournier treated forty-one cases of the disease according to the same method, with such success, that he pronounces it the most certain means of promoting resolution;[4] but Ghiglia is of opinion that it is seldom efficient, and ought not to be administered unless depletion has been premised.[5]

Veratria has occasionally been used in acute *pleurisy* and *pericarditis*, in the former without notable advantage, but in the latter with marked alleviation of the præcordial distress. By producing a similar effect in some cases of *valvular disease of the heart*, it has been found a useful palliative; and in some instances of *dropsy* resulting from suppressed discharges, or from organic disease, it has seemed to promote the absorption and discharge of the effusion, probably by its sedative influence on the heart. But in all such cases it must occupy a very inferior position to digitalis. It has been used for these affections both internally and externally. In the latter mode, also, it is stated to have cured various chronic inflammations, such as *enlarged glands*, and scrofulous *swelling of the joints;* but here its value is probably very

[1] Thérapeutique, 5ème éd., ii. 772.
[2] Bull. de Thérap., xlv. 395.
[3] Ibid., xlv. 61.
[4] L'Union Méd., quoted by Reil, loc. cit.
[5] Bull. de Thérap., lvi. 109.

slight. It is unnecessary to add anything of its alleged occasional efficacy in *whooping-cough*, *chorea*, *hysteria*, and *functional paralysis* of the facial and other superficial nerves. For all of these affections the materia medica contains more certain and less disagreeable remedies for internal administration. In the last mentioned disease frictions with veratria ointment are deserving of trial.

ADMINISTRATION.—On account of its acrid taste, veratria is always administered *internally* in the pilular form, and in doses varying from one-fortieth to one-fourth of a grain. The dose should be gradually or rapidly increased from the minimum mentioned, according to the acuteness and the nature of the disease, until nausea or depression of the pulse announces that its constitutional influence is established.

For *external* use it may be employed in an alcoholic solution, or mixed with lard or oil. From one to four grains of veratria in a drachm of alcohol; or four grains of the alkaloid to a drachm of lard may be prescribed. The latter preparation causes decided prickling and stinging of the skin. (*Reil.*) Glycerin may be substituted for alcohol in the solution just mentioned. For *endermic* use from one-eighth to one-half a grain may be prescribed, mixed with starch. For *inoculation* one-sixth of a grain of veratria, or of its muriate, may be employed at a single operation, which may be repeated twice a day.

Class XI.

EVACUANTS.

Evacuants are medicines which produce a discharge from particular organs. The greater number of them are included in the Class of Eliminants established by some modern writers, and particularly treated of by Mr. Headland.[1] The latter term is, we think, less eligible than the former; for while it is certain that these medicines do produce evacuations from the various emunctories of the economy, it is not certain, and it by no means follows, that they eliminate any material cause or element of disease.

The use of evacuants, which is coeval with the earliest history of our art, was undoubtedly suggested by the operation of nature in the cure of many diseases. It was of daily observation that convalescence was ushered in by discharges, especially from the skin, the bowels, and kidneys, and when it was discovered that certain plants and other natural agents excited or promoted such discharges, they were instinctively employed to produce similar effects at the will of the physician. And as it was a part of the existing pathological doctrines, that the symptoms of diseases are the result of a struggle on the part of the system to expel some peccant humor from the body, these evacuants were presumed to promote its expulsion, and in that manner contribute to the restoration of health.

But the material causes of disease were not then demonstrated, nor have the minutest investigations of modern chemistry and physiology succeeded in revealing them. But in following up medicinal substances in their hypothetical chase after the morbid principles they have been thought adapted to destroy, it has been found that those belonging to the present class are far from exerting their power upon all the excretory organs indifferently. The same laws which preside over the

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[1] On the Action of Medicines.

composition and decomposition of the organic elements of the body, prevail also here. As the different constituents of the food are appropriated, each after its kind, by the living bone, muscle, gland, or membrane; and as the unassimilable portions of the food are rejected, this by the skin, that by the bowels, and that by the kidneys, according to its peculiar constitution, different medicines are in like manner discharged by the several organs named, and by others, either exclusively or principally. Solid nutriment, whether wholly or only in part unassimilable, is ultimately evacuated from the bowels; fatty substances, after having been taken into the circulation in the form of an emulsion, are secreted by the liver; liquids and saline matters pass off by the kidneys; and among medicines some are discharged with the secretions of the bowels, some with those of the skin, the kidneys, or the bronchial mucous membrane. But in thus passing from the body, as might indeed be anticipated, they stimulate to unusual activity the organs through which they are discharged, and increase their normal secretion so long as the stimulation is restrained within certain limits. But once this bound exceeded, the secretion, instead of being promoted, is impeded and diminished to such a degree, it may be, as to become a cause of disease and death. Thus cantharides, copaiba, or oil of turpentine, in appropriate doses, may greatly augment the flow of urine, but in excess may arrest it altogether by occasioning congestion or inflammation of the kidneys. This proposition is not less applicable to those evacuants which operate both by absorption into the blood, and by their immediate and direct application to the organs they are adapted to stimulate, as, for example, certain emetics and cathartics. The evacuant operation of these agents may depend, in a great measure, upon the reflex action excited by their presence as irritants in the stomach or bowels. Again, emmenagogues become evacuants in quite a different manner from those agents which augment secretion by a direct stimulant action upon a gland; some of them, as ergot and borax, influence the distended uterus chiefly, and others act by contiguous sympathy, or by a continuous irritation propagated from neighboring organs, as from the rectum in the case of aloes, and from the bladder in that of cantharides.

Allusion has been made above to the theory which was anciently invoked to explain the curative operation of evacuant medicines, and according to which they expelled from the system a material morbid principle upon which all the phenomena of disease were supposed to depend. But to any one who will carefully study the Hippocratic writings upon this subject, it must be evident that no practical precept was more frequently enjoined, or more profusely illustrated, than the

obligation to avoid any active interference with the process of coction, which was regarded as an essential preliminary to the due discharge of the morbid humor. The Greek physicians did not, as some of the present day propose to do, substitute the forced evacuation of a secretion for its natural flow. For them this was an operation to be respected; to be promoted and encouraged, indeed, but only when the efforts of nature were clearly tending to produce it. The ancient doctrine, therefore, cannot be invoked in support of the modern theory, or of the practice deduced from it, and which consists in the use of evacuant medicines without regard to the stage of the disease, or its natural tendency to a critical discharge. In other words, the preparation of the system for this evacuation, which was an essential part of the Hippocratic method, is now entirely overlooked, or rejected as unnecessary.

The ancient practice was a mere ministering to or helping of nature, the modern is a rude, and what might well be called an impertinent, interference with the natural processes of cure when they tend to issue in a critical evacuation. But if we take a general survey of the mode in which health is restored after sickness, we shall find that it is rather by supporting and invigorating the functions of the economy, so as to enable it to resist the exhausting or oppressive influence of the morbid process, than by any evacuant operation whatever. To cite a striking illustration of this view, which has been suggested by Dr. C. Handfield Jones, when a narcotic poison or the virus of a venomous serpent, for example, has been introduced into the system, no attempt is thought of directly to eliminate it, but stimulants are employed to sustain the powers of life during its operation, until the changes in the fluids, &c., which it tends to produce, have come to an end, or until it is cast forth from the economy.[1] This remark is quite as applicable to diseases which arise spontaneously, but whose active cause is acknowledged to be either a specific virus producing certain changes in the blood which have been hypothetically illustrated by the analogy of fermentation, or which, as Dr. Jones suggests, are rather morbid states of the blood itself, depending upon catalytic processes. The latter was precisely the doctrine of the medical world in the time of Huxham, when it was customary to speak of putrid fevers and putrefactive processes, a doctrine to which the success of the sustaining and stimulant treatment lent the most unequivocal support. All of the continued, including the eruptive, fevers belong to this category, some in a greater and some in a less degree, varying with the prevalent medical constitution.

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[1] Brit. Med. Journ.; BRAITHWAITE'S Retrospect (Am. ed.), xxxviii. 269.

If, occasionally, as in the case of typhoid fever, an evacuant treatment has been judged the most efficient, it has been so under the influence of a popular medical theory, or in comparison with other methods, such as depletion, which had more disasters to lament than triumphs to boast of.

Or if we inquire what method has been most successful in treating malarious disorders, in which, if anywhere, an eliminant treatment should have been successful, since their cause can hardly be denied to be a material poison, we shall still find that medicines such as cinchona and arsenic, which promote no sensible discharge whatever, constitute their surest and safest remedies. The history of syphilis presents another striking illustration of the doctrine here set forth. At one time it was believed that a venereal virus pervaded the system, which it required the full and prolonged sialagogue operation of mercury to eliminate; and the profuse and destructive salivations induced as a consequence of that belief are now a matter of history, and of little honor to the medical generations that practised them. Experience has proved, beyond all cavil, that mercury is most efficient in this disorder precisely when its eliminant effects are least decided.

If we turn to diseases of the skin, which are often, and sometimes probably with justice, regarded as depending upon and denoting a constitutional cachexia, we are still met by the fact that the most efficient means which can be employed for their cure consist of arsenical and other remedies, which, when duly administered, are very far from promoting the secretions, or reducing the tone or vigor of the system. And although it may appear as if the great relief afforded by saline diuretics in the acute forms of rheumatism gave support to the opinion that they promote the discharge of a material morbid element, confidence in the doctrine must be greatly shaken when it is recollected that purgatives, of whatever sort, produce no such result, and that quinia, or, still better, cinchona, and, best of all, opium, are of equal, or rather, as we would say, of superior, value to alkaline diuretics in the treatment of this disease.

Believing, then, that as eliminators of specific morbid principles medicines of the class about to be examined have no well-founded claim to confidence, we are compelled to fall back upon their more evident and intelligible actions to explain their great value as curative agents. These will be more profitably considered in connection with the several classes into which evacuants are divided according to the organs upon which they peculiarly exert their influence. As their general title implies, they are employed to remove from the economy certain matters which interfere with the health. These may be me-

chanical causes of discomfort or disease, and may be expelled from the alimentary canal by emetics or cathartics; they may consist of a positive or relative excess of the circulating fluid, and the before mentioned agents, with diaphoretics and diuretics, are capable of rapidly reducing the turgor of the bloodvessels; they may arise from an imperfect action of the secreting organs, whether secreting membranes or independent glands, whereby the materials for the secretions are retained in the blood, and the functions which depend on the due abundance of the latter are impaired; but evacuants restore the activity of the glandular organs, and relieve the blood of its excessive proportion of excretory elements. Some among the evacuants are chiefly local in their action, as certain purgatives and anthelmintics; but others, besides producing a general sedative effect through their depletory operation, act directly as sedatives upon the nervous system, and tend to prolong the influence of their more local and irritant action. Such, for example, are tartar emetic, colchicum, black hellebore, and nitrate of potassa.

It will be found that not a few of the particular medicines classed as evacuants are such only when administered in a certain dose, or in a certain condition of the organs which they are intended to influence. So purgatives are habitually employed to cure diarrhœa, not merely by removing irritant causes from the bowels, but by a substitutive action arresting or diminishing the alvine secretions. The same is true of expectorants, of which a particular group has received the name of stimulant; and, in fact, it is also more or less true of all the classes of evacuants that they might each be conveniently divided into two sections, the one containing stimulant and the other sedative medicines.

EPISPASTICS, vid. *Irritants.*

ERRHINES.

ERRHINES are medicines which promote a discharge of fluids from the Schneiderian membrane. Those which provoke sneezing were formerly called sternutatories, or ptarmica. They were employed both as substitutive irritants and as revulsives; as the former, in coryza, both acute and chronic, and both when simple and when it assumed the characters of ozæna; and as the latter, in various affections of the eyes, and even in amaurosis; in some cases, also, of deafness, probably depending upon obstruction of the Eustachian tube; and in several affections involving disorder of the brain, such as epilepsy and paralysis. It was, however, chiefly for the relief of headache, and a tendency to fulness of the head, that these agents were prescribed, and the popular use of volatile aromatic stimulants, in the form of smelling salts, at the present day, affords sufficient evidence of their utility. Those among them which are apt to excite violent and prolonged sneezing, were directed to be used with caution, lest they should occasion too severe a shock to the brain or to the abdominal organs.[1]

ASARUM.—ASARABACCA.

DESCRIPTION.—Asarum Europæum is a native of Europe, growing between 37° and 60° north latitude, in woods and shady places. All parts of the plant are acrid. The leaves are nearly inodorous, with a slightly aromatic, bitter, acrid, and nauseous taste. The powder made from them is of a yellowish-green color. The root varies from about the thickness of a straw to that of a goose-quill, is jointed, quadrangular, and furnished with radicles, of a grayish-brown color externally, and whitish within. When fresh, it has an aromatic odor, resembling that of valerian, and which readily excites sneezing. Its taste is acrid, bitter, and nauseous.[2] When long kept, both root and leaves lose their acrid qualities, and become altogether inert.

USES.—It was formerly used as an emetic and purgative, for the former of which purposes it was recommended by Matthiolus and Lin-

[1] The reader curious to learn more of this subject, can consult HOFFMANN'S "Dissertatio de Usu et Abusu Pulverum Sternutatorium," Op. Omn., suppl., i. 701.

[2] SACHS and DULK, Handwörterbuch, i. 509.

næus. It had also some repute as a diuretic, and, like other irritants, was employed with criminal intent as an emmenagogue.[1]

Its qualities as an errhine, however, gave it greater repute. When two or three grains of the powdered root are snuffed into the nostrils, no immediate effect is produced; but after a time a copious discharge of mucus, and even of blood, takes place. In this manner it has proved useful in cases of severe chronic headache, especially when the pain originated in inflammation of the frontal sinuses; of chronic inflammation of the eyes, paralytic affections of the mouth and tongue, in toothache, &c.

ADMINISTRATION.—As an *emetic* the dose is variously stated by authors as between a scruple and a drachm of the powdered leaves or root. As an *errhine* one or two grains of the root, or twice that quantity of the leaves, may be snuffed into the nostrils. It may also be mixed with ordinary snuff.

HELENIUM AUTUMNALE.—SNEEZEWORT.

This is a perennial herb indigenous to the United States, in all parts of which it grows abundantly in low and moist situations. The whole plant is intensely bitter, and somewhat acrid. When powdered and snuffed, it produces a profuse discharge of mucus, and violent sneezing. Every part of the plant is active, but the central disk florets are the most powerful.

Other errhines might be here described, such as *ammonia*, *turpeth mineral*, *tobacco*, *green* and *white hellebore*, and nearly all of the stimulant plants belonging to the natural families of *Labiatæ* and *Euphorbiaceæ*. But the more important of these will be fully considered elsewhere.

SIALAGOGUES.

HYDRARGYRUM,	vid. *Alteratives.*
MEZEREUM, PYRETHRUM,	" *Irritants.*
TABACUM,	" *Nervous Sedatives.*
ARMORACIA,	" *Diuretics.*
ZINGIBER,	" *Aromatic Stimulants.*

[1] MURRAY, Apparat. Med., i. 517.

EMETICS.

EMETICS, or medicines given to produce vomiting, are among the most anciently, the most universally, and the most constantly employed of all remedial agents. The indication for their use which is most emphatically mentioned by Hippocrates is that which must originally have led to their administration in disease, a sense of oppression at the stomach, with nausea. Celsus makes use of similar terms; but Galen, in his desire of being able to assign a scientific reason for every morbid phenomenon and every practical precept, taught that they are useful because they evacuate the morbid humors which clog the stomach and its ancillary organs. In this, as in other doctrinal subjects, he was followed by the Arabian and the Salernian schools. The introduction of chemistry into medicine was signalized by the vogue of antimony, which was first extolled by Basil Valentine, and afterwards by Paracelsus; and the importation of ipecacuanha towards the close of the seventeenth century only tended to enhance the importance of emetic medicines. Indeed, it was not until within the last century that any serious or widely-spread doubts were entertained concerning their efficacy. On the one hand, according to the Brunonian system, all diseases were believed to depend upon debility, and to require a stimulant treatment; and on the other, according to the Broussaian doctrine, all are of an inflammatory nature, have their chief seat in the stomach, and must be appeased by diluents and depletory agents. The two agreed in condemning the use of emetics, which the former regarded as exhausting, and the latter as incendiary. Thus, for more than half a century, two equally false doctrines conspired to set at naught the experience of ages, and almost entirely to banish emetics from the practice of medicine. Since the extinction of the schools which propagated these inconsistent dogmas, the medical profession has, unconsciously perhaps, submitted to the still more degrading influence of the fanatical and knavish system of Hahnemann, and been prone to abandon disease to its natural tendencies, even in cases the course and issue of which are often determined by an early and decided perturbative treatment.

At the commencement of every disease, whether idiopathic or symptomatic, its material elements are mobile, and may be readily dispersed

by a prompt and energetic movement. Like the particles of a saline substance in solution, if allowed to repose, they speedily crystallize in a solid and permanent form, when a little agitation of the liquid would effectually have prevented this result.

In almost all acute internal diseases, vomiting is one of the earliest and most striking phenomena, and one that frequently characterizes the subsequent course of the attack. Considering the relief that it often affords, we cannot be surprised that it should, as just stated, have always been regarded as one of the most important indications for the guidance of the physician, and it cannot be doubted that the emetic treatment derived from it will again acquire the credit which it once of right possessed.

Purgation, which resembles emesis as an evacuant and derivative agent, is widely different from it, in the organs which it directly affects, and more particularly so in the perturbative operation which renders the latter so potent a remedy. Still less does evacuation of blood by venesection, or of urine, perspiration, or bronchial mucus by the agents which especially provoke their discharge, compare in its effects with that profound and powerful, although temporary, convulsion of the whole economy which must tend in an extraordinary manner to break up the morbid habit into which it was about to fall, or had already settled.

In order to appreciate more fully the phenomena of emesis, and the action of the causes which produce it, it is necessary to consider the nervous sympathies, or rather the nervous physical relations, of the stomach. It is supplied with branches of the vagi nerves, whose chief office appears to be to control the active movements of the muscular coat of the organ; for its peristaltic action continues even after the section of those nerves. It is also abundantly furnished with branches of the great solar plexus and other neighboring ganglia of the sympathetic nerve, which are most numerous in the pyloric half of the organ, while those of the par vagum chiefly supply its cardiac extremity. The sympathetic nerve appears to be endowed with the function of causing rhythmical movements in certain hollow viscera, by which term may be designated the heart and bloodvessels, the bronchial tubes, the urinary passages, the uterus and its appendages, the pharynx and œsophagus, and the gastro-intestinal canal. It is quite intelligible, therefore, that a strong impression made upon the stomach, the nerves of which appear, even anatomically, to hold a central position in the ganglionic system, should be reflected upon many other parts of the economy, and upon those particularly which are concerned in the processes of organic life, and that it should in an especial manner

influence the action of the arteries and the secretions which immediately depend upon them.

This statement, general as it is, of the sympathies of the stomach, indicates the modes in which that organ may be influenced by impressions made upon distant parts, and, reciprocally, how its own state may affect them, and consequently how a strong and sudden commotion in it may become the means of essentially changing their condition and mode of action. As a hollow muscular organ, open at either end, it is capable of propelling its contents in either direction. In a normal state it carries them forward to the pylorus; but under the action of irritants, that is to say, of substances intrinsically unassimilable and productive of irritation, it sets up a retrograde action which tends to reject and expel them through the œsophagus. Such are the mineral emetics, sulphate of zinc, and sulphate of copper, and other substances which, although assimilable, yet in an undue quantity, produce an analogous action of the stomach, and stimulate it by their bulk as well as by their acrimony. Such agents are the domestic emetics, salt and mustard. It is well known, also, that mere repletion of the stomach with assimilable food is sufficient to excite vomiting. These effects are evidences of a wise provision against the dangers to which the stomach, one of the essential supports of life, is peculiarly exposed. Its degree of susceptibility to the irritant impression of ingesta, and especially of excessive quantities of food, varies in different persons even in health, and is generally most developed in those of a delicate organization, and in females more than in men. It is also awakened with great facility in children. In all of these cases, the stimulus which issues in the act of vomiting, is applied directly to the stomach itself. But in others, a remote irritation or exciting cause may produce the same effect. Tartar emetic, for example, which is the most powerful agent of its class when applied directly to the stomach, is equally certain in its emetic effects, whether it is thrown into the rectum or injected into a vein. From this fact we can only infer that the medicine operates upon the nervous centres which control the movements of the parts concerned in the act of vomiting, and it is more probable that it does so than that it irritates the terminal extremities of the nerves themselves. The *central influences* which occasion vomiting may be illustrated by the effect of the movements of a ship, a swing, a carriage, or even a rocking chair; of blows upon the head; of inflammation and other affections of the brain; of ideas of disgusting objects or sensations; and of certain emotions and passions, as fear, and the depression which follows violent anger. Under this head it is also proper to rank those singular cases in which

the power exists of emptying the stomach at will, by an act similar to that which is habitual with ruminating animals. We are acquainted with a family in which the father and a daughter both possess this faculty of relieving themselves of food which oppresses or annoys them. Vomiting may also be the consequence of *reflected irritation*, as when it is excited by tickling the fauces, by a calculus in the gall-ducts or ureters, by the contraction of the uterus in parturition, &c.

The phenomena of vomiting, particularly as excited by emetic substances, require a brief description, which, it may be proper to state, has reference rather to nauseating, than to so-called mechanical, emetics. The primary symptom is usually an uneasiness at the epigastrium, with general and undefinable discomfort, an anxious expression and paleness of the face, and perhaps a sense of chilliness with slight shuddering. The mouth is filled with saliva, and an irritation in the pharynx seems to respond to a laboring movement in the region of the stomach. The saliva is swallowed, and often with it mouthfuls of air, as if to repress the rising in the throat. Very soon spasmodic contractions of the abdominal muscles, diaphragm, and stomach take place, and with them the sense of nausea increases, and the general aspect of the patient is more and more that of prostration. The body is usually bent forwards, the head outstretched, and the straining efforts of the abdominal muscles are assisted by the hands clutching the knees, an assistant, or some piece of furniture within reach. The breath is held, and, often with a violent effort, the contents of the stomach are projected through the mouth and nostrils, and generally in successive gushes. After the food, a liquid is vomited which is usually sour, and if the retching continue, bile is thrown up under the double action of an anti-peristaltic movement of the intestine and the repeated acts of compression to which the gall-bladder and duodenum are subjected. During this stage of the operation, the pale and sunken aspect of the countenance is exchanged for a flushed and turgid appearance, the extremities are warm, the pulse full, and the skin is bathed in a warm and often copious perspiration; sometimes there is a simultaneous evacuation of the bowels, and even of the urine, but the last is almost exclusively a mechanical effect of the compression and percussion to which the abdominal viscera have been subjected. When the action of the emetic has terminated a sense of general relaxation, rather than debility, is experienced, and an inclination to sleep. When this is the case, the patient almost always awakes refreshed and relieved.

The mechanism by which these phenomena are produced consists partly of the contraction of the stomach itself, especially towards its

pyloric extremity, but mainly of the pressure to which it is subjected by the diaphragm on the one hand becoming fixed by a suspension of breathing during a full inspiration, and on the other by the abdominal muscles contracting forcibly, so as to thrust the bowels, and with them the stomach, against the diaphragm. In the very act of vomiting, the glottis is partially opened, as may be inferred both from the explosive noises which appear to issue from it, and the frequent entrance into it of portions of the matters vomited, which have then to be expelled by coughing.

The operation of emetics is manifold, and is both local and general.

As local stimulants, emetics act by increasing the afflux of blood to the stomach; and, so long as their immediate impression does not exceed physiological limits, they necessarily render its functions more active, augmenting the secretion of its special glands, while they also tend to diminish whatever congestion of the neighboring organs, and especially of the great secreting viscera, may exist. But the throes of vomiting exercise a direct influence upon these organs, mechanically agitating and compressing them, and therefore both facilitating the discharge of whatever secretion their ducts may already contain, and promoting the formation of a more abundant and easily secreted fluid. Hence, emetics deserve to stand first on the list of *deobstruent* remedies. In thus augmenting the discharge of the glands which are subservient to the function of digestion, they deprive the blood of a large quantity of fluid; not, indeed, as much as certain purgatives abstract, yet sufficient to be considered in estimating the sedative or antiphlogistic influence of the emetic treatment of disease. More particularly is this important, when we remember that their direct sedative impression upon the system, if less permanent, is much more rapid and decided than that of purgative medicines. Nor is their depletory operation, by an increase of secretion, confined to the abdominal organs. The profuse diaphoresis which they sometimes provoke, the discharge of mucus from the fauces, and the rapid increase of the bronchial secretion under their influence, indicate other important channels in which the effects of their spoliative action are developed.

The direct *sedative* influence of emetic, but more particularly of antimonial medicines, is one of their most important operations, including, as it does, both the nervous and the arterial systems. Its action upon the nervous system is chiefly manifested in the relaxation of muscular tension produced by various causes directly or indirectly irritating the muscular fibre. In spasmodic laryngitis it controls both the nervous and the vascular elements which constitute that affection, and it is not less efficient in relieving œsophageal spasm, overcoming rigidity of the os uteri, and relaxing the contraction of the muscles

which oppose the reduction of a dislocated joint. Even when spasm affects a large portion of the muscular system, the relaxing influence of nauseants and emetics is sometimes used with advantage, but only as a palliative, and in very robust patients. The sedative action of these medicines upon the vascular system is illustrated by its depressing influence on the pulse, and the subsidence of the heat, redness, and swelling of inflamed parts during their administration. These effects, together with the sudorific, emetic, laxative, and revulsive operation of tartar emetic, which will be illustrated more fully elsewhere, render it one of the most powerful among antiphlogistic agents.

The mechanical concussion produced by emetics, and their stimulant action upon the stomach and its associated organs, have been in all ages acknowledged to be of the utmost utility in the treatment of various diseases in which the function of digestion is more or less deranged. But the indications for their use which once were recognized, are now commonly regarded as illusory. Peccant humors, saburra, sordes, vitiated phlegm, and other analogous terms were applied to the real or supposed contents of the stomach, which emetics are fitted to evacuate. As an explanation of these words we may cite the description by Fothergill.[1] "Substances," he remarks, "which have a greater native tenacity than what the powers of the body can overcome, retaining their own nature, corrupt, and pass into a kind of ropy phlegm. The case is the same if the expulsive faculty of the stomach be weakened or hindered, which, as practitioners testify, often happens in debilitated habits; for then, though the ingesta be not remarkably faulty either in quantity or quality, yet they contract a vitiated quality which arises from it and is increased by their delay in the stomach. Hence arise different species of acrimony; hence the spring of mucus and tough pituitous matter; which, as they separately prevail, or are mixed together, aided by the temperament of the person inclined to this or that, they produce different, and sometimes truly alarming symptoms. So many kinds of depraved appetite; a total loss of it; a diminution or excessive increase of it; a vitiated, lessened, or total want of digestion; or a corruption of the undigested matter, often arise from these as their proximate causes." That this view has not been altogether lost sight of, is proved by the following statement of Sir Henry Holland, who says:[2] "The secretions from the mucous membrane lining this organ [the stomach] are frequently such in kind and quantity, that their removal becomes necessary to all further treatment; and, accordingly, we find that instant good is often

[1] Works, i. 88.

[2] Med. Notes and Reflections, Amer. ed., 1857, p. 388.

derived from emetics, when these matters alone are discharged." If the practice of administering emetics were more common, we believe that the correctness of the above descriptions would not be questioned, and it is also certain that they receive confirmation from the examination of persons who have died while laboring under such symptoms, especially when they occur among the phenomena of bilious remittent fever.

But the question presents itself, Whence do these vitiated secretions arise, and what is their pathological cause? The explanation given by Fothergill, that they are the result of a decomposition of the food, will not bear a moment's examination; for the products of animal and vegetable putrefaction could never be mucus of any description. The mucus, whatever its characters, can have but one source, the muciparous glands of the stomach. These, it is well known, are greatly enlarged in bilious fever and other forms of disease in which the so-called saburral state exists, and their enlargement is frequently associated with more or less thickening or softening, or both together, of the gastric mucous membrane. At the same time the tongue and gums are covered with a thick and pasty coating; the tongue itself is enlarged and flabby and indented with the teeth, and if the state continues, it gradually grows brown and dry; then its crust becomes fissured and ultimately peels off, leaving a raw, smooth, and dark-red epithelium exposed; the breath is also heavy, sour, or fetid. Accompanying this condition, there is always a greater or less degree of febrile movement, often limited to an evening exacerbation, yet usually manifest upon careful observation. In remittent fever, the existence of gastric inflammation, connected with these symptoms, is manifested by tenderness of the epigastrium, or even spontaneous distress in that region, by vomiting, usually of bilious matter, and by a high degree of fever, from which facts it appears to be only a reasonable conclusion that the state in question is a real and not a hypothetical one, and that it is the product of a process which, if not inflammatory in the sense of an inflammation produced by a direct irritant, such as arsenic or corrosive sublimate, is nevertheless essentially of that nature. Indeed, in the cases last named, the inflammation attacks the vascular rete of the mucous membrane, while in those especially under consideration as proper subjects of an emetic treatment, the glandular element is the seat of the peculiar alteration.

That emetics should be useful under such circumstances we must admit, not only as the result of direct experience in the gastric affections referred to, but also as a legitimate deduction from the admirable effects of stimulant remedies in follicular inflammation of the

fauces and larynx, applied directly to these parts, and also from the utility of medicines addressed to the stomach in the same affections, and which were long successfully employed to cure them before the topical medication of the accessible parts came into vogue. Indeed, a principal cause of the frequent failure of the latter is that it is too often employed alone, and without a due consideration of the symptoms which point to derangement of the stomach itself.

If, now, we reflect upon the operation of emetics as thus far described, we shall find in it a probable explanation of their value in the affections which are characterized by enlargement and an altered secretion of the mucous follicles of the stomach, whether we prefer to call this state inflammatory, or regard it as a perversion of function only. That it cannot with propriety receive the former title, purely and simply, is plain, because it tends neither to interstitial effusion nor to ulceration; yet it must be admitted to be sometimes associated with diffuse inflammation of the mucous membrane, as in some fatal cases of bilious remittent fever.

The so-called stimulant action of emetics has been referred to as being either immediate and remote or local and general. Their local stimulant property has, in some degree, been illustrated; their more general or remote effect is the consequence mainly of their local operation. It is not easy to perceive in this effect much more than the twofold influence which has already been pointed out as belonging to emetics, a local irritation tending to draw the fluids of the body to the stomach and evacuate them there, in so far diminishing the congestion of remote parts; and, in addition, a general perturbative action which tends to arouse the activity of organs which come within the sphere of its influence, in consequence of their taking a greater or less share in the act of vomiting. It appears very doubtful whether this influence is more than mechanical, and whether it is curative in any other way than by relieving the oppressed organs of the physical impediments to their free exercise. It is usually, however, explained by a reflex influence exerted through the nerves, as was suggested by Fothergill long before the rise of the theory of reflex nervous action. According to him, the local impression of the emetic upon the stomach "is propagated to the origin, termination, and extremities of the nerves, and also to the branches shooting off to the opposite region of the body;"[1] and by such a stimulant influence he explained the usefulness of these medicines in congestion of the brain, epilepsy, hypochondriasis, and chorea, and on a similar ground proposed them in spasm of

[1] Works, i. 79.

the glottis. Now, an observation of the effects of other remedies, and especially of purgatives, in these disorders leaves, we apprehend, no doubt that in all of the cases enumerated by Fothergill, whatever remedies have been found curative, do, and necessarily must, act by relieving certain affected parts of over-excitement, withdrawing it from them and scattering it through the system, or fixing it upon another locality in which it will cease to disturb the general harmony of the functions, or else, finally, by directly relaxing the spasm which constitutes the prominent phenomenon of the disease. The action, then, which has been attributed as stimulant to emetic medicines is, in reality, often revulsive or perturbative, or else a directly sedative action.

The *general indications* for the use of emetics may be inferred from what has already been said regarding their mode of action. The primary and most important one is the spontaneous effort of the stomach to reject its contents, as indicated by persistent nausea and retching. If the organ is in a state of repletion, or is known to contain a noxious substance, the propriety of administering these medicines is unquestionable; but it is not so easy to decide in regard to this point in the absence of such an indication. Nausea and vomiting are symptoms of affections of the stomach, such as simple and cancerous ulcer, and active inflammation from acrid poisons, which would almost certainly be aggravated by the action of even the mildest of the emetic medicines. In these cases, therefore, they should be avoided; and whenever acute and active gastritis is indicated by high fever, a red and dry tongue, intense thirst, burning pain and tenderness on pressure in the epigastrium, and the vomiting of everything which is swallowed, they would prove exceedingly mischievous, and, perhaps, fatally so. But, on the other hand, if the tongue is covered with a thick, pasty coating, of a sweetish, bitter, saltish, or sour taste; if the breath is heavy or fetid; if there exist a loathing of food, nausea, or straining, with a feeling of sinking or great oppression at the epigastrium, and eructations of a sour, acrid, or bitter liquid, and if, in addition to these symptoms, the complexion has an earthy or dull hue, and the sclerotica a muddy or jaundiced aspect, the propriety of administering an emetic cannot be for a moment doubted.

As regards the *contraindications* for the use of emetics, in addition to gastric inflammation or disorganization already mentioned, there are but few circumstances in which they are absolutely inadmissible. Undoubtedly, they should be cautiously employed in all cases of imminent hemorrhage from any organ, whether uterine, cerebral, pulmonary, or any other; but the absolute objection to them sometimes

inculcated, appears to be based upon theoretical rather than upon practical grounds; for it does not appear that ipecacuanha, at least, has ever been charged with any disasters of the nature referred to, and if some rare instances of the sort have been alleged against tartar emetic, they should not be allowed to deprive us of the advantages derivable from other articles of the same class. It is well known that emetics have been successfully used to check pulmonary and uterine hemorrhage; and it is questionable whether a single instance of fatal consequences from this use of them is recorded; on the contrary, they have been constantly employed with success in checking these and other forms of idiopathic hemorrhage. At the same time, it is, perhaps, the part of prudence in all of the disorders referred to, to make use of the milder and less exhausting articles of the class. Whenever a patient is affected with hernia, prolapsus of the rectum or uterus, any enlargement of the abdomen from pregnancy, a hypertrophied organ, a morbid tumor, or even a large collection of fæces in the intestine, emetics are, indeed, not contraindicated, but should be circumspectly used, and the mildest articles of their class preferred.

As a general rule, nauseant emetics are unsuitable to persons advanced in life, because they depress the heart and tend to augment unduly the bronchial secretion; but the mechanical emetics, such as sulphate of zinc or copper, or alum, may be administered without apprehension in appropriate cases. On the other hand, emetics are of all medicines the most useful in many diseases of children. Young persons vomit without much effort; indeed, it seems with infants to be a normal act for relieving an oppressed stomach, and many of the diseases incident to childhood are treated by no class of remedies so successfully as by these. Especially may they be regarded as a most precious resource in affections of the air-passages in early life. But this remark scarcely applies to tartar emetic, whose sedative powers are often developed in children with frightful violence and fatal effect, and by doses which, when prescribed, were expected to produce only nausea, or gentle vomiting at the most.

Something of a similar, and what may be called a poisonous effect of emetic medicines, is occasionally met with even among adults, and suggests caution in their use. Violent vomiting and purging and general collapse have, in numerous instances, been observed to result from a fractional dose of tartar emetic, and in some rare examples, a similar susceptibility to the action of ipecacuanha has been noticed. On the other hand, a remarkable insensibility to these and to other emetics, has sometimes been observed as a personal peculiarity, and it also ordinarily exists whenever the brain is morbidly excited, as in

cases of inflammation of this organ, and during the functional excitement of mania and delirium. The same torpor of the stomach is noticed in an apparently opposite condition of the brain, viz: when it is rendered torpid by narcotic medicines, and when it is subjected to mechanical compression resulting from external violence, or from disease within the cranium.

Of all the untoward effects of emetics, the gravest is coagulation of the blood in the arteries, in consequence of prolonged syncope, or extreme collapse. Trousseau quotes several examples of this accident. Wepfer relates the case of a female who was attacked with violent vomiting, followed by prolonged syncope. Soon afterwards she was seized with a very acute pain in the right foot, which, on the following day, was affected with gangrene. In another case the nose, lower lip, chin, and several toes sphacelated; and in a third case the same parts, and also the hands, were attacked, and one of the feet, besides several toes of the other foot, was lost. It is probable that these unfortunate effects were due to coagulation of the blood in the arteries.

Forms of Disease in which Emetics may be used.

Fevers.—The use of emetics in *continued fever*, by which term we here intend to designate not only typhus and typhoid fevers, but ephemeral and simple continued fevers, is advantageous chiefly, if not exclusively, in the forming stage of the attack, before the conditions of the disease are permanently fixed. At this period they often manifest a clearly moderating influence upon the subsequent course and grade of the symptoms, but probably cannot be depended upon for effecting a cure. During epidemics of the graver forms of these affections, however, when certain premonitory symptoms announce the approaching attack, it may not infrequently be arrested by the thorough operation of an emetic, which, in this case, exerts its eliminative and perturbative action together. The palliative influence spoken of above, is strikingly exhibited in all the forms of *eruptive fever*, provided that cases are selected for its use which are of a sthenic type, that it be employed before the appearance of the eruption, and that sedative emetics be not selected for the purpose. Under the circumstances referred to, the use of tartar emetic would be in the highest degree hazardous. It will be observed that all of these forms of fever except the ephemeral, are strictly blood diseases, and, therefore, that an eliminant treatment, which is, on the whole, sedative rather than stimulant, cannot be expected to furnish the most favorable results. *Periodical fevers*, the phenomena of which are manifested chiefly by a peculiar disturbance of the nervous system, are much more advan-

tageously treated by emetics. The simpler forms of intermittent fever, and especially the vernal cases, may often be cured by these remedies alone; as Fothergill expresses it, "their operation seems something wonderful." As regards autumnal fevers, and in proportion as they assume more of a bilious type, the same treatment is invaluable in many cases which refuse to yield to the administration of quinia alone. It must have happened to every physician to meet with instances of the disease for which bark seemed to have lost its virtues, until an emetic, perhaps combined with a cathartic, placed the system in a condition favorable for the action of the specific remedy. In many cases, also, in which an irregularity of the paroxysms, whether of degree of development, order of succession of the stages, or some other departure from the normal type, exists, the operation of an emetic restores the phenomena to their due sequence and proportion, and renders the disease easily curable by the ordinary means.

Inflammations.—There are few inflammatory affections in which emetics are not serviceable by one or another of their modes of operation, but in nearly all their utility is most conspicuous, as it is in idiopathic fevers, before the full development of the attack. It is enhanced in the greater number of this class of diseases, by the previous employment of depletory measures. Emetics sometimes avail to arrest the development, or render comparatively tractable, even so formidable a disease as *meningitis*, when prescribed during its forming stage. Of their use in *spasmodic laryngitis*, comprising an inflammatory and a nervous element, we have already spoken; and in *pseudo-membranous laryngitis*, nauseant emetics are valuable during the first stage for limiting and restraining the violence of the inflammation, and subsequently, mechanical emetics for expelling the obstructions of the air-passages. Quite an analogous mode of operation is displayed by these remedies in *bronchitis* and *influenza*, that is to say, they promote the bronchial secretions, and at the same time occasion their discharge; and the mechanical emetics are of the greatest value in those forms of bronchial disease, such as *bronchorrhœa*, in which the inflammatory element is slight, or null, but the amount of secretion is excessive. Cases are on record in which the administration of an emetic by the rectum, or its injection into the veins, has caused the expulsion of a fragment of food lodged in the larynx; and the same means have been used to clear the air-passages of newborn children of mucus, and thereby dissipate the *asphyxia* which would else have proved fatal. The forming stage of *tubercular phthisis* has been treated by emetics with alleged advantage. They are presumed to have been useful by their tending to produce the elimination of the imperfectly

concreted tuberculous matter. In *pneumonia* the sedative action of emetics is chiefly to be regarded, and indeed, it is less as an emetic than as a sedative that antimony has been found so valuable in this affection.

In inflammations of the *digestive organs* the uses of emetics are manifold. No other remedy acts so promptly to cure *tonsillitis*, *parotitis*, *ulcerative stomatitis*, and *aphthæ*, or follicular ulceration of the mouth. The affections of the *stomach* which are benefited by emetics have already been pointed out as comprising those which are not of a purely inflammatory type, and the same remark is quite as applicable to enteric disorders. But one among them is an exception to this statement, and that is *dysentery;* but the only emetic which favorably influences it is ipecacuanha. Wherefore it may be concluded that the curative power of the medicine, like the disease it cures, is specific, and not dependent upon its evacuant or its sedative operation. *Jaundice* has sometimes been treated with emetics, under the impression that the discoloration of the skin is due to the presence of inspissated bile, or some other mechanical obstacle in the ducts; but the want of success of such measures, and a better knowledge of the causes of this affection, have led to an abandonment of the method, except in the slighter cases free from any threatening symptoms.

In several diseases of the *nervous system* emetics are of signal service. *Apoplectic* symptoms produced by sanguineous congestion or effusion within the cranium, cannot be safely treated by these medicines, or, at least, not unless the free use of depletory means has proved unavailing. Consequently all cases in which paralysis accompanies loss of consciousness, with a full pulse and injected countenance, they ought not to be employed. When the pulse is feeble, and the skin pale and cool, there is more reason to expect them to be useful. When the cerebral symptoms arise from *narcotic poisoning*, or from *indigestible food* in the stomach, an emetic is the natural remedy, and in the latter case, indeed, is sometimes indicated by spontaneous attempts at vomiting. This class of medicines is perhaps the most efficient of all in *delirium tremens*, and still more so in *mania-a-potu*, or the affection produced as the direct and immediate effect of intoxicating drinks. *Insanity*, especially of the melancholic form, has sometimes been advantageously treated by emetics; but they are less serviceable than cathartics, at least when used alone. In combination with the latter medicines, and in the form of the disease just indicated, they have in all ages been renowned for their efficacy. A spasmodic affection in which they should not be neglected is *singultus*.

Of other affections which are sometimes benefited by emetics, it may

be sufficient here to mention *dropsy*, which they may cure, when the effusion is independent of mechanical causes, and palliate when it originates in such causes, by an influence exerted upon absorption and secretion; *rheumatism* in its forming stage, the progress of which the diaphoretic action of emetics may then arrest; *erysipelas*, especially of the face, which is often associated with gastric derangement and bilious symptoms; *swelled testicle* for which, in its commencement, an antimonial emetic, followed by nauseating doses of the same medicine, is sometimes a speedy cure, &c. It is unnecessary to supply a greater number of illustrations of the curative operation of emetics, as they will be found treated of in connection with the individual medicines of this class.

Emetics may be classified according to their origin in the vegetable or mineral kingdom; but this is an arrangement of no practical value, except as facilitating the search for any one of the class in systematic works which treat of them. Or they may be grouped according to the grade of their action, the mildest being oil and tepid water, or bitter infusions, which operate chiefly by their bulk, but somewhat by their nauseous taste; then follow mechanical emetics, so called, including the sulphates of copper, zinc, and iron, and the sulphuret of mercury; next to these horseradish, mustard, and squills, which nauseate but do not depress; ipecacuanha might then be considered, standing as it does almost alone in its peculiarities, but more analogous to squill than to any other of its associated medicines; and finally white hellebore, tobacco, and tartar emetic, might be grouped together as being all powerful sedatives and emeto-cathartics. But the greater number of the substances now enumerated belong to other classes of the materia medica, the expectorants, diaphoretics, nervous sedatives, irritants, &c., and it would, therefore, be inconvenient and unprofitable to introduce a description of them into the present division of the work. Their emetic virtues will be found treated of in connection with the several articles which have been named.

The unequal degrees of emetic effect possessed by these medicines, and the different actions conjoined with it, render it impossible to substitute one for another indifferently in the treatment of disease. If it be intended merely to evacuate the stomach without inducing any constitutional effect, some one of the goup of mechanical emetics which act by their bulk or their local irritation only, or of the irritant group which nauseate but slightly, should be preferred; but if a constitutional effect involving the condition of the nervous system, the circulation, and the secretions, is desired, then some of the nauseant articles will be selected, and, according to the nature of the case, those which pro-

duce a slight and transient, or a profound and prolonged depression of the economy. Of this last group, ipecacuanha stands on one side and tartar emetic on the other. The former should generally be preferred when the patient is young or delicate, and when the bowels are relaxed; the latter is more appropriate for robust and plethoric persons, when it is intended to agitate the whole system, and when a purgative operation, in addition to emesis, is sought to be produced.

THE ADMINISTRATION OF EMETICS.—The mode in which emetics should be administered will depend upon the object in view. When it is proposed merely to evacuate the stomach, as when some poisonous agent or improper food has been taken, a large quantity of lukewarm water, or of a weak bitter infusion, should be given in frequent and copious draughts, so as to produce the most rapid discharge of the offending substance, with the least possible irritation of the organ itself. Or one of the mechanical emetics may be administered, and after vomiting has commenced, draughts of the diluent liquids referred to will be found useful in sustaining while it moderates the operation. In such cases ipecacuanha may also be employed alone, or in conjunction with other emetic substances, if they should prove insufficient of themselves, and in all such cases the full dose judged necessary should be administered at once.

But when it is intended to make a strong impression upon the system, by means of the perturbative action of the medicine, to promote the secretions, and reduce excitement, a more prolonged emetic operation is required. This may be secured by administering the emetic upon an empty stomach, and in portions of one-fourth or one-third of the whole dose prescribed, at intervals of ten or fifteen minutes, until efforts at vomiting begin to be made, or emesis has actually commenced. Small portions of liquid may then be allowed, but when the evacuation has been pretty complete, and not before, should copious draughts of lukewarm liquids be taken to moderate the severity of the straining, and thoroughly to cleanse the stomach. In general, the operation ought not to cease until bile has been evacuated.

If the vomiting continues longer than is intended, or than is necessary, it may be moderated by the use of neutral mixture with the addition of a little hydrocyanic acid; by a small quantity of lemon-juice, or of peppermint, or other aromatic water; by a full dose of morphia, or an enema containing forty or fifty drops of laudanum; or by an aromatic plaster applied to the epigastrium.

For some hours afterwards no food should be taken, and for one or two days it should consist only of unirritating and digestible articles.

ZINCI SULPHAS.—Sulphate of Zinc.

History.—This salt has been known since the beginning of the fourteenth century, when it was prepared in Carinthia out of the ores of zinc. It was called Gilla by Paracelsus, who first taught how to purify it, and who used it medicinally. In 1735, its composition was shown by Brand.[1] Native sulphate of zinc is said to exist at Rammelsberg in the Harz Mountains, near Goslar, and also at Holywell in Flintshire, England, and in other places.[2] It is commonly known as *white vitriol*, and is prepared artificially by dissolving zinc in diluted sulphuric acid.

Action. *On Animals.*—According to the experiments of Orfila and others, this substance inflames the mucous membrane of the stomach, after having produced active vomiting with epigastric pain. Vomiting was still the most prominent symptom even when a solution of the salt was thrown into the jugular vein of a dog.

On Man.—The local action of sulphate of zinc is astringent and drying, but if its application is continued it becomes irritant and caustic. Toulmouche found that in doses of two grains it seldom produced vomiting. In four grain doses it occasioned some vomiting, with liquid stools in more than half the cases. Doses of six, eight, ten, and twelve grains almost always produced vomiting, and purging about half as often. Doses of fifteen grains caused vomiting in one-third only of the cases, and diarrhœa in two-thirds. In nearly all there was more or less colic, but very little nausea.[3] Although examples are not wanting of death produced by sulphate of zinc, yet the number of them is small. In general, the emetic quality of the medicine insures the speedy rejection of a large dose, or at least of its greater part. Large doses of it (thirty grains or more) produce a styptic taste in the mouth, constriction of the fauces, pain in the stomach and bowels, retching, violent vomiting, purging, distress, thirst, a contracted pulse, cold extremities, and sometimes death.[4]

Dr. Brennan has reported the case of a man who took four ounces of sulphate of zinc in mistake for Epsom salts. It was dissolved in five ounces of warm water. Immediately he experienced a sensation of violent distension of the head, was seized with coldness, shivering, and prostration; his features were contracted and of a leaden hue, and he felt a choking sensation with constriction around the chest. Spasms affected the eyeballs and upper extremities; there was tenderness in

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[1] Richter, Ausfür. Arzneim., iv. 530.
[2] Pereira, Mat. Med.
[3] Dierbach, Neueste Entdeck., iii. 520.
[4] Wibmer, Wirkung, &c., v. 468.

the throat, epigastrium, and abdomen; the respiration was 15 and feeble, the pulse 60 and languid, and there was incessant vomiting and purging. The mind was clear, and the patient recovered. Diarrhœa continued for several days.[1]

The secondary effects of the medicine, or those which result from its absorption, rank it among tonics and astringents. Probably, as a still more remote effect, its action is antispasmodic. It has also been thought to exert a specific action upon the bronchial tubes, by diminishing the secretion of their mucous membrane.

Uses. *Externally.*—It is chiefly employed for the sake of its astringent qualities, and both in solution and in the form of an ointment. The former is frequently used in subacute or chronic inflammations of the conjunctiva, of the auditory and nasal passages, the throat, vagina, and urethra, and also after the extirpation of polypi from any of these parts. Michaelis highly recommended a wash composed of this substance with extract of cinchona, catechu, and honey of roses, in the treatment of *cancrum oris*. Armstrong and others employed it successfully for the cure of *aphthæ*. The strength of the solution employed must be determined by the sensibility of the inflamed membrane. In *ophthalmia* collyria should seldom contain more than one grain of the salt to an ounce of water, and the same proportion is suitable in *gonorrhœa*. For *leucorrhœa*, a somewhat stronger preparation is more effectual. Wishart employed successfully the following solution in *ophthalmia neonatorum*:[2] ℞.—Sulph. zinci ℈j; aquæ ℥x; liq. zinci subacet. ʒss; spt. camphoræ ʒj-ij. A portion of this mixture was injected between the lids by means of a syringe, from three to six times a day. As an application to the nasal passages, to the mucous membrane of the mouth, throat, &c., a solution of ten grains to the ounce is not too strong. It has been used successfully to arrest coryza in its forming stage, as well as to moderate an excessive purulent discharge from the nostrils. Injections of a solution of the salt into the *bladder* have also served to arrest *hemorrhage* from this organ. In *epistaxis* a plug of cotton wool covered with finely-powdered sulphate of zinc has been successfully employed. *Polypi* of the nostrils have been made to shrivel by means of insufflations of powdered sulphate of zinc, so that they could be more readily extirpated by means of the forceps. As before remarked, a solution of the salt has been applied to prevent the reproduction of such tumors. Lisfranc had recourse to a solution of the sulphate (ʒj to ℥j) which he applied lightly by means of a camel's hair pencil after the

[1] Lancet, July, 1855, p. 52. [2] Edinb. Med. and Surg. Journ., Oct. 1829, p. 253.

inflammation caused by the removal of the polypus had subsided.[1] It has also been employed to prepare washes and ointments in a variety of cutaneous affections, particularly *chronic eczema* and *scabies*.

Dr. J. Y. Simpson has recommended anhydrous and finely-levigated sulphate of zinc made into a paste with glycerin (glycerin ℥j; prepared sulphate of zinc ʒj;) or with lard (lard ℥ij; prepared sulphate of zinc ʒj;) as a caustic application to indurated ulcers of the cervix uteri, lupus of the face, impetigo rodens, sensitive tumors of the female urethra, condylomata, &c. It will not act upon parts covered with cuticle or epithelium, but on the denuded tissue beneath it produces severe burning pain, which may be palliated by applying along with it a salt of morphia. Its eschar is stated to separate more rapidly than that of most other caustics, viz., on the fifth or sixth day, and it is further recommended by its perfect safety and its having no tendency to deliquesce or spread.[2]

Internally.—This substance was formerly much more employed than at present as an *emetic*. It was used especially, in doses of from ten to twenty grains, for the purpose of evacuating the stomach, without producing nausea or diarrhœa, in cases of *narcotic poisoning*, *indigestion*, &c. Some writers, indeed, as Gmelin and Moseley, contend that it rather fortifies the stomach than weakens it; but this opinion may very plausibly be questioned. On account of its mechanical mode of producing emesis it has been much employed in *croup* to promote the expulsion of false membranes from the air-passages. One of the earliest instances of its successful use for this purpose occurred in the practice of Dr. Francis, of New York.[3]

Sulphate of zinc has been much used as an astringent in chronic affections of the bowels attended with diarrhœa. Moseley attached great importance to it in the treatment of tropical *dysentery*, but as he prescribed it in combination with alum and cochineal, its precise efficacy cannot readily be inferred.[4] Baumgartner employed it in *typhoid fever*[5] with the object of healing the intestinal ulcers which have erroneously been looked upon as the starting point of the symptoms of the disease. So far as these local lesions are concerned, it may undoubtedly promote their cicatrization, while it strengthens the nervous system and moderates the diarrhœa. Baumgartner prescribed it in solution, and in doses of two or three grains three times a day. In obstinate *intermittent* fever it sometimes proves efficacious.

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[1] Bull. de Thérap., xviii. 213.
[2] Times and Gaz., Jan. 1857, p. 56.
[3] Hosack's Essays, ii. 170.
[4] On Tropical Diseases, p. 402, and al.
[5] Richter, op. cit., suppl. bd. p. 569.

W. Phillip alleges the utility of sulphate of zinc in certain forms of *dyspepsia*, but the cases in which he found it useful are not very distinctly described. They are such, probably, as those in which the medicine was recommended by Moseley and by Strong, cases distinguished by constipation and by flatulent distension after meals. Dr. Strong directed a pill containing three grains of the medicine to be taken four or five times in twenty-four hours.[1] From the general efficacy of tonics in removing this form of disease, and, contrary to prevalent opinions, in overcoming a constipated state of the bowels, the utility of the sulphate of zinc may be readily understood.

Sulphate of zinc has been highly recommended in several nervous disorders. In some cases of nervous *palpitation of the heart* it has seemed beneficial. Spasmodic *asthma*, spasmodic *coughs*,[2] and even *whooping-cough*, are said to have yielded to it. Under its administration, numerous cures of *chorea* have been effected. Dr. Hughes[3] has published a summary of sixty-three cases of this disease in which it was administered, and of that number forty-five recovered. The dose given at first was two grains three times a day, and it was afterwards gradually increased until in some instances no less than thirty-six grains were taken at a dose. Romberg[4] says that it has not merited much praise in the cases that have fallen under his observation. In *chronic discharges* from the genito-urinary organs of either sex it has been recommended as an internal medicine. Injections of sulphate of zinc dissolved in water have been successfully employed to arrest uterine *hemorrhage*, but they are probably more effectual in bleeding from fungous growths of the uterus or vagina. It may also be used to arrest hæmorrhoidal discharges.

ADMINISTRATION.—As an emetic, sulphate of zinc may be given in doses of from *ten* to *thirty* or *forty* grains. For other internal uses, *two* grains three times a day may be prescribed, and the quantity gradually increased until it reaches twenty or more grains. For external application, the ordinary strength of the solution of this salt should be from *one* to *three* or *four* grains to an ounce of water.

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[1] Edinb. Med. and Surg. Journ., Oct. 1842, p. 408.

[2] MOSELEY, op. cit., p. 558.

[3] GUY'S Hospital Reports, 1846.

[4] Diseases of the Nervous System, p. 75.

ANTIMONII ET POTASSÆ TARTRAS.—Tartrate of Antimony and Potassa; Tartarized Antimony; Tartar Emetic.

Description.—"Tartrate of antimony and potash is prepared by boiling water and bitartrate of potassa with teroxide of antimony." "It is in the form of transparent, colorless crystals, which possess a nauseous, metallic, styptic taste, and have usually the form of rhombic octohedrons. When exposed to the air they effloresce slightly and become white and opaque. In the shops it is found as an amorphous powder. It is insoluble in alcohol, but dissolves in proof spirit and wine. It also dissolves in about fifteen parts of water at 60° F., and in between two and three parts of boiling water." Its aqueous solution reddens litmus slightly, and when kept for some time undergoes decomposition and forms a soft, flexible, mucilaginous mass, composed chiefly of algaceous plants. "It is incompatible with acids, with alkalies and their carbonates, with some of the earths and metals, with chloride of calcium, and with acetate and subacetate of lead." It is also incompatible with astringent vegetable infusions and decoctions; but they do not, unless the preparations of galls be exceptions, render it inert, although they lessen its activity.

History.—The origin of the word *antimony* is uncertain. It is, indeed, commonly said that the chemist and monk Basil Valentine poisoned a number of his brethren by purging them too much with it; hence in French it might significantly be called *antimoine*.[1] The story is elsewhere told with some variations. A German monk, Valentine, having thrown to the pigs some antimony which he had used to promote the melting of other metals, found that, although it purged the animals very actively, they nevertheless grew fat. But on trying the same experiment upon his brethren, the monks, he met with such indifferent success that they all died.[2] It is more probable that the word is a corruption or imitation of the Arabian term for this metal, *atimad*.

The first mention of the medicinal virtues of antimony was by Basil Valentine. He seems to have been acquainted with the teroxide (*flores antimonii*), the red sulphuret (*sulphur of antimony*), and the terchloride (*butter*) of antimony. This was at the close of the fifteenth or at the beginning of the sixteenth century. Paracelsus, who lived at this period, contributed much to bring antimonial medicines into

[1] Allston, Mat. Med., i. 295.

[2] Querelles Littéraires, iv. 82.

vogue, but he also helped to divide the medical profession into two hostile camps, which for a long time carried on a furious contest relative to these preparations.[1] So bitterly were their partisans denounced that in 1566 the opponents of the medicine succeeded in obtaining a decree of the Faculty of Physic at Paris, backed by an act of the Parliament, which condemned antimony as a poison and prohibited its use. Antimonials continued, notwithstanding, to be used, but probably by irregular practitioners, for as late as 1609 a physician named Besnier was expelled from the Faculty for having prescribed them.[2] In 1637, however, antimony was received into the official codex, or pharmacopœia, as a purgative, and thirty years later (1666), the original decree against the remedy was rescinded by the Parliament upon the petition of the Medical Faculty itself. During the period of this controversy (1619), Mark Cornacchini, Professor in the University of Pisa, announced as almost a panacea, and soon brought into vogue, a powder composed by the Earl of Warwick, and which consisted of scammony, sulphuret of antimony, and cream of tartar.[3] Very probably, by observing the reaction of these substances, Mynsicht, of Mechlinburg, was led to the discovery, in 1631, of the preparation of antimony which forms the subject of this article, and to which he gave the name of tartar emetic.

Action. *On Animals.*—Viborg found[4] that when this substance was injected into the *veins* of horses in doses of from twelve to thirty grains, it occasioned a frequent and small pulse, trembling and twitching of the muscles of the skin, gaping, and a drooping look. On the injection of sixty grains the symptoms were very striking. The pulse became very frequent, and the breathing spasmodic and noisy; there were thin dejections, a copious secretion of sweat, tears, and saliva; automatic movements of the lips and of the tongue, as in the act of licking, a grinding movement of the lower jaw, restlessness, stretching of the limbs, scratching of the flanks with the hinder feet, and a frequent movement of the head towards the same part, and tremulousness with spasms of the shoulders, neck, and hams. When the quantity injected reached one hundred and twenty grains, the symptoms were sudden and violent. There were cramps, vertigo, paralysis, and death within three hours. According to Lappe and Hertwich, when the substance was administered by the stomach in doses of one or two drachms every three or four hours, there occurred, sooner or later, diarrhœa, debility, increased secretion from the mucous membranes,

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[1] Allston, loc. cit.
[2] Sprengel, Hist. de la Méd., iii. 121.
[3] Biographie Universelle, ix. 597.
[4] Wibmer, Wirkung, &c., v. 187, 194.

and, if the medicine was continued, a sort of typhoid condition, with diminished plasticity of the blood. Half an ounce given at a single dose caused frequency of the pulse, thirst, borborygmi, and muscular spasms. An ounce caused death, but only when administered in solution, in about eight hours; two ounces produced the same result in two hours and a half. Experiments upon *dogs* with this substance have been performed by many persons, and in various ways. The first among them, Courten (1678), has furnished nearly as complete an account of its effects as any of his successors. When injected into the veins a solution of from three to eight grains occasioned death in the course of two or three hours. In some of Magendie's experiments from twelve to eighteen grains were employed, and produced death within half an hour. The symptoms were depression, retching, vomiting, purging, nausea, and hurried breathing, restlessness, a rapid pulse, spasms of the limbs, moaning, exhaustion, and death. The heart and lungs, after death, were found distended with dark blood, and there was vascular injection of the stomach and duodenum. Magendie, on administering tartar emetic by the veins to an animal whose stomach had been removed and replaced by a bladder, found that vomiting was still excited by the contraction of the diaphragm and abdominal muscles. This, however, does not exclude the action of the medicine directly upon the stomach even when thus introduced into the system. Indeed, Dr. Brinton showed that when injected into the veins of an animal, it is in great part eliminated by the stomach.[1]

From a very carefully conducted series of experiments upon animals, Dr. Richardson drew various conclusions, of which the following is a summary: 1. Tartar emetic excites the same symptoms in dogs as in man. 2. All the permeable tissues absorb it, and its effects are specifically the same by whatever channel, including the blood, it may be introduced. 3. After absorption it may be detected in the blood, the serum, the urine, and all the organs. 4. It excites marked local effects in any membrane by which it is eliminated, and hence, however introduced into the system, it causes redness of the lining membrane of the stomach, and the symptoms which attend its direct introduction into this organ. 5. In large doses it produces vomiting and purging, and rapid collapse; but small doses long continued may cause death by exhaustion. 6. The immediate cause of death from this agent is, in all cases, failure of the heart's action. 7. The post-mortem lesions produced by it are general congestion; fluidity of the blood; intense vascularity of the greater curvature of the the stomach,

[1] Cyclopæd. of Anat., suppl., p. 319.

and in some cases of the rectum, and other parts of the canal, but without ulceration; and a pale-yellow, glairy mucous secretion. 8. In rapid poisoning by tartar emetic the fatal effect seems due to a direct chemical change in the blood, and an indirect effect therefrom upon the heart; while in slow poisoning there is added an interference with the assimilative powers, the result of the lesions excited in the stomach or other parts of the alimentary canal.[1] Dr. Nevin's experiments upon *rabbits* with comparatively small doses of tartar emetic, illustrated its power of producing gradual emaciation in these animals.[2] The experiments of Hertwich and Viborg show that *pigs* support the action of tartar emetic remarkably well. In doses of from ten to sixty grains, given to pigs of less than a year old, it produced vomiting and debility, but no severer symptoms. When the dose was raised to two drachms there were, in addition, signs of suffering, great thirst, convulsions, and death. Daubenton observed diarrhœa, distension of the paunch, and grinding of the teeth, as effects of the medicine given to *sheep*. By experiments upon cats, dogs, &c., it has been found that the specific effects of the medicine were produced by injecting a solution of it into the *cellular tissue; i. e.*, there was vomiting, with depression, &c.; the gastro-intestinal mucous membrane was found injected, and there was much congestion of the lungs.

On Man.—Endermically. The first idea of administering tartar emetic by the skin was suggested by Blizard, but the earliest application of it to the treatment of internal diseases was made by Mr. Sherwen, in 1787.[3] According to him, if a solution of tartar emetic was rubbed into the palms of the hands it produced a burning sensation in these parts, with nausea, perspiration, rumbling of the bowels, and diarrhœa. In some cases there was an increased discharge of urine. Gaitshell, who soon afterwards repeated these experiments,[4] obtained no such results. He only produced a copious eruption of pustules which he was the first to describe as an effect of tartar emetic. The last observation was confirmed by Bradley, in 1793,[5] who, however, denied that the solution produced even general diaphoresis. Hutchinson, on the other hand,[6] in 1795, corroborated in the main Sherwen's results; and the later experiments of Gendrin, who saw violent vomiting and purging in four cases produced by frictions with tartar emetic ointment made by mixing a solution of the salt with lard;[7] of Lembert, who observed in addition, general sweating and diuresis; of Bertini,

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[1] Times and Gaz., May, 1856, p. 473.
[2] Liverpool Med. Journ., Jan. 1857, p. 43.
[3] Memoirs of Lond. Med. Soc., ii. 390.
[4] Ibid., iv. 79.
[5] Ibid., p. 247.
[6] Ibid., v. 81.
[7] Dierbach, Neueste Entdeckungen, iii. 373.

who noticed violent colic and diarrhœa produced by a pitch plaster with tartar emetic applied to the abdomen;[1] and of Strambio, who observed slow pulse, pallor, coldness, vertigo, faintness, and debility,[2] from the same cause; all of these, and other examples that might be cited, prove that a frequent consequence of applying tartar emetic to the skin is derangement of the stomach and bowels, with diaphoresis and depression of the whole system.

The local effects of the application are these. A superficial and slight redness is almost the only effect of the watery solution; but when the medicine is retained in contact with the skin by being mixed with fat or some adhesive substance, it at first produces redness, and afterwards pustules which closely resemble those of smallpox, like which they form scabs, and may leave indelible scars behind them. This eruption is usually mature on the fourth or fifth day from its first appearance.[3] Sometimes, in consequence of the delicacy or the diseased state of the skin, or the quantity of the salt applied, large and deep sloughs are produced, and create a permanent deformity. They may even produce a fatal effect. Neumann[4] saw caries of the sternum and of the vertebræ produced by this ointment in the treatment of whooping-cough. A similar result has been witnessed when the ointment was used to recall a suppressed eruption of tinea.[5] These untoward effects seem most likely to occur when the tartar emetic is applied upon plasters.

The action of tartar emetic upon the skin is by no means uniform. In some persons this tissue is very insensible to its impression, while in others it appears to be morbidly susceptible. A similar difference is observed in the absorbent powers of the skin. As a general rule, pustulation is said to be produced with difficulty in cases of visceral inflammation of a high grade, and in fevers of the same class; yet, according to some authorities, the system becomes readily affected under the same circumstances. But when the febrile state declines, the skin regains its susceptibility, and a characteristic eruption appears upon the parts where the frictions were made.[6] Many writers have reported that the application of tartar emetic ointment upon one part has been followed by a crop of pustules upon another and often distant region of the body. But when the cases which they cite are examined, it is at once perceived that the seat of the supposed secondary eruption is always a very delicate portion of the skin, and just

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[1] Dierbach, Neueste Entdeckungen, iii. 373.
[2] Giacomini, op. cit., p. 262.
[3] Wibmer, Wirkung, &c.
[4] Heilmittellehre, p. 521.
[5] Bull. de Thérap., vii. 342.
[6] Guérin and Duparcque, Bull. de Thérap., xlii. 49.

such a one as would be apt to have the ointment carried to it by the patient's hands from the part first rubbed. Such parts are the lips, the nostrils, the genital organs, the anus, &c. The absorption of this medicine by the tissues, and its circulation through the system, may be further illustrated by one or two examples. A dose of tartar emetic was administered to a nursing-woman suffering from pleurisy; when next the child took the breast it was seized with active vomiting.[1] Orfila,[2] as an ordinary result of his experiments, found traces of antimony in the liver, kidneys, and urine of the animals employed. He also in several instances detected a considerable quantity of this substance in the urine of patients who had been taking large doses of it.

The experiments of Lieberkühn, Fontana, Magendie, Dupuy, and others, show that even when a solution of tartar emetic is *injected into the veins*, its principal effects are manifested in the stomach. Several cases are collected by Wibmer,[3] in which this method was employed to cause the expulsion of foreign bodies lodged in the œsophagus. From these examples it would appear that the promptness of the effect was not indicated by the quantity of tartar emetic employed. Thus, in four cases the quantities injected were severally six, four, three, and two grains, but the periods at which vomiting commenced were respectively thirty, one, fifteen, and fifteen minutes. Given by *enema*, this medicine purges, and sometimes vomits also.

Internally. Small Doses.—Mayerhoffer, who seems to have conducted his experiments carefully, asserts that the repeated use of even so small a dose as the one-hundredth of a grain occasioned a sensible derangement of the functions, which, however, became more distinct as the dose approached one grain.[4] When the quantity was gradually augmented until an emetic dose was reached, the following effects were observed: The malaise and nausea, which had before existed, increased, with frequent eructations, and retchings followed by vomiting; the stools were frothy, and consisted of mucus and bile; the abdomen was distended and painful; the urine, which at first had been copious, became scanty; the region of the liver was tender upon pressure; rumbling and cooing sounds proceeded from the abdomen, which was the seat of tearing, cutting, and griping pains; there were pains also in the lower limbs. There was an increased sense of warmth, alternating with chilliness, over the whole body, and the skin itched. Anorexia was complete, and if any food was taken, it renewed the nausea. The throat felt raw, and deglutition was somewhat difficult

1 Wibmer, Wirkung, &c. 2 Toxicologie, i. 618. 3 Op. cit., v. 180.
4 Böcker, Beiträge zur Heilkunde (Crefeld, 1849), ii. 372.

and painful. The tongue was covered with dirty mucus, and there was a pasty and insipid taste in the mouth. A sense of fulness was perceived in the chest, and the head felt heavy, dull, and oppressed. There was also a transient but irritating pustular eruption of the skin. The same fact is stated by Lohmeier,[1] who also mentions pain in the genitals and total impotency among the symptoms. The proportion of fibrin in the blood is also diminished.

When the dose is large enough to produce vomiting, various general symptoms precede, accompany, and follow this act. Such are a copious secretion of mucus and saliva in the mouth; eructation of a watery fluid with an acrid and saline taste; watery stools, preceded by colic; pain in moving the tongue; pallor and collapse of the features; often cold sweat, especially of the forehead; dizziness, and not unfrequently scintillation before the eyes; general exhaustion, debility, and an inclination to repose and sleep; a weak, small, and sometimes infrequent pulse; often palpitation of the heart, and sometimes a disposition to syncope. In some cases the face is hot, while the rest of the body is chilly. The act of vomiting is often accompanied by laborious and incessant straining and retching, which sometimes continue long after the complete evacuation of the stomach, and produce extreme relaxation and exhaustion. It may here be noticed that a dose of tartar emetic, such as usually excites vomiting when given with a small quantity of water, will, on the other hand, occasion purging without vomiting if largely diluted. The matters vomited consist mainly of mucus and bile, which are sometimes mixed with blood. After the vomiting is over, a disinclination for food and a strong craving for cool drinks remain. The action of tartar emetic on the pulse, which does not appear to have been observed in the experiments which have been described, was particularly studied by Ackermann. His observations were made on healthy persons, and the dose of the medicine administered to them was three-quarters of a grain. He uniformly found that the pulse became quicker and weaker, and in proportion to the degree of nausea which was produced.[2] Evidently this symptom was an effect of nausea, and not of the tartar emetic.

The influence of diet in modifying the operation of tartar emetic ought not to be overlooked. In the treatment of certain chronic and non-febrile affections, Trousseau found that constitutional effects such as have been described, were manifested only so long as the patients were kept upon low diet. Whenever food was more abundant and sub-

[1] Lancet, Mar. 1846, pp. 361, 362.

[2] Brit. and For. Med.-Chir. Rev., Apr. 1859, p. 346.

stantial, the local disturbance was augmented.[1] He observed, further, that certain articles of food and certain medicines modified the antimonial operation. Wine and acidulous fruits, both fresh and preserved, developed in a remarkable degree the emetic and purgative properties of the medicine, a fact which the writer explains by saying that tartaric and citric acids form soluble and violently emetic salts with antimony.

Large Doses.—The quantity of tartar emetic which may be considered poisonous is uncertain. Recovery has taken place after the ingestion of two drachms of this substance, and on the other hand, several fatal cases are recorded, occurring in children, where ten grains or less of it have been taken. In several of these cases the poisonous dose did not exceed a quarter of a grain, but the patients were already weakened by disease.[2] Merei, of Pesth, met with several cases of death in children from profuse diarrhœa provoked by tartar emetic. The patients did not vomit, but had twenty or thirty stools in rapid succession, followed by fatal collapse.[3] The writer has known a dose of not more than half a grain produce violent vomiting and purging, and a state closely resembling the collapse of cholera. The patient was an insane female, whose general health, however, was perfect. There is a case on record in which two grains given to an adult, proved fatal after producing violent symptoms. The patient would seem to have been laboring under functional dyspepsia produced by mental causes. No lesion of the stomach was found after death.[4] A case is recorded[5] in which repeated doses of a solution of this substance given to a robust child three years of age, for the relief of asthma, produced hyper-emesis and catharsis, collapse and death. Two fatal cases in children, in which three-quarters of a grain was the dose taken, are reported by Mr. Wilton.[6] Three cases are related by Hulot, in which three grains, one grain, and two grains were the quantities given. But although taken in divided doses, such violent symptoms and extreme prostration followed as rendered death imminent.[7] In a case by Dr. Pollock, and which occurred in Italy, a native of that country, robust, and in full health, was destroyed by a drachm of tartar emetic.[8]

The phenomena of poisoning by this agent may be described as follows: The patient is attacked with pain in the stomach, followed

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[1] Mat. Med. et Thérapeutique, ii. 731.
[2] Beck, Infant Therapeutics, p. 35.
[3] Month. Journ. of Med. Sci., Oct. 1850, p. 368.
[4] Archives Gén., xxvi. 262.
[5] Boston Med. and Surg. Journ., 1849.
[6] Taylor, On Poisons, 2d Am. ed., p. 476.
[7] Archives Gén., 5ème sér., i. 474.
[8] Lond. Med. Gaz., May, 1850 p. 801.

by incessant retching, præcordial cramps and burning heat, distension of the epigastrium, severe colic, watery and frequent stools, dryness of the throat, difficult deglutition, an unpleasant metallic taste in the mouth, and sometimes a copious discharge of saliva. The muscles of the neck, jaws, abdomen, and extremities are more or less rigid;[1] and sometimes there is active delirium. Generally the skin is pale and cool, and covered with a clammy perspiration; there is complete prostration of the strength, and sometimes repeated fainting or prolonged insensibility; the pulse is small, weak, contracted, and after being at first infrequent, it falls, perhaps to thirty-four in the minute, and afterwards becomes rapid, thready, and almost imperceptible. In this condition death may take place. The frequency of the respiration is generally diminished, and may be reduced to five or six in the minute. Even where recovery ultimately ensues, the rate of the breathing, and of the pulse also, may continue to be slow for several days. Although such effects as have been described do really take place, it is, at the same time, true that they are exceptional, and that much larger doses of the medicine than produced them have often been given, not only without mischief, but with great advantage.

There are instances in which enormous doses of this preparation have been taken without a fatal effect. In one of these half an ounce of it was swallowed by mistake for Epsom salts,[2] and neither in it nor in Dr. Pollock's case was there any purging. In another, in which nearly an ounce was taken, extreme prostration was the first symptom, and in two hours violent purging, with vomiting, thirst, and a burning pain in the fauces, gullet, and stomach. There was also, on the third day, a copious eruption of tartar emetic pustules over the whole body. This is the only example known of such an occurrence.[3]

Tolerance.—This singular property of the medicine remains to be noticed. When a large dose of tartar emetic is repeated at intervals, it ceases to produce evacuations. Its action seems then to be wholly antiphlogistic, sedative, or, as it was called by the discoverer of this fact, *contro-stimulant.* In 1811, Rasori, to whom the discovery is due, published his celebrated essay on the treatment of pneumonia by tartar emetic.[4] In this essay he claims it as new, and admits it to be opposed to received opinions, "to conduct the treatment of pneumonia with

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[1] Two Instances of Tetanic Symptoms caused by Antimony. By Dr. Elliotson, Times and Gaz., July, 1856, p. 6.

[2] Lancet, May, 1847, p. 535.

[3] Taylor, op. cit., from Med. Times, and Western Journ. of Med. and Surg.

[4] Delle Peripneumonie infiammatorie e del curarle principalmente col Tartaro Stibiato. Opuscoli di Med. Clin., ii. 129.

tartar emetic from the onset to the close of the attack, to make it the chief, and often the sole remedy, to carry its dose far beyond what the boldest practice had ever before reached, by administering a scruple, a drachm, or even several drachms in the course of twenty-four hours, and not uncommonly several ounces in the course of an attack, and finally, with all this, not to bring on vomiting and purging, or, at least, but slightly and rarely, nor to excite perspiration beyond what is appropriate to the nature and the stage of the disease." It was Rasori's belief that tolerance of the medicine in large doses depends upon the inflammatory condition present and ceases with this latter. But experience has not confirmed his opinion. On the contrary, Laennec remarks: "Every day I observe tolerance indefinitely prolonged in the case of patients who have recovered their appetite and strength. . . It is true that after the acute stage of a pneumonia tolerance diminishes and sometimes ceases altogether, but it is more usual for the patient to become accustomed to the tartar emetic, and to such a degree that during convalescence, and when he has grown able to eat as much as a healthy person, he will still take daily, and without knowing it, six, nine, twelve, and even eighteen grains of the medicine."[1] On the whole, Laennec concluded that the habit of taking the medicine, and not the presence of an inflammation, is the cause of its being tolerated. Subsequent observers have amply confirmed this view. Dance remarked that if the medicine was suspended and afterwards resumed it excited vomiting and purging until tolerance was established anew. It would seem that, as Bonamy suggests,[2] the gastro-intestinal mucous membrane ceases by degrees to respond to the impression of the medicine, having been rendered by it obtuse to the action of all stimulants; hence, obstinate constipation generally results from its use. When tolerance is established with difficulty, it is generally of short duration, and if then the use of the medicine be persisted in, derangement of the stomach and bowels supervenes.[3] In such cases it is probable that it produces its specific inflammation of the gastro-intestinal mucous membrane (presently to be described), which, causing the tartar emetic to be rejected from the system, prevents the establishment of its proper sedative action. Tolerance is not easily established, nor does it last long, in females and children. In the latter class of patients its duration is peculiarly brief, and is apt to be followed by exhausting discharges.

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[1] Traité de l'Auscultation, 4ème éd., i. 621.

[2] Etudes sur les Effets Physiologiques et Thérapeutiques du Tartre Stibié, p. 124.

[3] Trousseau and Pidoux, op. cit., ii. 729.

Local Effects of Large Doses.—A burning sensation with constriction is felt in the pharynx and œsophagus, with swelling, dryness, heat, and redness of the posterior fauces; there is difficult deglutition and a disagreeable metallic taste; later, upon the half arches, the velum, the pharynx, the edges of the tongue, and the cheeks, ulcers make their appearance. They are generally one or two lines, but sometimes half an inch, in diameter, except upon the dorsum of the tongue, where they are usually linear, and are covered with a deposit resembling false membrane. This pellicular inflammation sometimes extends to the soft palate, tonsils, and pharynx. Boudet observed this condition in twenty-six out of a hundred and forty-four cases of pneumonia treated with tartar emetic, and in only five of these was the upper portion of the air-passages completely unaffected.[1] In certain cases a pustular eruption is developed in the mouth and pharynx having the general characters of aphthæ, but in some it is identical with that produced by tartar emetic upon the skin. It is said to appear about the fourth or fifth day of the treatment, and, according to some writers, in nine-tenths of the cases in which this agent is given in large doses.

Internal Lesions.—Hoffmann relates a fatal case of poisoning by this substance in which sphacelus of the stomach and of several adjacent organs was found after death.[2] This statement wants confirmation. In a case reported by Recamier, the peritoneum was injected, the mucous membrane of the stomach tumid, red, and covered with tenacious mucus. In addition to these alterations may be mentioned softening of the gastric mucous membrane, with hypertrophy and ulceration of the muciparous follicles of the stomach and the lower portion of the œsophagus. Engel describes ulceration both of the agminated and of the solitary intestinal glands, or rather of the mucous membrane covering them. Durand-Fardel reports a case in which a pseudo-membranous exudation covering the whole pharynx and œsophagus was found.[3] None of these lesions occur frequently; all of them, indeed, may be regarded as exceptional, since several writers who have had large experience in the use of tartar emetic have failed to meet with them. It is, indeed, denied by some, however groundlessly, that they are the effects of antimonial irritation. Strambio published an account of his dissections in twenty-four fatal cases of pneumonia which had been treated after the Rasorian method, yet no trace of its action was found in the intestinal canal.

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[1] Canstatt's Jahresbericht, f. 1853.

[2] Orfila, Toxicologie, i. 624.

[3] Bull. de Thérap., xxv. 370.

It is of interest to note the effects of the long-continued use of small doses of this substance. They have been studied by experiments upon animals and clinically, or in the investigation of cases of homicidal poisoning, by Millon and Lavran,[1] Dr. Nevins,[2] Dr. Taylor,[3] and others. The principal symptoms of chronic antimonial poison are stated to be great nausea, vomiting of mucous and bilious liquids, great depression, watery purging, followed often by constipation of the bowels, a small, contracted, and frequent pulse, loss of voice and muscular strength, coldness of the skin, with clammy perspiration and death from complete exhaustion.

After this review of the effects produced by tartar emetic upon the animal economy according to its dose, mode of administration, &c., it would not be difficult, in imitation of many eminent writers upon medicines, to defend a theory of its *modus operandi*. But, notwithstanding all that is known and all that is surmised upon the subject, the question remains as obscure, as insoluble perhaps, as any in therapeutics. One thing alone is certain; tartar emetic does not produce vomiting by an irritant action upon the stomach merely. Introduced by the bowels, the skin, or the veins, its action is essentially the same. The doctrine, that it acts through the nervous system, is nothing more than a hypothesis which may, indeed, serve as a conventional expression to mark the limits of our knowledge, but which conveys no sensible idea of a definite fact.

Uses.—Although it is customary to treat separately of the emetic and the sedative properties and uses of the preparation under notice, no such natural distinction, it is believed, exists; the two are generally united, and, where this is not the case, the one is an ordinary effect of the other. We shall, therefore, point out under each disease in which the medicine is used the mode by which its curative effects are obtained.

Fevers.—The use of tartar emetic in *typhus* was recommended by Rasori. Richter[4] considered it appropriate to almost all conditions of the system which occur in fever, to the typhoid no less than the inflammatory, the mucous, the bilious, and the rheumatic forms, particularly at the commencement of the attack. It is an ancient and well-approved practice to give an emetic at the onset of a febrile disease, and, provided that it be done betimes, the subsequent course of the attack is generally milder and shorter. But except in robust subjects, other emetics than the one under notice are to be preferred. It is also used

[1] Annales d'Hygienè, xxxvi. 221.
[2] Liverpool Med.-Chir. Journ., i. 36.
[3] Guy's Hospital Reports, 3d ser., iii. 369.
[4] Ausfürlich. Arzneim., v. 182.

as a sedative and diaphoretic through the course of the attack, as well to moderate the general febrile movement as to meet especial indications. A very important one of these is described by Blane[1] as follows: "The head being particularly affected in this sort of fever [typhus], the patient is extremely restless and delirious, especially at night; and there is a medicine which has a most pleasing effect in procuring both rest and perspiration. This is a combination of an opiate with an antimonial medicine, which was administered in the evening with great success." Almost exactly the same indications are furnished by Graves;[2] he advises this combination in the class of cases of typhus in which, at an advanced stage of the attack, there is cerebral excitement, and determination to the head, with total want of sleep, persistent delirium sometimes of a furious kind, &c. A quarter of a grain of tartar emetic given every hour until the excitement subsides, and after this an opiate medicine, seem to dissipate the alarming symptoms, and pave the way to recovery. These cases are certainly exceptional in the history of petechial typhus, so much so that there is reason to suspect that in those referred to by Dr. Graves some cerebral complication must have existed, for as a general rule, the disease is, of all others, the most intolerant of sedative medicines. *Eruptive fevers* call for great caution in the use of this remedy; indeed, the safer rule would probably be to exclude it altogether from their treatment. If, at any time, they are judged to require the use of an emetic, one of a stimulating sort would be preferable. It is comparatively an old method to prescribe tartar emetic before the commencement of the treatment by bark and its preparations in *intermittent fever*. But certain modern writers have recommended it in doses large enough to produce tolerance by their repetition, and claim to have found the method a successful one. That it may sometimes have cut short the disease by a profound and violent agitation of the whole economy, and in this way have prevented a recurrence of the paroxysm, must be admitted, since the same result has followed the employment of many remedies which have certainly no antiperiodic virtues. But the emetic plan has repeatedly failed altogether, and cannot deserve much regard when remedies of so much greater efficacy are within reach. But when, as often happens, the attack is preceded by gastric derangement, sallowness of the skin, and an icterode tinge of the eye, emesis is the best introduction to a cure; but even under these circumstances a vegetable is preferable to an antimonial emetic. Vernal intermittent fever may sometimes be cured by such emetics alone.

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[1] Diseases of Seamen, p. 367.

[2] Clinical Medicine, p. 128 et seq.

Pneumonia.—The treatment of this disease by tartar emetic was used in Great Britain by Balfour about the year 1818.[1] In this country it was used by Dr. McCall, of Tennessee, in 1821; but it does not seem either at that time, or subsequently, to have attracted from American practitioners the degree of attention it deserved. In England, too, the method was adopted tardily, and with great hesitation, even after Mackintosh and Dr. Stokes had written in its favor, and to the present day it continues to be regarded with suspicion. Dr. Stokes, even, did not depend upon it exclusively, but always considered it as secondary to general and local bleeding. He saw correctly that it was more effectual before than after hepatization was complete, and also confirmed the Rasorian doctrine to the extent of showing that although the first doses of the medicine produced vomiting and purging, these effects generally subsided after twenty-four hours, when, as he remarked, might be witnessed the interesting circumstance of a patient taking from eight to twelve grains of the remedy daily without vomiting, purging, or sweating, or indeed any effect save the gradual removal of the pneumonia.[2] Dr. Stokes prescribed the medicine in doses such as were recommended by Laennec, and in this respect, as well as in his estimate of its efficacy, Dr. Williams agreed with both of the physicians named.[3] Dr. Copland,[4] and Dr. Davies,[5] who employed the remedy in a very methodical manner, but in smaller doses at first than were needful, Dr. Blakiston,[6] and Dr. Walshe, who declares that if he were forced to surrender either cupping and tartar emetic or general bleeding, in the treatment of pneumonia, he should not hesitate to relinquish the last,[7] are the principal English authorities, in addition to those before mentioned, who advocate the use of tartar emetic in the treatment of pneumonia. But none of them has given such detailed accounts of its effects as will enable us to determine its precise value either as compared with other remedies, or with a purely expectant treatment. This has been done in a very satisfactory man-

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[1] He regarded the medicine as to a great extent a substitute for depletion, alleging that in many cases of local inflammation "a speedy and perfect cure can be obtained with the loss of so moderate a quantity of blood as to warrant the conclusion that bleeding might be safely omitted altogether, even in circumstances in which it is generally considered the only means of saving the patient's life."—*Illustrations of the Power of Emetic Tartar*, p. 8.

[2] Diseases of the Chest, p. 345.

[3] Cyclopædia of Pract. Med., iii. 440.

[4] Dictionary of Pract. Med. (Am. ed.), ii. 894.

[5] Watson's Lectures (Am. ed.), p. 513.

[6] On Diseases of the Chest, p. 280.

[7] On Diseases of the Lungs, &c. (Am. ed.), p. 302.

ner by M. Grisolle in his classical work upon pneumonia,[1] and from it we must mainly draw the materials for a definite and rational judgment of the case.

It was shown by Rasori, 1. That pneumonia may be treated throughout its entire course by tartar emetic; 2. That the cure may be confided to it chiefly or alone; 3. That by its use depletion may be greatly lessened or entirely dispensed with; 4. That it may be given in what seem enormous doses, as twenty-four grains in as many hours, or two ounces in the course of the attack; 5. That these doses produce neither vomiting nor purging, nor any serious disturbance of the digestive organs, but a state of *tolerance* which has already been defined.

When we come to estimate the value of the Rasorian method, we find that it did not consist of the use of tartar emetic only, but that copious depletion was generally employed along with it, so copious, indeed, that no honorable and successful practitioner has since ventured to imitate its excesses. The doses advocated by Rasori were never generally adopted by other physicians, and by a few only in Italy, where Tommasini, in particular, inculcated a less heroic plan. He usually commenced the treatment with six or eight grains a day of tartar emetic, in divided doses, and rarely exceeded fourteen grains in this period. Laennec employed a very analogous system. He prescribed one grain of the medicine every two hours, until six grains had been taken; and then, unless the symptoms were urgent, allowed the patient to repose for seven or eight hours. By gradually augmenting the dose, he sometimes reached the quantity of thirty grains in twenty-four hours. In this manner, and taking into the account well-marked cases only, he lost but about one patient in twenty. M. Louis, who investigated this subject with his wonted discrimination and impartiality, found that of twenty cases in which the disease presented a grave type, three only were fatal, and these were of persons between sixty and seventy years of age. M. Trousseau lost but two out of fifty-eight cases which he treated almost exclusively by antimonial preparations.

But the most conclusive facts which bear upon this subject consist of a group of cases, forty-four in number, which M. Grisolle treated by means of tartar emetic alone. They were all of a grave type. The treatment was commenced between the second and the ninth day of the disease. The initial daily dose of the medicine was from six to eight grains dissolved in five ounces of a simple infusion, and admi-

[1] Traité Pratique de la Pneumonie aux différens ages, &c. Paris, 1841.

nistered in portions every hour. The greater number of the patients did not take more than twenty grains in the course of the attack; some of them, however, took as much as sixty grains. All, without exception, experienced from it certain primary effects—vomiting and purging, namely; but the latter was the more frequent of the two. Out of thirty-six cases in which the medicine was continued for several days, tolerance was manifested in seventeen after the third or fourth day; and among one hundred and fifty-four patients who took the medicine in the manner described, twelve only tolerated it from the first.

Its influence upon the individual symptoms may be thus expressed. The first sign of its beneficial operation is the diminution or the cessation of the *stitch* in the side. Within twenty-four hours after the first dose the pulse falls considerably, and becomes softer, and at the same time the heat of skin abates. The fall of the *pulse* in the period mentioned varies between ten and forty beats a minute. The frequency of the *respiration* also declines, and most so when it has previously been most hurried. In seventeen of thirty-three cases the *sputa*, which were highly characteristic when the first doses of the medicine were taken, lost the greater part of their pneumonic characters within twenty-four hours, and in one-third of the cases had assumed the appearance of catarrhal sputa. In nearly all, the *physical signs* furnished by auscultation and percussion begin to diminish after the first day's use of the medicine. The *other symptoms*, such as headache, thirst, general malaise, &c., declined or ceased from the same period. As M. Trousseau has remarked, one effect of this treatment is that there is hardly any convalescence. Three days are sometimes sufficient to transport a patient from the very brink of the grave into such a state of well-being that, were it not for the auscultatory signs, the fact that he had labored under a dangerous attack of pneumonia would be incredible. M. Grisolle confirms this statement, and adds that he has been susprised how rapidly the strength returns in such cases. The fact that it had not been consumed by depletion or prolonged sickness will probably suffice to explain this striking result. The appetite, too, is speedily restored, and so completely that sometimes in forty-eight, or even twenty-four, hours after taking the first potion the patients have urgently asked for food. As will be inferred from these facts, the average duration of the attack is remarkably short; in the series of cases referred to it did not exceed ten days, and out of forty-four patients twenty were able to resume laborious occupations on the twentieth day from the commencement of the attack. The rapidity of the cure did not appear to bear any proportion to the number of

discharges by the mouth and bowels. In comparing this group of cases with one in which tartar emetic and depletion were conjoined, the proportionate mortality in the latter appears to be less than in the former, but the duration of the attack greater. These were cases in which the strength of the pulse and the general febrile excitement appeared to call for venesection.

Although some authors recommend tartar emetic in the *pneumonia of children*, the propriety of its use is open to serious question. The dangers to which it exposes persons of tender age have already been pointed out. They would of themselves go far to inspire extreme caution in employing the medicine for the class of patients referred to, as well as for those whose delicacy of constitution or whose impaired strength contraindicates the use of direct sedatives. Before the end of the second year of life this medicine ought seldom, if ever, to be prescribed, but subsequently to this period it may sometimes be useful. In children at the breast, M. Valleix did not derive advantage from it in the treatment of pneumonia,[1] and Bouchut depicts the state of collapse he has known it to produce;[2] MM. Rilliet and Barthez,[3] it is true, found its effects almost identical with those which have been described as occurring in adults, but they speak of the readiness with which it deranges the stomach and bowels, and even produces softening of the gastro-intestinal mucous membrane, when the pneumonia is secondary.[4] They, however, hold it to be useful when prudently employed. Hérard[5] prescribed it successfully in the Children's Hospital at Paris, since he lost but five out of twenty-nine cases of primary pneumonia. Dr. West[6] also regards it as serviceable, but is by no means disposed to rely upon it to the exclusion of depletion and mercurials. Dr. J. F. Meigs,[7] while admitting the usefulness of extremely small doses of the medicine as an antiphlogistic, rejects it as hazardous when given in such quantities as were used by the writers just quoted. He found that in some cases such large doses of it caused a more or less persistent paleness, exhaustion, and rapidity and weakness of the pulse, attended sometimes with drowsiness alternating with irritability, depending apparently upon prostration.

As regards the *dose* which may be given to children, Dr. West advises that for children of two years old, one-eighth of a grain should be administered in solution every ten minutes until vomiting is pro-

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[1] Clinique Méd. des Enfans, p. 179.
[2] Malad. des Nouveaux Nés, p. 342.
[3] Malad. des Enfans, i. 118.
[4] Ibid., p. 468.
[5] Ranking's Abstract, vii. 47.
[6] Lectures on the Diseases of Infancy and Childhood (Am. ed.), p. 199.
[7] Diseases of Children, 2d ed., pp. 169, 170.

duced, and continued every hour or two afterwards for a period of twenty-four or thirty-six hours. MM. Rilliet and Barthez give very similar directions.

Contraindications.—Many physicians have objected to the use of large doses of tartar emetic in pneumonia, that it sometimes occasions inflammation of the bowels. Both Laennec and M. Grisolle, however, found that redness of the tongue, abdominal pain increased by pressure, copious evacuations, &c., are mitigated rather than aggravated by continuing the medicine, provided that these symptoms have been produced by the action of the medicine itself. If they depend upon previous gastro-enteric inflammation, or if any degree of this state exists, the use of tartar emetic is wholly inadmissible. Hence, in the treatment of tuberculous pneumonia, the probability is so great of the bowels being already diseased, that the use of tartar emetic would be extremely hazardous.

Laennec held that when the medicine is not tolerated it ought to be abandoned; but since it is certain that its efficacy does not depend upon this condition any more than it does upon the evacuations which it may produce, a juster rule would be to persist in its use provided the local and general symptoms of the disease are improved by it. It should not be forgotten that complete toleration of the medicine from the first is unpropitious rather than encouraging, for it betrays a feeble and imperfect power of reaction.

Dr. Peebles, of Petersburg, Va., has described injurious effects which he attributes to this medicine employed in the treatment of pneumonia.[1] The chief symptom it seemed to produce was hemorrhage from the nostrils or from the bowels. Of the cases which he relates, one only presented characteristic pneumonic symptoms, and in that one the "anxious and shrunken countenance, cold, harsh skin, and feeble pulse," did not certainly render tartar emetic a seasonable remedy. A tendency to hemorrhage is not one of the toxical effects of tartar emetic, at least in the white races, and in the cases referred to it must be attributed to a different cause.

Attention has been called to another mischievous effect by Dr. Boling.[2] It resembles somewhat the usual poisonous effects of the medicine, but is ascribed by Dr. Boling to the use of calomel along with the tartar emetic. While the improvement appears to be progressive under the treatment "suddenly, in some cases, in others, somewhat gradually, the patient becomes restless, the thirst is augmented, the discharges from the bowels are more numerous and thin,

[1] Am. Journ. of Med. Sci., April, 1848, p. 338. [2] Ibid., Oct. 1851, p. 330.

the abdomen becomes tympanitic, and perhaps tender, the tolerance is lost, and though he may not have done so for several days, he vomits, or makes frequent efforts to do so; the tongue becomes dry and pointed; there is jactitation, anxiety of countenance, delirium, and perhaps stupor a short time before death. Occasionally jaundice supervenes, and in a few cases the matter vomited bears a close resemblance to that ejected in yellow fever. During the progress of the change, the pulse becomes more frequent, hard, concentrated, small, and thready." Such symptoms resemble more closely, it is true, than those of Dr. Peebles' do, the ordinary toxical effects of emetic tartar, yet are not identical with them. We are, therefore, disposed to entertain Dr. Boling's suggestion, and suspect that they may be attributed to the simultaneous administration of mercurial and antimonial medicines. If this notion be well founded, it inculcates an important lesson, particularly for practitioners of the Anglo-American school, who attach so much value to the use of mercurials in all inflammatory affections.

Pregnancy is generally regarded as a contraindication to the use of large doses of tartar emetic. But M. Grisolle calls this judgment in question. The violent vomiting which is an ordinary symptom of pregnancy, does not, as a general rule, increase the chances of miscarriage. Now, although it is true that this accident is only occasionally provoked by the sympathetic vomiting of pregnancy, and although M. Grisolle has seen no case in which it could clearly be attributed to the emetic medicine, it does, nevertheless, seem to be a physician's duty to avoid even this inconsiderable danger, unless the antimonial treatment is essential to save the mother's life. That depletion exposes to a still greater danger is perhaps not a perfectly satisfactory reason for incurring the lesser one.

Various Inflammations.—Pseudo-membranous Laryngitis—Croup. In this disease the tartrate of antimony and potassa is recommended as an emetic, and as a sedative antiphlogistic remedy at the same time. The concurrent use of general depletion and mercurials, with which its operation is believed to harmonize, is generally prescribed. But while the employment of emetics in such a conjunction cannot be too strongly insisted upon, it is equally important that the patient's strength, which the disease itself tends only too rapidly to undermine, should not be exhausted by so depressing an agent as the one in question. Plastic exudation cannot be cured by sedatives of the circulation and debilitants. These medicines tend to hurry on the period of fatal exhaustion, when the treatment should rather be so sedulously guarded as to husband the powers of life.

Spasmodic Laryngitis. No medicine is more certainly or more promptly effectual in arresting the progress of this distressing disease than antimonial emetics. In general, no sooner does vomiting take place under their influence, than the voice and respiration lose more or less of their stridulous character. Emetics which are not also nauseants, have a less decided influence than this one, which generally cuts short the disease, when given during its first paroxysm. It relaxes the whole system, and resolves the spasm of the glottis, while it also drains the swollen mucous membrane of the larynx by its sedative action upon the circulation, and permits the air to enter the lungs freely. The *syrupus scillæ compositus*, which is a well-known and universally employed remedy in spasmodic laryngitis, owes its efficacy chiefly, if not entirely, to the tartar emetic which it contains.

According to M. Trousseau, tartar emetic is very efficacious in arresting *pulmonary hemorrhage* when the source of the discharge is in the parenchyma of the lungs and not in the bronchia. This distinction seems to be hypothetical. The use, however, of nauseants and emetics to counteract bleeding from the lungs is certainly to be approved when rest, position, and revulsion fail to control it. They were long since recommended by Stoll. In *pleurisy*, it was at one time a good deal employed, but a greater familiarity with the natural history of the disease has caused it to be abandoned. *Chronic coughs* depending upon bronchial inflammation have been cured by pustulating the chest with tartar emetic; but other and less painful methods are, at least, as efficient.

Various writers, of more or less reputation, have reported the results of using large doses of this medicine in *acute articular rheumatism.* The names of Laennec,[1] Chomel,[2] Dance,[3] and, in this country, Findlay,[4] may be alluded to. The results of the first mentioned authors are far from convincing; for they are sustained by no sufficient evidence. The essay of Dance, which is based upon an analysis of twenty cases, is wholly unfavorable to the remedy. With the exception of a few mild cases, none were permanently or beneficially influenced by it, while the disturbance of the stomach and bowels, and the distress occasioned by the movements it rendered necessary, proved it to be a very ineligible medicine. Chomel found no advantage from its use. The failure of tartar emetic in this disease, and its success in pneumonia, both of them diseases which are regarded as involving the same pathological element, and therefore calling for the

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[1] Archives Gén., iv. 481.
[2] Leçons de Clinique Médicale, p. 312.
[3] Archives Gén., xix. 485; xx. 5.
[4] N. Am. Med. and Surg. Journ., x. 167.

same treatment, illustrate the difficulty and the imprudence of deducing therapeutical precepts from pathological data.

Nauseating doses of tartar emetic have been found useful in a variety of local inflammations. During the forming stage of *tonsillitis*, such, or even full emetic doses of the medicine, will often cut short the attack. Mr. Lever (1837) and Dr. Kennedy found it a very certain means of arresting the development of *mammary abscess* after parturition. Other physicians have found it equally efficient in *hernia humoralis*, in acute *ophthalmiæ*, and even in *parotitis*. Recamier and Sanson allege that they have frequently succeeded in arresting the progress of traumatic *phlebitis* by its use, in large doses.[1]

Dropsy.—In those forms of the affection to which squill is appropriate, it has been observed that diuresis is more certainly established when tartar emetic is given at the same time. Such are the cases of dropsy which partake of an inflammatory nature, and which have arisen from exposure to cold after an exanthematous affection. If, in such cases it is thought preferable to employ cathartics rather than diuretics and diaphoretics, this medicine, added to saline laxatives, is believed materially to increase their efficacy. In some instances of effusion consequent upon *pleurisy* or *peritonitis*, emetic doses of the medicine have seemed to promote recovery. Pustulation of the shaven scalp has been recommended in acute as well as chronic forms of *hydrocephalus*.

Hildebrandt and Michaelis both mention having used this medicine successfully in *diabetes*, by giving it in emetic doses, and, in the intervals between them, smaller quantities to promote the cutaneous transpiration.[2] The property which tartar emetic has of increasing the secretion of saliva, has already been noticed. On the other hand, we find Dr. Findlay, of Ohio,[3] employing the medicine to arrest *mercurial salivation*. He prescribed from one-tenth to one-sixth of a grain in solution every hour, so as to act upon the skin and intestinal canal slightly, until the cure was complete. In every instance, when thus given, it is said immediately to have checked the progress of the disease, and seldom to have failed within forty-eight hours in removing all complaint of sore mouth or throat. When given in large doses it has sometimes been known to cause the expulsion of *tænia* from the bowels.

Tartar emetic is useful in several diseases of the *nervous* system. Cases of acute *meningitis* or hydrocephalus, have been reported by

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[1] Trousseau and Pidoux, op. cit., ii. 740. [2] Dierbach, Neueste Entdeck., iii. 448.
[3] N. Am. Med. and Surg. Journ, iii. 194.

Laennec, Thomas, and Wolff, and one case of the tuberculous form of the disease by Teallier, in which repeated fractional doses of the medicine appear to have been chiefly instrumental in effecting a cure. But, as remarked by Hahn,[1] it is always contraindicated if the patient is very young, if the meningitis has had prodromic symptoms, and if the inflammatory condition is not well marked. On the other hand, it is less objectionable after the age of four years, when the child is not feeble, when the tuberculous diathesis is not fully developed, and the inflammatory symptoms are not strongly marked. Neumann relates a case in which severe headache and *amaurosis* followed suppression of an eruption on the left hand and forearm by means of a quack salve. The symptoms were removed by exciting an inflammation on the parts originally affected, by means of tartar emetic ointment.

Epilepsy and also *chorea* have been cured by pustulation of the scalp and the region of the spine with the same ointment, as well as by the internal administration of tartar emetic. In the latter disease it has been used with advantage as a nauseant and emetic by Bouley,[2] and by Gillette.[3] Similar means have been found effectual in *tetanus* of both forms.[4] At one time the ointment was used extensively as a counter-irritant in *whooping-cough*,[5] but the contradictory estimates of its value given by even the best authorities and the extremely painful eruption caused by it, have led to its abandonment. The fact that it sometimes produces caries of the sternum and vertebræ has already been cited from Neumann, who adds, that it seemed to be of no advantage to the cough. The opinion once entertained of its efficacy, may be inferred from the statement of Autenrieth that it cured this disease in fewer days than other remedies required of weeks.

In *mania*, nauseating doses of this medicine are sometimes used to control the violence of the paroxysms; in *melancholia* its emetic operation is occasionally productive of excellent results. But in *puerperal mania*, especially affecting persons of a dull phlegmatic temperament, it was highly recommended by Esquirol. Dr. Evory Kennedy says of it[6] "in several years' observation of this medicine's application in hospital and private practice, but two or three cases have held out against it when commenced sufficiently early." His plan was to prescribe nauseating doses, under the influence of which the patient was kept for twenty, or for thirty-six hours, or longer if necessary, taking care that the depressing effects of the tartar emetic were not pro-

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[1] De la Méningite Tuberculeuse, p. 171.
[2] Bull. de Thérap., liii. 52.
[3] Ibid., liv. 242.
[4] Dierbach, op. cit., from Dublin Journ., Sept. 1843.
[5] Archives Gén., ix. 444.
[6] Am. Journ. of Med. Sci., xvii. 305.

duced. Dr. K. admitted that its use requires great caution. The same authority speaks highly of it as an adjuvant to venesection in *puerperal convulsions*, probably in the form depending upon plethora. Mr. Spence[1] used it for maniacal attacks in females, especially when connected with disorders of the menstrual function, or occurring after delivery, and during the acute stage of the disease. He gave it according to the contro-stimulant method, in doses varying from five to thirty grains, and found that it seldom occasioned vomiting, but almost always great relaxation of the whole system with general quiescence, and a return to the rational and conscious state. It may serve to show how little the action of the remedy has sometimes been understood, to state that several writers have recommended it in *delirium tremens*, a disease which presents in the strongest light the frequently occurring combination of excitement with debility. Dr. Peddie, however, advocates its use in this affection, and has published several cases in proof of its virtues.[2] It is very probable that the emetic operation of the medicine may have been more serviceable than its sedative and debilitant action was injurious; for the usefulness of *stimulant* emetics in this affection is well established; but it cannot readily be admitted that a depressing agent like the one in question could be of real advantage. In *mania-à-potu* a condition distinguished by maniacal delirium, violence, and the exertion often of prodigious strength, a fury which, indeed, usually subsides if left to itself, the remedy under notice may be used as a nauseant to control the patient's violence, or to hasten the resolution of the attack. The simultaneous employment of the warm bath with cold affusions upon the head is very serviceable.

To overcome Muscular Rigidity.—In the last century, a surgeon named Lebas, gained great credit among women for the art which he possessed of rendering the process of *labor* easy. According to Velpeau, he employed tartar emetic for this purpose.[3] Ramsbotham recommended nauseating doses of antimony to overcome rigidity of the os uteri. In 1835, Dr. Evory Kennedy pointed out the conditions in which it is useful.[4] In tedious labor from rigidity of the uterus, when the os uteri is found slightly gaping, with a thickened, tense state of the lips, and usually much heat of the parts, he recommended nauseating doses of this medicine as preferable to bleeding, because less exhausting and quite as efficient. He does not, however, assert that it will invariably succeed, it being in some cases unavailing, and in others

[1] Edinb. Med. and Surg. Journ., xxxvi. 112.
[2] Edinb. Month. Journ., June, 1854, p. 506. [3] Bull. de l'Acad. de Méd., ii. 531.
[4] Am. Journ. of Med. Sci., xvii. 298.

inadmissible. In 1843, Dr. Gilbert, of Philadelphia, confirmed these statements by his own observations.[1] Favorable reports of its efficacy have also been published by Drs. Young,[2] Channing,[3] Alexander,[4] Read,[5] Storer,[6] and others. From the reports of these physicians, it may be inferred that the medicine is most useful when rigidity of the os tincæ causes the body of the uterus to exhaust itself in unavailing efforts, which are still further neutralized by the agitation of the patient, and her unwillingness or inability to co-operate with the expulsive action of the womb. In such cases tartar emetic quiets the agitation, mitigates, or regulates the violence of the pains, and reduces the action of the uterus within normal limits.

Nausea produced by antimony is sometimes successfully employed to favor the reduction of *strangulated herniæ*. Without exhausting so much as depletion, it doubtless acts in the same manner, by withdrawing a portion of the blood contained in the vessels of the hernial tumor, and thus diminishing its bulk so much as to render reduction possible. The same agency is also very efficient in the *reduction of dislocations*, by producing muscular relaxation. The original suggestion of this method is ascribed to Delpech,[7] but a somewhat earlier mention of it was made by Duncan.[8] Injected into the veins, it has been used to procure the expulsion of *foreign bodies* wedged in the œsophagus, as already described in this article. In the same way it has caused restoration from the asphyxia produced by *carbonic acid gas*.

Contraindications.—The dangers attending the administration of this medicine to young children have been already dwelt upon; all conditions of the system, at whatever age, which are distinguished by feebleness, render its use hazardous. It is injurious to very old persons, by deranging the digestion and inducing marasmus. In emetic doses it ought not to be given to persons affected with hernia, displacement of the uterus, aneurism, valvular disease or dilatation of the heart, hæmoptysis, or congestion of the brain; during pregnancy it should be very cautiously used, if at all.

ANTIDOTES.—In poisoning by tartar emetic, it is recommended to give large draughts of lukewarm water, followed by infusions of vegetable astringents, such as cinchona, galls, green tea, &c. But the best authorities deny the efficacy of these astringent substances. Berthold recommends strong coffee as the best means of arresting excessive and

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[1] N. Y. Journ. of Med., i. 426.
[2] Edinb. Med. Journ., i. 645.
[3] Bost. Med. and Surg. Journ., July, 1856, p. 435.
[4] Ibid., Aug. 1856, p. 55.
[5] Ibid., Jan. 1857, p. 505.
[6] Ibid., March, 1857, p. 122.
[7] Bull. de Thérap., 1834, vii. 88.
[8] GIACOMINI, from Lond. Med. and Surg. Journ., June, 1833.

protracted vomiting produced by this substance. The Italian physicians generally prescribe wine, alcohol, ether, or the preparations of opium, for the same purpose.

ADMINISTRATION AND DOSE.—This substance has an advantage over ipecacuanha in being tasteless, so that it can be administered to children, to the insane, to females, and to others who might refuse a nauseous or unpleasant medicine. To produce *tolerance* of tartar emetic, *one grain* in a small quantity of liquid may be given every two hours until six are taken, and then, after an interval of several hours, the dose may be gradually increased until from fifteen to thirty grains, if necessary, are taken in the space of twenty-four hours.

To excite vomiting, *one grain* is the average dose. It is almost always given in solution. The most convenient plan is to dissolve three grains of the salt in a fluidounce of water, and administer one-half of this quantity; at the end of fifteen minutes half of the remainder, and in fifteen minutes more the rest. Draughts of warm water, or of some weak bitter infusion, may be given as soon as retching begins.

As a *nauseant sudorific* the dose is from a quarter to half a grain, given every hour or more. As a *diaphoretic* and *expectorant*, one-twelfth to one-sixth of a grain, at intervals of one, two, or three hours. But for such doses *antimonial wine* is preferable. Of this preparation a fluidrachm (or seventy-two drops) contains one-quarter of a grain of tartar emetic.

If thought proper, tartar emetic can be associated with ipecacuanha, in the proportion of one grain of the former to ten or fifteen grains of the latter.

A solution of one grain of tartar emetic and an ounce of Epsom salts in eight ounces of water, and given in wineglassful doses every two or three hours, forms an excellent *purgative* in inflammatory affections.

The *endermic* application of this medicine by means of an ointment has already been described. A saturated solution of the salt in water is considered preferable, as being "milder, less painful, and cleaner" than either the ointment, or the plaster made by sprinkling tartar emetic upon Burgundy pitch. It has also been proposed to produce a crop of pustules by inoculation. A paste is made with tartar emetic and a little water or oil, and, by means of a fine lancet, introduced into small punctures in the skin. The pustules which result are touched twice every day with a strong solution of the salt until they reach their maturity. Whenever tartar emetic ointment is applied to the integument in children, great care should be taken to prevent its being

conveyed by their fingers to delicate parts of the body, and especially to the eyes. Serious consequences have followed a neglect of this precaution.[1]

IPECACUANHA.—Ipecacuanha.

Description.—This drug is the dried root of the *Cephaëlis Ipecacuanha*, a native plant of the central parts of South America. Its common name is that given to it by the aborigines. In commerce it occurs in pieces of three or four inches long, and about the size of a small writing-quill, "variously bent and contorted, simple or branched, consisting of an interior slender, light straw-colored ligneous cord," and a cortical portion which has "a knotty appearance, in consequence of a number of deep circular fissures about a line in depth, and which extend inwardly to a central ligneous cord, so as to give the idea of a number of rings strung upon a thread." It has an acrid, aromatic, somewhat bitter taste, and a slightly nauseous but peculiar odor.

The active properties of ipecacuanha depend upon a principle called *emetina*, and which exists in the proportion of about sixteen per cent. in the dried root. In its purest form it is a white pulverulent substance, inodorous, and almost tasteless. When less pure, it has a grayish-yellow color, and is slightly bitter. It is very soluble in alcohol, and but slightly so in water, ether, or oils. It fuses and is readily decomposed at a high temperature.

The officinal preparations of ipecacuanha are as follows:—

Pulvis Ipecacuanhæ et Opii.—Powder of Ipecacuanha and Opium; Compound Powder of Ipecacuanha; Dover's Powder.

This admirable medicine is made by rubbing together of powdered opium and ipecacuanha *a drachm* each, and of sulphate of potassa *an ounce*. Ten grains of the powder contain one grain of opium.

Syrupus Ipecacuanhæ.—Syrup of Ipecacuanha.

To make this syrup, a tincture is first prepared by macerating an ounce of coarsely-powdered ipecacuanha with alcohol in a percolator, and filtering from it a pint of liquid, which is then evaporated to six fluidounces, adding sufficient water to make a pint, and with two pounds and a half of sugar preparing a syrup. Its dose as an emetic, for an infant under a year old, is about half a fluidrachm; for an adult, one or two ounces. As an expectorant, to a child of a year old five or ten minims may be given, and to an adult a fluidrachm.

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[1] Bull. de Thérap., liii. 140.

Trochisci Ipecacuanhæ.—Troches of Ipecacuanha.

These are prepared with powdered ipecacuanha, sugar, arrowroot, and tragacanth mucilage. Each contains about a quarter of a grain of ipecacuanha. Morphia may be added, in the proportion of one-fortieth of a grain to each troche.

Vinum Ipecacuanhæ.—Wine of Ipecacuanha.

This preparation may be made by macerating two ounces of bruised ipecacuanha in two pints of sherry wine for fourteen days, or more speedily by percolation. It is a mild and convenient preparation, more suitable for feeble persons than antimonial wine. As an emetic it may be administered to an adult in the dose of one fluidounce; and in the dose of a fluidrachm, properly diluted, to a child a year old. As an expectorant or diaphoretic its dose is from ten to twenty minims.

History.—Ipecacuanha was made known in 1649 by Piso, who published an account of its singular efficacy in the dysentery of Brazil. In 1672, a large supply of it was brought from the latter country to France by a physician named Legros; but it was not until 1686 that it became generally known throughout Europe. Three or four years previously, Adrien Helvetius, after finishing his studies at Leyden, repaired to Paris for the purpose of selling certain nostrums of his father's composition. He failed in his adventure, but made acquaintance with a wealthy druggist, who at that time was under treatment for a serious illness by a physician named Afforty. When the patient got well he presented his physician with some of the Brazilian remedy as a mark of his gratitude; but Afforty, who appears not to have prized the gift very highly, transferred it to Helvetius. The latter made use of it in several cases of dysentery, and was convinced of its possessing specific virtues in this affection. The qualities of the new medicine, whose name, however, was kept secret, were speedily published at all the corners of the streets, and the court and the town echoed with its praises. Luckily for Helvetius, several courtiers, and the dauphin himself, the son of Louis XIV., were treated by him successfully by means of the new remedy. The king, on learning from his minister, Colbert, how precious a secret Helvetius possessed, deputed his physician, d'Aquin, and his confessor, La Chaise, to ascertain its value, in order that it might be made public. After it had been subjected at Hôtel Dieu to trials, which all issued triumphantly, a thousand louis d'or were paid for the secret of its composition. Meanwhile, a certain Garnier, who had been employed to procure the root from Spain, set up a claim to share the reward upon the ground that the credit of introducing the medicine belonged to himself; but his plea was held to be invalid. Helvetius was after-

wards decorated with titles, and raised to the highest medical dignities of France. He wrote a special treatise upon the use of ipecacuanha in diarrhœa and dysentery.[1] It was not, however, until some years afterwards that its value was recognized in Germany by Leibnitz, Valentini, and Wedel, and in England by Sir Hans Sloane and by Baglivi.

ACTION. *On Animals.*—When ipecacuanha is administered in large doses to dogs it excites vomiting and is followed by depression. *Impure emetina* given to the same animals causes vomiting and depression, followed by sleep and sometimes death. The mucous membrane of the stomach and bowels, and also of the bronchia, is found to be inflamed. Similar phenomena are occasioned by injecting a solution of emetina into the veins, the pleural or the peritoneal cavity, &c.[2] Two grains of *pure emetina* are said to be sufficient to kill a dog.

On Man.—Externally. When powdered ipecacuanha is applied to a portion of the skin deprived of its epidermis, it occasions severe pain and inflammation, and when incorporated with oil or fat, and used by friction, it is capable of producing severe irritation. At first small papules of a bright rose color make their appearance in great numbers and sometimes confluent, and are followed by small pustules with a central depression, and which soon dry and leave no mark behind them. Dr. Turnbull imagined that the pulse was lowered as an effect of this application. The papules cause but little pain. A similar eruption is produced by a plaster of diachylon, or Burgundy pitch, sprinkled with powdered ipecacuanha. The same result is obtained by frictions with the following ointment: ℞.—Pulv. ipecacuanhæ ʒij; ol. olivæ ʒij; adipis ʒiv.—M.

Inhalation. When dried ipecacuanha root is pulverized in a mortar, the fine particles which become diffused through the air sometimes cause a swelling and inflammation of the eyes and face and irritate the mucous membrane of the respiratory passages, causing epistaxis, sore throat, dyspnœa, and even hæmoptysis. The case is mentioned of an apothecary's wife who, as often as the root was powdered in her husband's shop, was seized with spasmodic asthma.[3] The following case is quoted by Wibmer.[4] A man while powdering ipecacuanha removed from his face, during the space of three hours, the veil which he was provided with for his protection. He was seized with vomiting and constriction of the chest, and, after the lapse of an hour,

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[1] Compare MURRAY, App. Medic., i. 797; SPRENGEL, Histoire de la Méd., v. 468; Biographie Universelle, xx. 23; Biographie Méd., v. 152.

[2] ORFILA, Toxicologie, i. 651.

[3] MURRAY, Apparat. Med., i. 802.

[4] Wirkung, &c., ii. 77.

had spasms of the throat and glottis, and his face was of an ashy paleness. Depletion and antispasmodic medicines relieved these symptoms, but in the course of a few hours they returned again, although less violently. For some days afterwards he suffered from fits of dyspnœa. Almost identical symptoms were experienced by H. Bullock from the same cause.[1] The case of Mr. Roberts presents somewhat milder features, but shows an extreme susceptibility to the action of the drug. He experienced dyspnœa and then a regular attack of asthma if he remained in a room where the preparation of ipecacuanha was going on. The attack continued about an hour and ended with copious expectoration.[2] M. Trousseau states that he knew of two apothecaries who were seized with a fit of dyspnœa whenever the bottle of ipecacuanha in their shops was opened. The author is acquainted with a physician who has often experienced an intense coryza from the emanations of this substance.

Dr. F. Robertson, of Nashville, Tenn., has furnished in his own case a singular example of acquired susceptibility to the action of this drug.[3] Previously to the attacks, which he describes, he had been in the habit of handling and using it without the slightest inconvenience. But once, while putting up a dose of the medicine, he was suddenly and violently attacked with asthma and oppression at the præcordia. He attributed the new susceptibility to weakness produced by fatigue. Two years afterwards a still more violent paroxysm was occasioned by a dose of the wine of ipecacuanha. It was attended with an intense burning sensation in the fauces and in the lungs. After the paroxysms of dyspnœa, and when expectoration became free again, a large quantity of sputa was rejected, "which any person at first sight would have pronounced to be a mass of small nearly transparent worms." These bodies were no doubt formed of concrete mucus or fibrin moulded in the smaller air-tubes.

Effects of a different kind from any of these were observed in the case of a man who had been pounding ipecacuanha. Along with severe neuralgia in the branches of the fifth nerve, the eyelids were enormously swollen, there was profuse lachrymation, and injection of the conjunctiva; the cornea was turbid, the pupils contracted, and vision completely lost. These symptoms were more marked in the right eye than in the left. Foot-baths, a blister to the nape of the neck, and purgatives, with belladonna ointment around the eye, gradually dissi-

[1] Lond. Med. Gaz., 1837, p. 701.

[2] Pereira, Mat. Med., 3d Am. ed., ii. 623.

[3] Amer. Journ. of Med. Sci., Jan. 1844, p. 252.

pated the symptoms. On several other occasions the same cause produced similar effects in the subject of this case.[1]

Internally. In small or nauseating doses, ipecacuanha produces malaise with shuddering, chilliness, yawning, a flow of saliva, and eructations. In somewhat larger doses it occasionally gives rise to uneasiness and rumbling in the bowels, and a sense of emptiness there, an increased secretion of saliva and mucus, constriction of the chest, irritation of the throat, a dry cough, occasionally spitting of blood or epistaxis, nausea and an inclination to vomit. In full doses it excites vomiting very soon after it is taken, but which is neither very severe nor frequently repeated, nor attended with the same degree or even kind of sinking and prostration which tartar emetic occasions. In all doses it is apt to relax the bowels if they are in a healthy state. It differs from the compounds of zinc and copper, in lacking their astringent quality.

The quantity requisite to produce an emetic operation cannot be definitely stated. In 1744–5, Dr. Samuel Pye published a list of nearly three hundred persons to whom he had administered ipecacuanha, together with its dose, and the effects produced by it.[2] The average quantity which he gave was only *two* grains, yet it generally produced vomiting three or four times, and sometimes oftener. In about twenty of the cases it occasioned several stools besides. On the other hand, as will be shown under the head of *Dysentery*, drachm doses of the medicine have been given without any evacuation whatever following.

Cullen[3] taught that the powder "to the quantity of a grain, or perhaps less, in many persons can hardly be given without exciting nausea and perhaps vomiting. Yet in nine persons out of ten we need hardly depend upon any dose under five grains." In small doses," he adds, "that do not excite vomiting, it pretty certainly acts upon the intestines." The ordinary practice of directing twenty grains as the emetic dose of ipecacuanha sufficiently shows either that the experience of physicians generally has proved the inertness of such quantities as were used by Cullen and Pye, or else that the powers of the drug have been greatly underrated. Some writers of the Italian school advocate this substance as a counter-poison to opium, which they look upon solely as a stimulant, and they cite cases in which, without producing any evacuation, it has dissipated the phenomena of narcotism. If the facts are authentic, the explanation is unsatisfactory.

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[1] Journ. f. Pharmakodynamik, 1857, p. 397.

[2] Med. Obs. and Inq. (4th ed.), i. 240.

[3] Materia Med., ii. 475.

The laxative action of ipecacuanha when given in small and repeated doses cannot well be questioned. If mixed with purgative medicines it increases their power. This was long ago observed by Lewis,[1] who says that fifteen grains of jalap, with two or three of ipecacuanha, will purge more than twice the quantity of jalap by itself. From its milder operation as an emetic it is preferable to antimonials for females, young children, and feeble persons generally, unless the nature of the disease call for a more powerful agent. It is unsuitable when a strong perturbative and sedative action is intended.

The action of *emetin* is identical in its nature with that of ipecacuanha.[2] A quarter of a grain of *impure* emetin, given to a man, caused nausea and vomiting, and a dose of from one and a half to two grains, taken fasting, caused protracted vomiting, and drowsiness. Lerminier estimated the power of impure emetin at about ten times that of ipecacuanha. But Domeier, on the contrary, found from one to two grains of this substance necessary to excite vomiting with any certainty. *Pure* emetin is said to be three times as strong as the impure, and one-quarter of a grain of it to have the emetic power of twenty or thirty grains of ipecacuanha. One-tenth of a grain, given to a man fifty-eight years old, excited vomiting. But, like ipecacuanha, its action is not always in direct proportion to its dose, for Chomel gave it in doses of a quarter of a grain, gradually increased to four grains, and it was only at the dose of one grain and a half that vomiting took place. On the following day a similar dose did not occasion vomiting. Another patient took twelve grains of emetin within twenty-four hours, without either vomiting or diarrhœa resulting. If these results represent the ordinary action of the drug, we may conclude that, like tartar emetic, it tends to establish tolerance when given in large doses.

USES. *Diseases of the Lungs.*—Ipecacuanha is a valuable remedy in *acute bronchitis.* The symptoms which seem to indicate its use are a short, tickling, paroxysmal, and spasmodic cough, to relieve which small and repeated doses (half a grain every hour) are the most effectual. If nausea or vomiting is excited, the effect is all the more certain, for either operation promotes in a remarkable degree the bronchial secretion. In the cases alluded to, it may be usefully associated with acetate of ammonia or some other saline or alkaline draught. This medicine is one of the safest and most efficient in *suffocative catarrh*, and it can be used with confidence either in old age or infancy. A case is mentioned by Higginbottom of its complete success in removing the accumulated fluids from the lungs in a patient seventy-eight

[1] Materia Med., ii. 11. [2] REIL, Mat. Med., d. rein. chem. Pflanzenstoffe, p. 163.

years of age. Akenside states that he prevented suffocation from the mucus in the air-passages in variola by its use.[1] M. Cruveilhier used the decoction or infusion (ʒij in Oiss of water) for the same purpose, or, as he more distinctly says, in capillary bronchitis. Of the quantity indicated, a glass was to be taken every half hour. This method, he remarks, excites nausea and a flow of saliva rather than vomiting, and produces easy discharges from the bowels. Under its influence the cough subsides, expectoration becomes freer, and the patients feel relieved.[2] In the suffocative catarrh of young children, and indeed in all the pulmonary affections of young patients which call for the use of emetics, ipecacuanha is the most efficient and safe. Very seldom, indeed, is the more powerful and perturbative action of tartar emetic requisite, and in general the milder agent should first be tried. In simple catarrhal laryngitis of the spasmodic form (*spasmodic laryngitis*) it will usually render unnecessary a recourse to the stronger medicine. In *chronic bronchitis* complicated with pulmonary emphysema it is very serviceable, both as an expectorant, and, during paroxysms of the disease, as an emetic. The accounts which have come down to us of its having cured consumption are doubtless to be understood as referring to chronic bronchitis with purulent expectoration. According to Delioux,[3] it is but little inferior to tartar emetic in the treatment of *pneumonia*. He used it according to the Brazilian method, described below, and found that it not only did not occasion diarrhœa, but rather confined the bowels. It subdued the pulse, excited perspiration, deprived the sputa of their bloody hue, and hastened the resolution of the disease. It was prescribed conjointly with depletion and vesication. The paroxysms of *whooping-cough* are sometimes rendered much milder by an occasional emetic of this substance. It was said by Akenside to be singularly efficacious in that form of *spasmodic asthma* to which hypochondriacal and hysterical subjects are liable, as well as females at their menstrual periods and at the menopause.[4] A scruple may be given at once when the paroxysm is violent, or when the disease is habitual. From three to five grains may be taken every morning, or every other morning. Murray mentions several cases in which the medicine produced complete relief in this distressing affection.

Diseases of the Stomach and Bowels.—Daubenton recommended minute doses of ipecacuanha to be taken in the morning fasting, for the relief of gastric debility, and constipation depending upon want of energy

[1] Trans. Lond. Coll. Phys., i. 102.
[2] Annales de Thérap., v. 340.
[3] Bull. de Thérap., xli. 152.
[4] Loc. sup. cit.

in the intestines.[1] The cases of *dyspepsia* which he describes are those in which the food lies heavy upon the stomach after meals, producing torpor of the body and mind, flatulent distension of the abdomen, cold extremities, general nervousness, uneasy and dreamy sleep, constipation, &c. He recommended the medicine to be taken in the dose of about one grain every morning fasting, and asserted that it so invigorates the stomach as to prevent the annoying train of symptoms which has been mentioned, and causes the bowels to be regularly moved. The efficacy of this method has been confirmed by Hufeland, Richter, James,[2] and more recently by Dr. Budd.[3]

Ipecacuanha is recommended by Fothergill[4] in an affection which he describes as "an habitual *diarrhœa*, depending on some irritating acrimony of the juices, accompanied with great weakness, and irritability of the bowels." This condition is described as being independent of structural alterations. A grain or two of ipecacuanha taken every morning before rising, with an opiate at bedtime, and a strictly regulated diet, is said to be very effectual in curing it. A very similar condition is that in which Richter and Vogt found the medicine so useful during the European wars of 1813, and which the latter describes,[5] in its acute form, as an asthenic flux, without irritating ingesta in the bowels, or high fever, but with tormina and tenesmus. In the chronic form of the same affection (*diarrhœa chronica a laxitate*) the stools are more feculent or mucous, but still passed with tenesmus and spasmodic pains in the abdomen, and the general health is much impaired by the interruption of the sources of nutrition. The dose employed was a quarter of a grain every half hour or hour, in connection with bitters, astringents, and tonics, particularly those of the aromatic class.

The esteem in which ipecacuanha was held as a remedy for *dysentery* may be inferred from the fact that it was first brought into notice as a specific for this disease, that it was commonly entitled "radix antidysenterica," and that Piso, its earliest historian, styled it the "sacred anchor" in bowel complaints. Murray's estimate of it was scarcely less exalted; but, as a capital point in its use, he enjoins that it be given while yet the inflammation of the bowel is superficial, and, so to speak, movable, and has not altered the structure of the intestine. Upon this point Richter also strongly insists. When thus employed, it mitigates the pain, renders the dejections less frequent, and removes their bloody

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[1] New England Journ. of Med. and Surg., v. 205.

[2] Richter, Ausfürlich. Arzneim., ii. 478.

[3] Diseases of the Stomach (Am. ed.), p. 260.

[4] Works, iii. 246.

[5] Pharmakodynamik (3tte Aufl.), i. 309.

character. A repetition of the dose is advised two or even three times in the first twenty-four hours. But the method of Piso was not closely followed by his successors, and the virtues of the remedy were less conspicuously displayed. Pringle, however,[1] thought that it succeeded best when it operated by stool as well as vomited. He, indeed, laid it aside on account of the distress produced by its action; yet he adds, "Upon the whole, I am not clear whether it is not the surest method of cure." Cleghorn used the medicine after the same plan.[2] Freind speaks of "that remarkable efficacy in dysenteric disorders which ipecacuanha challenges to itself."[3] Among recent writers, Cambay[4] insists upon its value after depletion. The number of citations might be multiplied; but, if narrowly examined, they make it evident[5] that not every form of the disease can be cured by this medicine, nor by every mode of exhibiting it. When the attack is brought on by cold, it is inferior to simple opiates even at the onset; when by irritating ingesta, it has little advantage over other vegetable emetics; but when the disease is epidemic, and assumes bilious characters, with bitterness of the mouth and a foul tongue, no remedy of the same class can be compared with ipecacuanha.

As was remarked above, when the treatment of dysentery by ipecacuanha was first introduced, large doses of it were given. In 1795, this practice was revived. Balmain,[6] who had been in the habit of giving the medicine in small quantities, found that a nostrum monger in his neighborhood had been extremely successful in treating dysentery, by doses of a drachm and a half to two drachms. He imitated this practice with great advantage, administering the medicine in the form of a bolus, along with forty drops of laudanum, and provided the patient kept quiet, and lay with his head and chest tolerably elevated, nausea seldom followed, and very often no stool occurred upon the following day. A few years afterwards, Mr. Playfair employed the same method in Calcutta.[7] After trying small doses of ipecacuanha without effect, he prescribed from thirty to sixty grains with as many drops of laudanum. The first dose was sometimes vomited, but the second was always retained. Usually for many hours after the medicine was taken no inclination to stool was felt, and there was freedom from griping pain. When evacuations did at last occur, they were free, without pain, and unmixed with blood. More recently Delioux, who prescribed the medicine in large doses, but in decoction

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[1] Diseases of the Army, p. 231.
[2] Diseases of Minorca (Am. ed.), p. 146.
[3] On Fevers, p. 39.
[4] De la Dysentérie, p. 563.
[5] Zimmermann, De la Dysentérie.
[6] Mem. Med. Soc. Lond., v. 210.
[7] Edinb. Med. and Surg. Journ., ix. 18.

or infusion, and frequently repeated, found that after the vomiting and nausea occasioned by the first doses had subsided, tolerance was established; the abdominal pains were mitigated, the stools, though often more numerous the first day, were less so afterwards, and their characters were speedily modified, for they grew more bilious and consistent, and were even sometimes moulded; the pulse and heat of skin subsided, and diaphoresis was established.[1]

Hemorrhages.—Numerous writers of high credit ascribe distinguished hæmostatic virtues to this medicine. One of the earliest of these is Mangetus,[2] who imputes to a dose of one drachm of the medicine the subsidence of an alarming hemorrhage from the *womb*, which preceded the expulsion of the ovum in a case of abortion. Dr. Osborne, of Dublin,[3] says that the treatment of simple *menorrhagia* by ipecacuanha, has never yet failed in his hands, and that he has also found it successful in *epistaxis*. Cases of its success in *hæmoptysis* and menorrhagia, are given by Frank.[4] Vogt says that it is only in habitual and chronic losses of blood that the medicine is useful: but the cases already referred to disprove this assertion. M. Trousseau has several times used it with success in uterine hemorrhage, particularly after childbirth. He also found it to arrest an obstinate hæmoptysis in a female. The discharge of blood had continued, in spite of a variety of measures, for eighteen months, when ipecacuanha was administered, and the hemorrhage was suspended for three months. Mr. Higginbottom employed it with striking advantage in several cases of *flooding after delivery*, and when the exhaustion of the patient was such as to threaten speedy dissolution.[5]

M. Trousseau insists upon the great advantages to be derived from emetics of ipecacuanha in the various affections which are apt to occur *after parturition*, and all of which, according to him, have a peculiar character impressed upon them by the recent delivery. He particularly refers to *acute dyspepsia*, *suppression of the lochia*, *subacute metritis*, *inflammation in the iliac fossæ*, *pulmonary catarrh*, and *subacute pneumonia*. It is very unusual, he asserts, for such disorders not to be removed, or at least greatly simplified, by the use of twenty or thirty grains of ipecacuanha in divided doses. Even when the disorders mentioned rise to the magnitude of serious inflammations, the symptoms are nearly always moderated by an emetic of this substance.

In *intermittent fevers* of a bilious type, and still more in the *bilious* and *remittent* fevers which prevail in the autumn, and sometimes in

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[1] Bullet. de Thérap., xli. 104.
[2] Biblioth. Pharm. Med., iv. 1143.
[3] Am. Journ. of Med. Sci., xxvi. 453.
[4] Magazin. für Arzneim., i. 548, and ii. 768.
[5] Lancet, June, 1845, p. 732.

the spring, diseases in which there is generally a dusky hue of the complexion, some yellowness of the conjunctivæ, a loaded tongue, sick stomach, and fulness of the hypochondria, the administration of a full emetic dose of ipecacuanha at the onset of the disease, and even for two or more successive days, forms, perhaps, the surest method of moderating the violence and shortening the duration of the attack. It also prepares the way for a successful administration of the preparations of cinchona.

ADMINISTRATION.—As an *emetic* the usual dose of ipecacuanha is twenty grains in *powder*. It is most efficient when given in divided doses of five or ten grains repeated every ten or fifteen minutes until vomiting takes place freely. As remarked above, however, much smaller doses than these produce emesis in many cases, and much larger may be given without danger. For infants the proper dose is one grain of the powdered root or one fluidrachm of the syrup. It is usual to administer tartar emetic and ipecacuanha in conjunction in the proportion of one grain of the former to ten or fifteen of the latter. As in the case of other emetics, warm chamomile tea, or warm water simply, should be given to promote the operation of the medicine. The *infusion*, which may also be used as an emetic, is made by adding two drachms of the powder to six ounces of boiling water; it may be given in the dose of a fluidounce, and repeated at short intervals. The infusion employed by the natives of Brazil, and recommended by Piso and Helvetius, is made with the bruised root in the proportions just indicated, and allowed to stand before being used for twelve hours. The liquid is then carefully decanted and fresh water supplied, and this is done for two successive days. Of the three doses, the first only produces much vomiting. Each is divided into two or more parts, which are given at intervals of two or three hours if the attack is mild, but if severe the whole dose is taken at once.

As a *nauseant*, from one to two grains of ipecacuanha may be repeated at short intervals. As an *expectorant* and *diaphoretic*, the same dose may be given at longer intervals. For infants, the syrup may be used in doses of five to twenty minims.

ALUMEN,	vid.	*Astringents.*
CUPRI SULPHAS,	"	*Irritants.*
SINAPIS,	"	*do.*
SCILLA,	"	*Expectorants.*
TABACUM,	"	*Nervous Sedatives.*
LOBELIA,	"	*do.*
HYDRARGYRI SULPHAS FLAVUS,	"	*Alteratives.*

CATHARTICS.

THE terms *cathartic* and *purgative* are derived, the one from the Greek καθαιρω, and the other from the Latin *purgo*. Etymologically, they signify *cleansing*, and were applied to medicines which were supposed to purify the system of its morbid humors, whether they produced a discharge from the bowels, the kidneys, the lungs, or any other part. By modern usage, their application is restricted to medicines which are employed to evacuate the bowels.

Hippocrates appears to have considered purgatives, and, indeed, emetics also, chiefly as evacuants, and to have subordinated their use to his views of the indications for expelling morbid humors from the system; hence he enjoins that in acute diseases they should not be employed until the signs of coction manifest themselves, and then that they should not be used too vigorously.[1] In another place he refers to the case of a man who died from the effects of a purge of elaterium, and while approving of their judicious use under appropriate conditions, he points out the dangers incurred by those who use them without sufficient reason. Galen calls attention to the error of persons who congratulate themselves upon the copious operation of purges, forgetting, or not knowing, that it is usually followed by a confined state of the bowels. It is true that these precepts of the ancient physicians, which are reiterated by nearly all medical writers until within the last three or four centuries, had reference to the drastic purges, which were then the only ones in use. The introduction of saline cathartics, and generally of laxatives, belongs to a comparatively later date, and is to be ascribed chiefly to the Arabian physicians. So much mischief appeared to have been done by drastic purgatives in the hands of the vulgar and of ignorant or pretended physicians that Hoffmann wrote an essay on the propriety of rejecting them entirely from the materia medica.[2] It is well known that the popular use of these medicines is quite as prevalent now as in the time of Hoffmann, and that, in spite of the fatal results of their injudicious use, and the trial and conviction of some of the more notorious quacksalvers for manslaughter by means of them, they continue to be regarded by the vulgar as the most efficient of all remedies.

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[1] Edit. Fœsii, i. 46, 406.

[2] Opera Omn., vi. 284.

This partiality arises, in some degree, from the prejudice which the coarse and ignorant have in favor of whatever is vigorous or even rude in its action, but also, it must be confessed, from the unquestionable relief which cathartic medicines afford in many of the ailments of this class of persons, whom the habitual use of gross food, as well as the neglect of personal cleanliness and of the calls of nature, render peculiarly apt to be benefited by purgatives and depurative agents. The evacuant method, says Hufeland, has outlived all medical fashions and hypotheses, and we may with truth declare that in a great number of cases the intestinal canal is the field of battle upon which the issue of the most important diseases is determined.

Purgation is the exaggeration of a normal function, defecation. Nature has provided for a regular discharge of the innutritious portions of the food, and of the products of the decomposition of the body, chiefly through the intestinal canal. The frequency of this discharge is not the same at all ages, nor for all persons. In infancy it is very great, in old age, on the contrary, very slight. Ordinarily, indeed, during adolescence and adult life the greater number of persons have a single evacuation every day, but the exceptions to this rule are so numerous that almost any departure from it, unless attended with decided inconvenience, should not be considered as necessarily morbid. Many persons are uncomfortable unless they have several stools in every twenty-four hours, while many others evacuate the bowels but once in several days, and a few are relieved only at much longer intervals than this.

The causes of sluggishness of the bowels are various, but some of them may be mentioned here. One of the most common, at least among the females who from indolence or from necessity lead a sedentary life, appears to be debility of the muscles of the intestines, which, it must be presumed, arises from the same enervating causes which waste and weaken the muscles of animal life. Of the direct influence of these causes upon weakness of the intestinal muscles, there appears to be some doubt, or rather of the degree to which they contribute to torpor of the intestines, for it must not be overlooked that in the cases referred to there is a deficiency of the biliary and other intestinal secretions, which, in the normal state of the parts, serve to stimulate the peristaltic movements, and, still more, to preserve the fæces in so soft a condition, as to render their propulsion easy, and prevent their distending the bowel by accumulation. The peristaltic action, moreover, contributes but slightly to the expulsion of the fæces. It is incessant and continuous whether the bowels are open or not, and probably in the fœtus, which has no alvine evacuation, as well as in

the adult who is subject to constipation. On the other hand, defecation is a voluntary act in part, and in part, also, excito-motory, and is performed by the action of muscles which are indeed excited into contraction by the presence of fæcal matter in the rectum, but whose degree of action the will can regulate.

Infrequent opening of the bowels may arise from a cause the opposite of this. In a state of vigorous health, supported by active exercise, especially in very cold climates, and generally during the winter season of temperate regions, the fæces are scanty and very solid, because a larger proportion than usual of the food is appropriated to the nutrition of the body, and especially to the formation of fat, and also, perhaps, because a great deal of carbonaceous matter, which would, under other circumstances, be excreted by the liver, is exhaled with the expired air from the lungs.

In estimating the causes which produce constipation, and conversely and by implication those which promote evacuations from the bowels, the influence of mental states must not be overlooked. The most pressing desire to go to stool may be suspended by some sudden emotion; habitual and prolonged constipation may proceed from a dull and melancholy cast of thought, and, on the other hand, pain and fear may produce a sudden and profuse evacuation, owing to the rapid secretion of a large quantity of liquid into the intestines. The sudden application of cold to the abdomen, or even to the feet, will also produce an opening of the bowels, which, in this case, appears to be due rather to an impression upon the spinal cord and a reflex action upon the abdominal nerves, than to distension of the bowels themselves. That the latter cause may produce catharsis is evident from the effects of large draughts of pure water, especially if they are taken when the intestinal canal is empty, and partly, also, from those of saline mineral waters, in which the proportion of the irritant ingredient is very small indeed.

The primary action of purgative medicines is irritation of the mucous membrane of the intestine. The natural condition of food, in that it contains a large proportion of unassimilable constituents, seems to indicate that the latter are expressly provided for the purpose of stimulating the intestine by their mechanical impression. Food prepared in such a manner as to contain little or no unassimilable matter, soon exhausts the digestive powers, and, besides other evil effects, produces obstinate constipation. On the other hand, that which is largely composed of indigestible substances tends to increase the peristaltic action of the intestine, and the ease and frequency of the evacuations, and hence is often employed as a remedy for constipation in the

shape of pulpy fruits, mush or bread made of Indian corn, wheat-bran, oatmeal, &c. Other varieties of food irritate the bowel and produce diarrhœa, not so much by a mechanical as a chemical irritation, as, for example, vegetable acids whether contained in the pulp of unripe fruits, or extracted from them artificially; crude vegetables imperfectly prepared for digestion by culinary processes; and saccharine substances which undergo partial fermentation, and become acid in the stomach. But even among the unassimilable principles of food, all are not equally mere irritants of the intestinal mucous membrane. Some are susceptible of absorption, and after having been taken into the blood, are eliminated, in a more or less altered condition, by the glandular structures, and chiefly by those of the kidneys and the bowel.

Cathartic medicines, like the unassimilable portions of the food, are partially retained in the intestine, where they exercise a stimulant or irritant local action, and are partially absorbed from the stomach and small intestines, and are excreted by the several organs, but particularly by the large intestine, where their stimulant action gives rise to an augmented secretion from its glandular structure in addition to that already provoked by the direct irritation of the medicine.[1] All purgative medicines are absorbable, and the extent to which they are actually absorbed, either without change, or after solution in the juices of the intestine, will depend in a great degree upon their dose. Administered in minute doses, they are absorbed and impregnate the blood and the secretions formed from it, without producing any purgative effect. Thus, it is a familiar fact, that if we desire to have mercury display its constitutional instead of its cathartic influence, it must be administered in minute doses, or be so guarded by opium as to prevent its irritating the bowels, and so passing off by them. Salines, even when they purge, augment the secretion of urine, and it even happens, sometimes, that in the form of natural mineral waters, they act upon certain persons as diuretics, in whatever dose they may be taken. Apart from these, and saccharine mucilaginous substances, all other purgatives act chiefly as local irritants, and contain an active principle of more or less acrid properties.

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[1] This doctrine, for which a modern and indeed quite recent origin is commonly assumed, is in reality the most ancient of any relating to this subject, for it dates back to the fourth century before the Christian era. Aristotle is thus quoted by Dr. Adams: "When purgatives are conveyed to the stomach, and are there dissolved, they are carried by the same passages as the food, and when they cannot be digested, but their prevailing power remains unsubdued, they return, and carry with them whatever opposes them, and this is called purging." (Problem. 43, in Comment. on Paul. Æginet., iii. 485.)

On the other hand, by whatever channel they may be introduced into the body, cathartics tend to pass off by the bowels, and in doing so to purge. This fact, although unexplained until a recent date, was not unfamiliar to the earlier physicians. Hoffmann speaks of the ancients having produced purging by means of pediluvia of a decoction of hellebore; of purgative ointments being applied to the skin of the abdomen; of purgation having followed the application of an ointment of hellebore to an issue, and that of an ointment containing colocynth to the umbilicus.[1] Examples of a similar effect have been cited in the introduction to this work; and more recently Dr. Salgues, of Lyons, reported a number of cases in which powdered colocynth or aloes applied to the denuded derm provoked a full cathartic operation.[2] Experiments were long ago performed with laxative substances injected into the veins by Fabricius, Haller, Hunter, Hale, Magendie, and others, demonstrating their specific action when thus introduced into the economy. It is not, however, to be inferred that the medicine, in whatever manner it may be introduced, is confined in its operation to the bowels. But here alone is its peculiar action manifested, and here, perhaps, it is principally eliminated, although, for a time, it probably impregnates all the secretions. When injected into the veins its taste has sometimes been perceived in the mouth, and it is well ascertained to have been present in the urine, milk, &c. Pliny relates that the daughters of Prætus were cured of insanity by drinking the milk of goats fed with hellebore; and that when these animals are fed on ground ivy their milk is curative of diseases of the spleen.[3] It was also long vulgarly known that the milk of mothers who use purgatives often relaxes the bowels of their infants.

The general operation of cathartic medicines depends partly upon their local and direct irritant action upon the surface of the bowels and partly on their local but indirect irritant action developed as they pass through the bloodvessels or the glands of the intestinal canal, by both of which the activity of the circulation in its lining membrane, and consequently of its secreting organs, is increased, and a discharge of fluids takes place into the cavity of the intestine, mingling with and diluting its previous contents, stimulating its muscular coat to more active contraction, both by its own presence and that of the blood in the vessels, and by the increased bulk of the contents of the bowel. These contents consist partly of the indigestible or the undigested remains of the food and partly of the effete products of nutri-

[1] Opera Omn., i. 214, 435; see also Paulus Ægineta, ed. Syd. Soc., iii. 502.
[2] Abeille Méd., ii. 30. [3] Hist. Nat., liv. xxv., ch. xxi. and xxxiii.

tion; for it must not be forgotten that the colon is the great reservoir in which the waste materials of the economy are deposited before being finally cast forth from the body. Now, it is probable that purgative medicines which are absorbed, and particularly those of the saline and resinous groups, are excreted by the same channels through which the ordinary secretions into the colon take place, and, as was just remarked, they cannot during their passage fail to stimulate the intestinal glands, and consequently to hasten the elimination of effete matters from the blood, as well as whatever specific material causes of disease may there exist, and also to quicken those destructive changes in the tissues which, within due limits, are absolutely essential to the preservation or the restoration of health.

The universality of the treatment by purgatives is explained by this view of their operation. There is hardly any disease, whether acute or chronic, in which the process of nutrition is not disordered, and in which the normal secretions, and therefore the due elimination of the products of the destructive processes of nutrition, are not interfered with. There are also some in which certain alvine evacuations proper to the disease suggest or represent the natural process of its cure, and which it is, on the one hand, hazardous to interfere with, and generally most salutary to promote, if care be taken to prevent their running into excess.

The evacuations produced by purgatives vary with the different agents employed, both in regard to their quantity, consistence, and composition. Their quantity depends, at least in the first instance, upon the amount of food and fæces which may happen to be present in the intestinal canal. The first discharges are usually fæcal, and the subsequent ones are less consistent and more or less mixed with partially digested food. These are followed by the mucous and biliary fluids in various proportions. The more or less prolonged sojourn of the fæces in the bowel, as well as the state of its glandular, and especially of its biliary, secretion, render their color various, from the paleness of clay to an almost inky blackness, with intermediate shades of yellow, brown, and green, the last almost exclusively in infants. But yellowish stools, which are sometimes supposed to be bilious, may derive their color from rhubarb or gamboge used as a purge. Among the laxatives, the salines, appropriately dissolved, produce copious and watery evacuations, with more or less borborygmi and griping, and sometimes a scalding sensation in the anus. Magnesia is very apt to be partially evacuated in substance, as shown by whitish streaks or nodules in the stools; and castor oil is usually found floating in a thin layer, or in globules upon the surface of the discharge.

The operation of drastic purgatives is generally preceded by severe griping pains and heat in the abdomen. The stools at first contain fæces of a greater or less degree of consistence, cylindrical and homogeneous, or composed of a mass of small rounded portions more or less compressed together, and followed by serous, mucous, or bilious matters, still or frothy, and gelatinous, purulent, or membranous, according to the existing condition of the chylopoietic viscera.

Besides the spasmodic pain and more or less constant warmth in the abdomen, excited especially by drastic cathartics, the rectum and anus, which are endowed, the one with a powerful muscular apparatus, and the other with common sensibility, are apt to become irritated and thrown into violent spasmodic action, known as straining or tenesmus, during the throes of which mucus tinged with blood may be discharged, or the mucous coat of the rectum may protrude, while the hæmorrhoidal veins, turgid with blood, oppose the return of the tumor. Or the irritation of the rectum may be propagated to the adjacent organs, exciting in the female uterine hemorrhage or vaginal leucorrhœa, and in the male tenesmus of the bladder or dysury. Of all purgatives, aloes is most prone to irritate these parts.

The *general* or *constitutional* effects of purgative medicines are various. Some, like gamboge, produce a sickening sensation of the stomach, which is followed by general debility, discomfort, and depression. Castor oil induces a disposition to repose, and even sleep; and saline cathartics occasion a marked chilliness and coolness of the extremities, and a general sensibility to cold. A similar effect is ascribed to calomel. When an excessive dose of a purgative medicine, and especially of the drastic class, is administered, there is experienced, in addition to severe abdominal pain, a marked tendency to collapse, the whole cutaneous surface may become shrunken and cold, the extremities be affected with cramps, the features pale and sunken, the pulse weak, rapid, and thready, and along with tenesmus, and profuse watery or scanty and mucous and bloody stools, there may sometimes be associated violent vomiting or retching, and the patient may die from exhaustion. If recovery takes place, it is through a reaction which has all the characters of an inflammatory fever.

The *remote* effects of purgative medicines are implied in the preceding sketch of their operation. As local irritants they are revulsives, yet feebly so in comparison with cutaneous irritants; besides which, this property is masked, and infinitely exceeded in usefulness by their depletory effects. But it must not be overlooked, as a disadvantage attending their irritant action, that it is necessarily followed by torpor of the intestines and their associated viscera. It

is difficult to adjust the administration of purgative medicines so that they shall not leave behind them this result. Castor oil is, indeed, said to occasion less confinement of the bowels with each successive dose, when it is used as an habitual laxative, so that it may be given in constantly diminishing quantities. But a single full dose of it is more prone than other medicines of the class to produce constipation.

The *evacuant* operation of purgative medicines, it will be remembered, is not confined to the removal of the contents of the bowels, but it promotes the depuration of the blood besides; and thus, by a double action, tends to remove from the system the causes of disease, as well those which might enter from the intestinal canal as those which are generated by the decomposition of the tissues, or have been received from without, either through the lungs or the bowels. To these may be added another, and in some cases a very important, mode of action, that of promoting absorption from the intestine. Purgatives here act partly by removing the accumulated secretions which impede the absorption of the nutritive juices. These "sordes" of the ancients are not of questionable existence, as in the case of the stomach, for they have often been demonstrated by the inspection of dead bodies, especially of those which were also found to contain intestinal worms. Their action must necessarily be to interfere with the influence of the digestive juices upon the food, and still more to obstruct its absorption by the lacteals. Now, purgatives remove this obstacle to nutrition, while they directly quicken the function by their stimulant impression.

The *depletory* action of purgatives is that which renders them applicable to the cure of so large a number of diseases; to nearly all, indeed, which involve an inflammatory or a congestive element. In addition to the constitution of the blood, so far as it contains morbid elements, and which was noticed in the last paragraph, it must not be overlooked that the mere bulk of the circulating fluid is often a serious aggravation of disease, and that much suffering and much imperfect performance of function may be prevented by reducing the tension of the bloodvessels. A more direct manner of accomplishing the same object is venesection. This important agent, which a medical fashion has caused to be temporarily laid aside, is closely imitated in its operation by cathartics, and especially by those of the saline and the drastic groups. But while venesection removes all the elements of the blood alike, purgatives abstract only its watery portion, and hence the latter must be considered as only supplementary to the former, or as an appropriate substitute for it whenever the treatment is intended to be sedative rather than spoliative. The element withdrawn from the body by venesection is vital, and has required a long elaboration to

perfect, and its loss is one which the system is slow to repair; but that which purgatives remove is little else than water, and it is replaced speedily and without difficulty. In some diseases, as in serous plethora and dropsy, direct depletion is inadmissible; but indirect depletion by purgatives which produce copious watery stools will carry off the excess of fluid, and allow an opportunity for a radical cure by other means. They accomplish this object indirectly, by depriving the blood of a portion of its watery constituent, and thus enabling the veins to take up the fluid which is effused in the cellular tissue or elsewhere.

Several *classifications* of purgative medicines have been employed. The most ancient was founded upon an observation of the quality of the discharges which they provoked. There were *eccoprotics*, or medicines which promote the expulsion of fæces without augmenting the intestinal secretions in a marked degree. Among these none can be included which are properly purgative. But many tonics, and particularly nux vomica, exert such a power, directly or indirectly. *Laxatives* are medicines which occasion soft, but not necessarily liquid, discharges, and of these castor oil, manna, and sulphur may be taken as examples. *Purgatives* proper are those which produce more liquid discharges, and irritate the intestine, but not to an excessive degree. Calomel, the salines, senna, and rhubarb may be classed under this title. Finally, *drastics* are purgatives which operate powerfully, and produce a lively, and in excessive doses a violent, irritation of the intestinal mucous membrane. A more ancient and specific nomenclature was based upon the fact that different purgative medicines excite evacuations, each of some one secretion rather than another, and this arrangement, founded upon accurate observation, lent no slight support to the humoral doctrines of disease which so long prevailed in medicine. The principal divisions according to this system were *cholagogues*, or cathartics which provoke a discharge of bile, *phlegmagogues*, or those which procure mucous stools, and *hydragogues*, which excite watery evacuations, and the daily experience of every physician in the use of purgatives confirms the appropriateness at least of the last two divisions of this classification.

The principal hydragogue cathartics are the salines, elaterium, jalap, black hellebore, gamboge, colocynth, senna, and croton oil. The following may be classed as phlegmagogue, viz., olive oil, castor oil, cassia, manna, sulphur, rhubarb, and aloes. The division of cholagogues is less strictly defined. The ancients (Mesne, Serapion, and others) included in it aloes, rhubarb, cassia, manna, hellebore, squill, scammony, colocynth, elaterium, and other less active cathartics besides; and Marggrave, in the seventeenth century, enumerates nine

agents of this class, the three principal of which were scammony, rhubarb, and aloes.[1] Finally, Mr. Headland admits mercury alone to be a true cholagogue, and states that all cathartic medicines act as indirect cholagogues. But the claim of mercury to this distinction, on the ground of its *specific* action upon the liver, is not established.

Torpor of the liver—by which, it is presumed, a diminished secretion of bile from functional causes is intended—is probably owing either to some general condition of the system which lessens the amount of all the secretions, or to an impaired activity of the gastric digestive function. In all, except acute febrile diseases, the latter appears to be the most common source of this derangement. We know that in a healthy state of the constitution every stimulus applied to the gastric mucous membrane solicits a flow of bile, and it is altogether probable that the freedom and copiousness of its discharge depends first upon the presence of food in the stomach, and then upon the proper changes in that food having been accomplished by means of the gastric juice. If the stomach fails to receive food, or to prepare it for the action of the alkaline liquids, the bile and pancreatic juice, which meet it upon its entrance into the duodenum, there is no proper demand for the secretion of the liver, and that organ ceases to prepare bile. It seems probable that what is usually called torpor of the liver is oftener torpor of the stomach and duodenum, and hence that to attempt its cure by addressing remedies to the liver itself is to apply them to the wrong end of the chain of morbid causes.

The list given above of medicines which the ancients held to be cholagogue shows conclusively that they included in this division of purgatives all which, in appropriate doses, are capable of exerting a lively impression upon the intestinal canal, and particularly of exciting serous discharges, and thereby "unloading" the portal vessels, and indeed the circulation of all the chylopoietic viscera. Such an operation must necessarily have for an effect the quickening of the intestinal and the pancreatic as well as the hepatic secretions, and more remotely the better performance of the digestive function. Among them there are two—aloes and rhubarb—which contain bitter principles, and which are probably in a peculiar degree cholagogue, because by virtue of this element they may possibly to some extent act as the bile itself does, and consequently promote changes in the food adapted to solicit the secretion of the liver. At the same time it must be admitted that the yellow color of the dejections which they provoke lent some

[1] Alston, Mat. Med., i. 45.

plausibility to, if it did not indeed suggest, the idea that they promote a discharge of bile.

But it is certain that mercurial medicines are not cholagogue by virtue of their stimulant or irritant action upon the intestinal mucous membrane, and consequently that if they excite the biliary secretion, it is because they are absorbed, and that they either stimulate the liver in consequence of a specific direction to that organ, or that by modifying the condition of the blood they promote its secretion in common with that of all the other glands. The latter is almost certainly their real mode of operation, and one that is often displayed by alkaline medicines, which have also been classed as cholagogues. The proofs of this mode of action, particularly in the case of mercury, will be found in another part of this work; but we think enough has here been said to render it highly probable that there are no such medicines as cholagogues in the sense of their having a specific power of stimulating the secretion of the liver alone.

An arrangement founded upon the mode of action of medicines belonging to the present class, and which is most in accordance with the existing state of knowledge, is that proposed by Mialhe,[1] who, if he does not always satisfy the judgment by demonstrating a coincidence of his conclusions with those of clinical observation, has, nevertheless, we are persuaded, adopted the only method of investigation which can lead to accurate results, either in theory or practice. All cathartics, which are not merely mechanical irritants, are either soluble or insoluble. The former either possess a coagulating influence, enabling them to combine with the tissues, irritating them and augmenting their secretion, as in the case of croton oil; or else are destitute of that coagulating power, but either by endosmosis, as in the case of the salines, or by a peculiar power of stimulating the mucous membranes, and which Mialhe terms *sapidity*, as in colocynth and aloes, provoke an increased discharge of fluids. The latter, which are partially or wholly insoluble, as gamboge, scammony, jalap, and castor oil, are rendered soluble by the alkaline liquids of the economy, magnesia by its acids, and calomel by its alkaline chlorides. The following remarks will aid in illustrating the propriety and utility of this classification.

Croton oil, when taken in large doses, is probably absorbed, and, as elsewhere stated, appears to be capable of producing in this manner its specific eruption upon the skin. But it is equally true that its ordinary operation appears to be confined to the intestinal mucous membrane

[1] Chimie Appliquée à la Physiologie et à la Therapeutique, Paris, 1856.

which it actively irritates. Saline purgatives, on the contrary, given in weak solution become diuretic, and when in a concentrated form, they excite an endosmotic and exosmotic action, the result of which is a discharge of serum into the intestine, while a certain proportion of the same solution is absorbed into the blood, and tends to render the urine alkaline. Mannite, the active principle of manna, has also been detected in this secretion. Aloes and the resins, it is affirmed, which are only partially soluble in water, become entirely so in the alkaline secretions which pervade the lower bowels; and it is given as a reason why they so seldom disorder the stomach, that the fluids of that organ are acid and not alkaline. Hence, it has been found advantageous to prescribe them in pilular form, and associated with soap, which hastens and facilitates their solution. Castor oil, probably, acts by virtue of the acrid principles which it contains, but in so far as it is absorbed, the conditions for its absorption are chiefly furnished by the alkaline secretions of the colon. According to Mialhe, calomel (protochloride of mercury), which, it is well known, is insoluble, is rendered soluble by the alkaline chlorides (chloride of sodium) which it meets with in the stomach, by undergoing conversion into a soluble bichloride. The poisonous effects of this compound are prevented, it is said, by the slow and gradual manner in which its conversion takes place, and by its immediate union "with the alkaline chlorides and the albuminous elements of the blood to form a double chloride, which is very different in its action from the uncombined bichloride."

Therapeutical Application of Cathartics.—The uses of these medicines depend upon their possessing evacuant, revulsive and depletory, and depurative virtues.

The *evacuant* operation of cathartics has reference chiefly to the existing contents of the intestinal canal, although it must be attended with more or less of the associated actions. Its object is to remove those substances, which, by their local irritant impression or by absorption into the system, interfere with the healthful performance of its functions. They may consist of ingesta which, in the actual state of the digestive organs, are unassimilable, or of excreta which are unduly retained. According to the condition of the bowels, they may occasion diarrhœa or constipation. It is of the latter we shall in the first place treat.

Constipation. When the action of the bowels is diminished in consequence of an immoderate quantity of food, especially of a rich and stimulating quality, there is usually more or less gastric derangement, nausea, and oppression, and a bitter or pasty condition of the mouth, and loss of appetite; the abdomen is distended and hard, and is the

seat of uneasy sensations, including fulness and more or less colic, a sense of pressure about the anus, often enlargement of the hæmorrhoidal veins, with general malaise, some headache, muddiness of the complexion, feverishness, and turbid urine. Under these circumstances, three or four grains of blue mass followed by a dose of the infusion of senna with Epsom salts; or else the compound extract of colocynth with a small proportion of calomel or blue mass, cleanses the bowels effectually of their offending contents, and dissipates all the symptoms to which their presence gave rise. This form of indisposition is probably due either to the excitability of the bowels having been exhausted by the undue quantity and quality of their contents, or by the accidental influence of mental causes of an exciting nature, and if not thus treated is apt to work its own cure by a spontaneous diarrhœa, provided that a proper abstinence from food is observed.

Habitual constipation may proceed from a variety of causes, some of which reside within the intestine itself, while others are external to it. It is probably in the colon, the organ of defecation, that the greater number of the former exert their influence. They may consist of a *deficiency of the natural secretions*, which, while they give the fæces a proper consistence, either stimulate the bowel to a due degree of peristaltic action, or mechanically promote the progress of its contents by lubricating the mucous membrane of the colon and rectum. The fæcal mass, thus retarded in its passage, gradually loses its moisture by absorption, and enlarges by the accretions which it receives from above, until it finally distends the bowel, overstrains and paralyzes its muscular coat, and thus leaves no means of relief except from purgative medicines. For such a condition, those which correct its causes are the most appropriate; laxatives which soften the obstructing mass, and purgatives which promote its expulsion, such as salines with resinous cathartics, aloes and colocynth with Epsom salts, for example. The most ordinary causes of this form of constipation are want of muscular exercise, and with it an undue or a painful application of the mind, or any other cause which, while it tends to diminish the intestinal secretions, leads to a neglect of the calls of nature. The universal habit of taking the meals at regular hours involves the necessity of an equally regular and periodical evacuation of the bowels, for in all healthy persons very nearly the same number of hours must be required for the digestion of the food, and the arrival of the fæcal mass in the rectum where it excites a desire for and a tendency to its evacuation. If the call of nature, as it is most aptly termed, is not obeyed, the rectum gradually loses its sensibility to the stimulus, and an accumulation takes place in it of fæcal matters which sometimes

attain an enormous size, filling the entire cavity of the pelvis, and gradually becoming so dry and hard that no means except mechanical ones can any longer avail to dislodge the mass.

Closely allied to the form of constipation just noticed is one which is frequently associated with it, and which is generally ascribed to *muscular atony*. It is of very common occurrence as a part of general debility, whether this belong to the patient's original constitution or is the consequence of exhausting chronic diseases which impair the strength of all the functions. It would seem to be peculiarly an incident of diseases which impair the nutritive qualities of the blood, and of those in an especial manner which are characterized by a deficiency in the proportion of its red corpuscles, viz., anemia and chlorosis. But in these affections a purgative treatment addressed to the removal of the constipation must be so managed as not to exhaust the system, and hence those medicines of the present class should be selected which do not provoke copious discharges, and they should be so combined as to insure their moderate action on the whole of the intestinal canal, and when necessary should also be associated with tonics. Of this description, indeed, are the pills and mixtures which long experience has proved to be most efficient in chlorotic amenorrhœa.

Mechanical obstructions are frequently a cause of constipation. Such are contractions of the bowel by the deposit of cancerous or fibrous matter in its coats and the accumulation of indigestible articles, such as fruit-seeds or stones, bran, magnesia, charcoal, &c., or others external to the bowel and compressing it, as displacements of this organ (invagination, herniæ), retroversion of the uterus, and tumors of any of the organs or parts within the abdomen. Of the internal causes some are removable by purgatives, but of the external scarcely any are susceptible of removal by these means. A simple reference to those which have been mentioned is sufficient to show that many of them not only cannot be removed by such means, but that their effects must be seriously aggravated by purgatives. If the cause of constipation is uncertain, the attempt to remove it should be made with great caution, the milder purgatives alone being used for the purpose; and, indeed, those of the drastic class should never be employed when there is any reasonable doubt of the freedom of the intestine from organic obstruction either within it or without.

Finally, constipation may depend upon affections of the *nervous system*. In various inflammatory, organic, and even functional diseases of the brain and the spinal marrow this condition forms a prominent symptom, and one which can rarely be overcome without a resort to the active medicines of the cathartic class. But if the cause

continues in operation the effect will continually be reproduced; and this is the case in most of these affections whose tendency is towards a fatal issue. But fortunately in those among them susceptible of cure, or even of palliation, purgatives are beneficial by their revulsive as well as by their evacuant operation. In one group of them, nervous disorders produced by lead, these medicines are eliminants of the material morbid cause of the disease, viz., the lead in the tissues, and, at the same time, are evacuants of the bowels and stimulants of the spinal nervous system.

It has already been noticed that purgatives have always been favorite remedies with the vulgar on account of their sensible effects, and of the immediate relief of suffering which they often afford. Too little regard is paid to their secondary effects; too much inclination is shown to depend upon them instead of adopting the slower but more certain method of cure by means of a regulated diet and exercise, and of tonic medicines adapted to restore the bowels to their normal strength. A mere purgative operation calls upon the intestinal muscles to make a powerful exertion; they become exhausted by this expenditure of strength, and speedily fall into a state of atony more complete than that from which they had been aroused. Hence the mischiefs of habitual purgation. Even if continued and increased torpor of the bowels were the only evil, it might be borne. But the constant use of purgatives irritates the stomach, impairs the appetite, occasions flatulence and dyspepsia, and may possibly become a cause of chronic thickening, hæmorrhoids, or abscess of the rectum, &c. Especially are they to be used moderately, or avoided, if possible, when the patient is of a nervous and susceptible temperament. In such cases comparatively small doses of these medicines will be found requisite, while in persons of a torpid nature, with thick skin, heavy features, and an impassible nervous system, the stronger and more depletory agents are to be preferred. But whenever the debility which may exist, with its accompanying symptoms, depends upon confinement of the bowels, they should be released by whatever degree of active treatment is necessary for the purpose, it being always borne in mind that in such cases clysters should precede purgatives, as being less exhausting, and more speedy in their action.

Biliary disorders without so much derangement of the digestion as of discomfort in the right hypochondrium, enlargement of the liver, and jaundice, are most effectually relieved by purgatives preceded by the administration of small doses of mercury, and especially of blue mass. In such cases the saline medicines are usually to be preferred, particularly if administered in a very dilute form. On this account the natural saline mineral waters are peculiarly efficient.

Diarrhœa is a symptom of various pathological conditions, from the slightest to the gravest, from the most transient irritation or congestion to a destructive ulceration of the mucous membrane of the intestines. It may be caused by all ingesta irritating by nature or rendered so by the existing morbid susceptibility of the bowel; by a profuse secretion of bile, such as is apt to occur during the hot season of the year, or from errors of diet, and particularly the use of animal food; by secretions from the mucous glands containing some morbid element such as that derived from the repercussion of certain cutaneous diseases and the effluvia of putrefying organic matter; or by the stimulus of over-distension when the body is weakened, as in cholera. It may also be caused by morbid conditions of the mucous membrane itself, including congestion or inflammation arising from the action of cold upon the surface of the body, ulceration of the eliminative glands from the deposit of typhoid or tuberculous matter in them, or by a debility generally attended with atrophy of the mucous membrane. Finally, diarrhœa may be excited by irritation in a remote part, as in the nerves of the teeth during dentition, or by mental emotion. It is true that during the pain of dentition the biliary secretion is diminished, and hence the food undergoing fermentation probably acts as a direct irritant; but after violent agitation of the mind there can be no doubt that the liver is excited to pour out its secretion profusely, which occasions diarrhœa by its irritating qualities, as well as by the bulk of the liquids secreted.

Such various conditions must necessarily require different agents for their cure, and for the relief of the diarrhœa which is common to them all. Yet it is evident that those which arise from the presence of irritating ingesta or secretions must be proper objects for the evacuant operation of purgatives; that all which involve a simple inflammatory element of moderate severity must be benefited by the depletory and substitutive action of the same medicines; and that those, even, in which the local lesion is the effect of an effort on the part of the system to rid itself of noxious matters may be benefited by their eliminative action. On the other hand, diarrhœa produced by mere debility cannot but be aggravated by any of the modes of action of these medicines; and that which is the consequence of reflected irritation, whether physical or mental, is often a conservative act upon the part of the economy, which protects or relieves the vital organs, and should be treated by means addressed to its cause rather than to its effects.

Nearly all of the conditions specified in the preceding paragraph as being adapted to a treatment by purgatives are more favorably influ-

enced by those of the saline class than by any others, when given either alone or in conjunction or alternation with mercurials, the latter being especially indicated when gastro-hepatic symptoms are prominent, and the former when inflammatory action and fever prevail. Simple diarrhœa from cold, or from the presence of undigested food in the intestinal canal, yields more readily to castor oil, which has the advantage of leaving the bowels somewhat confined when it has been administered in a single full dose, especially with the addition of five or ten drops of laudanum. When the discharges are very acid, as is often the case in children, magnesia is the most appropriate remedy; and when the diarrhœa is dysenteric and of a typhoid type it is often favorably modified by rhubarb, because the tonic and astringent virtues of this medicine co-operate with its purgative action. In sthenic forms of dysentery, calomel and the salines are to be preferred.

Intestinal worms are among the abdominal disorders in which purgative medicines are the most useful. They are generally prescribed to be taken after the administration of agents which are directly hostile to the life of these parasites, and in this case they should be selected from among those which produce an abundant secretion of intestinal fluids, such as senna, jalap, gamboge, &c., and which thus tend not only to carry away the dead or weakened worms, but also to dislodge the mucus in which they are apt to be enveloped. Calomel, which is both vermicide and purgative, is one of the most efficient remedies of the present class when used alone.

The medical writers of the last century were in the habit of employing purgatives in the treatment of *continued fever*, but in general without distinguishing between typhus and typhoid fevers. Among those, however, who, like Huxham, did recognize the radical differences of these two affections, mild purgatives and laxatives were prescribed in the former, but condemned in the treatment of the latter. "I have known," says this writer, "a common purge injudiciously given at the beginning of this fever immediately followed by surprising languors, syncope, and a large train of other ill symptoms; however it may be necessary sometimes, even at the beginning, to cleanse the primæ viæ by a gentle puke, a little rhubarb, manna, &c., if you give anything drastic, be assured your patient will rue for it, and you will repent it."[1] More modern observations have shown that a systematic treatment of typhoid fever by laxatives is attended with a less mortality than when depletion, stimulants, or tonics, are chiefly depended

[1] An Essay on Fevers, 7th ed., p. 81.

upon, and over these methods it has the advantage of shortening the disease, and preventing, in a great degree, such complications as bed sores and hemorrhage, or perforation of the bowel. Yet when compared with an expectant treatment, in which particular symptoms are combated as they arise, while the general management of the disease is committed to hygienic influences, there is nothing to manifest the superiority of evacuant measures. Indeed, typhoid fever would constitute an exception to all self-limited diseases if any treatment whatever were competent materially to shorten its duration or diminish the mortality which belongs to it under a mild expectant system. If, however, medicinal alvine evacuations are thought desirable in any case, they should be procured by means of castor oil or saline laxatives, which are usually recommended (apparently upon theoretical grounds, if not under the influence of a mere habit acquired during the sway of a medical hypothesis) to be prescribed in conjunction with small, or so-called alterative, doses of blue pill or calomel.

One of the most valuable applications of purgatives is to the treatment of *serous plethora*, a sort of dropsy of the bloodvessels, which is very common during pregnancy and in chlorosis. It is this condition which has led to the custom, at one time universal, and still common among the vulgar, of considering bleeding one of the necessary incidents of the pregnant state; but while depletion relieves the plethoric condition, it robs the blood of its most important element, the red corpuscles, and predisposes to a renewal of the symptoms in a more aggravated degree. An equal alleviation is procured by saline laxatives, particularly when they are associated with diuretics of the same class, without any loss of strength. Similar remarks are applicable to the serous plethora of chlorosis. Evacuant, tonic, and ferruginous medicines, in due proportion, are often essential to the successful management of this disease.

The evacuant operation of cathartics has always rendered them the principal agents used in the treatment of *dropsy*, and *serous effusions* generally. The liquid which they cause to be discharged from the intestinal canal is speedily replaced by that which is absorbed from the cavity in which the effusion exists, and thus by degrees the whole of the morbid collection may be evacuated. Whether this effect will be curative or only palliative must depend upon the character of each case. In general, when the cause of the effusion is a permanent organic change, the purgative is only of a temporary advantage; it may evacuate the liquid completely, but cannot prevent its reproduction. Such is the case when general dropsy depends upon organic valvular disease of the heart or granular degeneration of the kidneys, or ascites

upon cirrhosis of the liver. But when, as in many cases of ascites, the affection of the spleen or of the liver is one not only curable, but by purgatives rather than by any other remedies, the evacuation of the liquid is permanent; or if not from the first action of the medicines, may become so upon their repetition. In this form of dropsy it is that the active hydragogue cathartics (jalap, elaterium, colocynth) are most useful, particularly when, in combination with salines, they succeed small doses of mercurial preparations. In other forms, as pericardial and pleuritic effusion, but especially in general dropsy produced by cold, purgatives alone are less advantageous than diuretics, but the two in alternation are more efficient than either alone.

The evacuant and revulsive operation of cathartics forms a most precious resource in many affections of the *brain*, and in some of the *spinal marrow*. At the commencement of inflammatory affections of the former organ, a full dose of calomel, followed by a saline sufficient to produce copious watery evacuations, is a means of materially mitigating the violence of the subsequent course of the attack; but it is one which is not so well adapted to persons of a delicate constitution, nor to children, as it is to robust adults. These medicines, and even the most powerful drastic cathartics, such as croton oil, are strongly indicated in *congestion of the brain*, whether this arise from a plethoric condition and over-excitement of the brain, or from an imperfect evacuation of the bowels, or the presence within them of some indigestible substance. Even when paralytic symptoms render probable the existence of an effusion within the cavity of the cranium, they, along with moderate depletion, are best adapted to promote its absorption, provided they be not carried to the extent of exhausting the patient. In the beginning, saline cathartics are the most appropriate; but subsequently a regular evacuation, at intervals of two or three days, by means of jalap or of the compound cathartic pill, will be found more effectual. Congestion of both of the central organs of the nervous system, and a consequent impairment of their functions, are common effects of constipation, and may be relieved by the same agents which are fitted to remove this condition.

Purgatives influence *uterine disorders* partly by their deobstruent and partly by their stimulant properties; by the former when habitual constipation is present, and with it a congested state of the whole venous system of the abdomen, as indicated by hæmorrhoids, derangement of the hepatic functions, &c.; and by the latter when, instead of this special infarction of the abdominal organs, they fail in their functions from a deficiency rather than an excess of blood in their vessels. In the one case any of the evacuant remedies will probably fulfil the

indication presented; in the other those which especially stimulate the lower part of the bowels—the resinous cathartics in general, and aloes in particular.

Affections of the *respiratory organs* are not in general favorably influenced by cathartics, except in so far as a state of plethora may be present, or when the disease is in its forming stage. In the former condition their depletory action is important as a palliative, and in the latter it sometimes prevents any further development of the attack. Saline cathartics are only to be preferred in such cases when there is a decided febrile reaction; but for bringing about resolution, promoting expectoration, and allaying the painful irritation of acute inflammations of the bronchial mucous membrane, no remedy is comparable to castor oil.

The use of purgatives in *chorea* is not of recent introduction into medicine, since it was recommended by Sydenham and De Haen, and more lately by Hamilton and Bardsley. In cases of pure and uncomplicated chorea occurring in robust children, it is very probable that medicines of this class will often accomplish a cure, but in many others, and, as we believe, in a majority of the whole, a really curative plan must be tonic rather than debilitant. But it is a peculiarity of this disease that the bowels are very torpid, and the dejections are often very dark and fetid; and it is probable that this circumstance first suggested the employment of cathartics for its cure. Those which have been most successfully employed belong to the drastic division, and comprise calomel and jalap, scammony and aloes, and should be given at intervals of two or three days according to the nature of the evacuations and the degree of improvement obtained.

Several *diseases of the skin* are benefited by a judicious and persevering use of purgatives. Eczema and impetigo at the decline of the acute stage, are sensibly moderated by saline laxatives, particularly when administered in conjunction with bitter vegetable infusions; and lepra, if not inveterate, is improved by these and by the more drastic articles, such as jalap and aloes, especially when associated with calomel.

In general terms, the selection of a purgative should be determined by the character of the effect which it is intended to produce. The salines are adapted to a prompt and thorough evacuation of the bowels, with the advantage of acting as depletory agents. Croton oil is also speedy in its operation, and is at the same time powerfully revulsive. On the other hand, a slower but equally decided influence is exerted by the resinous cathartics and by castor oil, either alone or given subsequently to the administration of calomel. When acidity of the

stomach and bowels prevails, magnesia is preferable to all the other agents of its class. If the biliary secretion is deficient, mercurials render it more abundant, and if, on the other hand, it is excessive and altered in quality, the same medicines, by increasing its flow and at the same time tending to evacuate it from the bowels, is still the most appropriate remedy.

The association of different purgatives in the same dose is an ancient practice, and was intended to promote, by a single medicine, all of the secretions of the intestine and its greater glands, but especially the mucus, the serum, and the bile. Thus, in dropsy dependent upon hepatic derangement, rhubarb and aloes, which were believed to excite the secretion of the liver, were combined with jalap as a hydragogue, and senna as a phlegmagogue medicine. At the present time, the same method is universally employed, with the difference that mercurials take the place of rhubarb and aloes. The popular purgative, composed of senna, manna, and Epsom salts, the black draught of the English Pharmacopœia, is a combination of similar intent and operation. In these associations, as Mialhe has remarked, the effect produced upon particular portions of the economy is to be regarded more than the abundance of the evacuation which takes place. Compound cathartics are more useful than a single one, not only because they purge more actively, but because they act upon several organs at once. When calomel and jalap are administered together, the former acts upon the whole intestinal canal, but chiefly secondarily upon the liver; although the jalap is for the most part dissolved by the alkaline secretions of the large intestine which it purges, while it carries off the portion of calomel which remains undissolved.

The proportion of water taken with or after certain purgatives, influences their operation. Saline laxatives are most prompt and thorough in their effects when largely diluted. In this case the bulk of the medicine contributes to its effects, and at the same time moderates its irritant impression. If given in a small quantity of liquid, a full dose of Epsom salts will generally fail of its intended effect, and sometimes occasion burning pain in the abdomen. In the cases in which magnesia is peculiarly indicated, that is, when there is an acid condition of the alvine secretions, too large a quantity of water interferes somewhat with its combination with these acids, and consequently with its purgative effect. A similar remark is applicable to mercurial cathartics. In general, with the exceptions already indicated, purgative medicines act more promptly when a moderate quantity of liquid accompanies them on their passage through the bowels; too little

delays their progress and their solution, and too much prevents their exercising a due degree of irritation upon the mucous membrane.

As the presence of food in the alimentary canal must interfere more or less with the action of the purgative medicine, it should generally be administered upon an empty stomach. This rule is peculiarly important in the case of saline medicines, and hence it is customary to prescribe them to be taken early in the morning; but resinous cathartics which are slower in the operation are given with more advantage at bedtime. The same hour is appropriate for the administration of mercurials, and in the morning they may be followed by a saline draught.

When it is desired not to exceed a moderate purgative effect, it is most prudent to administer the proper medicine in divided doses, at intervals of one, two, or three hours, or to associate with it a narcotic such as hyoscyamus, which will moderate its effects without impairing its purgative power. Opium may be employed for the same purpose; but it is too apt to interfere with the cathartic action. When calomel is given in cases attended with large or frequent evacuations, this combination is of great value. Purgatives which gripe because they create flatulence, may have this action favorably modified by associating with them a carminative, as anise or caraway seed; and the irritation of drastic medicines may be moderated by the free administration of diluent and especially of mucilaginous drinks, after this symptom has begun to manifest itself. The same liquids are very serviceable in allaying the gastric and intestinal irritation produced by the harsher purgatives. Bitter, tonic medicines are often associated with cathartic medicines, particularly when a necessity exists for their repeated use, and when the former agents are not contraindicated by the presence of a febrile or inflammatory state. In the treatment of habitual constipation, this combination, while augmenting the power of the cathartic medicine, prevents it from rapidly exhausting the susceptibility of the bowel, and requiring a repetition of the purgative dose.

CATHARTIC ENEMATA.—An operation of the bowels can be produced by the introduction of any of the agents of the present class, introduced into the large intestine through the anus. As in the case of the same medicines administered by the mouth, they may operate by their bulk, their temperature, or their intrinsic stimulant or irritant properties, and in some degree also in consequence of their absorption. According to the experiments of Falck,[1] the more the temperature of

[1] Archiv. für phys. Heilkunde, x. 765.

a clyster of pure water is above or below that of the body, and the greater its bulk, the more apt it is to produce a purgative effect. To fill the colon of an adult, three or four pints of liquid are necessary, and there is reason to believe that a portion of it may pass through the ileo-cæcal valve. This is not, however, ordinarily the case, and hence this valve used to be called by the French *la barrière des apothicaires*, or the apothecaries' barrier, in allusion to the custom of employing apothecaries to administer enemata. The habitual use of such large enemata is accused, and probably with justice, of producing a permanent dilatation as well as atony of the colon. But there can be no objection to an occasional resort to them.

The advantages of employing evacuant enemata, instead of purgatives by the mouth, are several, but they are chiefly confined to cases in which it is desirable to avoid irritating the stomach or interfering with digestion, and those in which the object in view is either to evacuate the lower bowels, or to employ their mucous membrane as a surface upon which a salutary derivation may be made. All medicines of the purgative class, except calomel, may be made use of in this manner, and consequently all degrees of stimulation may be applied to the colon by their means. The same laws respecting the absorption of medicinal substances obtain in this as in the other case, and consequently the effects of enemata depend in part upon their local irritation, and in part upon their absorption and subsequent elimination from the glands and bloodvessels of the colon.

The simplest enema is water. It is the one most frequently used in France, where this mode of producing evacuation of the bowels is more common than elsewhere. This is probably due to the universal and habitual use, by all classes of the people, of coffee and astringent wines, of eating a large proportion of bread and a small one of fresh vegetables, and of taking but two meals in the twenty-four hours. In that country the habit of obtaining this artificial relief frequently supplants entirely the calls of nature, so that the bowels are never open unless an enema is made use of. Examples of the same nature are occasionally met with in the United States. If, instead of employing cold water—which is the only safe liquid for habitual use in this manner—warm water, either alone or with soap, salt, oil, lard, sugar, or molasses, is injected into the bowel, very serious consequences may result. The natural protective mucus is removed, the lining membrane of the intestine is irritated, and gradually the fæces become more and more scybalous, and the formation of hæmorrhoids or fistula in ano almost certainly ensues.

But, as occasional remedies in disease, enemata cannot be too highly

estimated. It frequently happens that the condition of the stomach or small intestine peremptorily forbids or renders inexpedient the administration of purgatives by the mouth; or that the patient is unable or unwilling to swallow; or that, as already remarked, the stimulant or derivative action of a purgative is the one principally desired; or that, in a word, the action of the purgative upon the colon is sufficient to fulfil the curative intention. In all such cases an enema of the proper quality, and properly administered, is greatly to be preferred before other means of evacuating the bowels.

Enemata are not officinal in the United States Pharmacopœia, but the following are those ordinarily employed:—

Enema Aloës.—Clyster of Aloes.

Aloes *two scruples;* Carbonate of Potassa *fifteen grains;* Barley Water *half a pint.*

Enema Catharticum.—Cathartic Clyster.

Olive Oil *one ounce;* Sulphate of Magnesia *half an ounce;* Senna *half an ounce;* Boiling Water *sixteen fluidounces.* Infuse the senna for an hour in the water; then dissolve the salt and sugar; add the oil, and mix them by agitation.

Enema Commune.—Common Clyster.

Common Salt *an ounce;* Warm Gruel or Barley Water *twelve ounces.* Oil, lard, or molasses may be added. Epsom or Glauber salts may be substituted for common salt in this preparation.

Enema Colocynthidis.—Clyster of Colocynth.

Extract of Colocynth *half a drachm;* Soft Soap *an ounce;* Water *a pint.* Mix and rub them together.

Aperient enemata, which are at the same time emollient and demulcent, may be made of mucilage of flaxseed, an infusion of slippery elm bark, a decoction of rice or barley or oats; or, if a stimulant operation is required, it may be procured by means of oil of turpentine or assafœtida, the former made into an emulsion with mucilage or the yelk of egg, and the latter with mucilage or water.

It is of the utmost consequence to the success of enemata that they should be administered slowly, and with occasional remissions of the propulsive force, so as to allow the liquid to diffuse itself over the large intestine. This is peculiarly necessary when the bowel is obstructed with fæces. The patient should lie upon the left side at the commencement of the injection, afterwards upon the back, and ultimately upon the right side, so that gravity may favor the diffusion of the liquid throughout the large intestine. The first tendency to expel it should be steadfastly resisted, and the patient's effort to do so

seconded by applying a folded napkin, and pressing it firmly against the anus.

Purgative *suppositories* were employed by Hippocrates, composed of honey, soap, salt, nitre, and powdered colocynth. Although these agents were generally applied in the vagina for the cure of uterine affections,[1] they were also, as in modern times, sometimes introduced into the rectum, and directed to be of a spherical and sometimes of an oblong or oval shape. They act partly by mechanical irritation, and partly by their purgative virtues. Dr. Osborne found assafœtida, elaterium, and croton oil, associated with soap, to act freely when employed in this manner;[2] but the last-named medicine, on account of its irritant properties, should not be used except when the necessity of procuring an evacuation of the bowels is unusually urgent. A very efficient laxative suppository, and one much used by nurses and the poorer classes when constipation affects infants, consists of a piece of brown soap about an inch in length and half an inch in diameter. But its repeated use irritates the anus, and renders the constipation more obstinate. In all cases the suppository should be introduced beyond the grasp of the sphincter ani. It may be carried to its place by means of the finger, previously anointed, or by means of a glass tube, open at both ends, and furnished with a piston.

SULPHUR LOTUM.—Washed Sulphur.

Description.—Sulphur is a simple substance which is very widely diffused in nature. It exists in a more or less pure state, or combined with metals, in the mineral kingdom, and enters into the composition of albuminous or protein substances. It is most abundant in volcanic regions. The crude sulphur of commerce is chiefly obtained by fusing native sulphur or by roasting native sulphurets. By subliming this product the *flowers of sulphur* are obtained, which, when thoroughly washed with hot water to remove their acidity, form the officinal preparation. It is a crystalline powder of a fine yellow color, which has a slight taste, and by friction exhales a perceptible smell.

History.—The name of this substance is derived, according to some, from *sal*, salt, and πυρ, fire, and, according to others, from *solum*, earth, and πυρ.[3] The synomymous word brimstone is derived from *bryne*, burning, and *stoan*, stone.[4] The earliest mention of sulphur is

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[1] Ed. Fæsii, i. 265.
[2] Dublin Quart. Journ., xvi. 473.
[3] Alston.
[4] Bailey.

contained in the account given of the destruction which overtook the cities of the plain by "fire and brimstone."[1] In the Odyssey, Homer describes the use of its fumes to purify dwellings. Hippocrates mentions sulphur (θεῖον) several times in his treatise on the diseases of females. Pliny alludes to several varieties of it and the sources whence they were obtained.[2] One of these only, which he describes as being clear and of a greenish tint, is said by him to be employed in medicine. He attributes to it a heating and maturating quality, and states that it discusses swellings, and for that purpose forms an ingredient of plasters and poultices. An ointment made with it and rubbed upon the loins is, he adds, very serviceable in lumbago. In combination with resins, it removes lichenous and leprous eruptions from the face. As an electuary, it relieves dyspnœa and cures coughs with purulent expectoration. It communicates its virtues to thermal springs. Dioscorides[3] gives almost the same account as Pliny, but dwells more particularly on the use of the medicine in cutaneous diseases, and especially in the itch. Galen copies the statements of his predecessors. Paul, of Egina, speaks of it as a "wonderful remedy for scabious complaints."[4]

ACTION. *On Animals.*—Benk found that in dogs sulphur occasioned anorexia, thirst, and diarrhœa. The animal temperature at first was raised, but afterwards it fell below the natural standard; at first, too, the pulse was more frequent, but subsequently became slower than usual; there was also embarrassed breathing, slight general trembling, convulsions, and sudden death. The effects of sulphur upon cats were nearly the same, but with the addition of vomiting, general emaciation, debility, and coma. After death, the stomach and intestines were found very much injected.[5] According to Hertwig,[6] small and occasional doses of sulphur display no peculiar effects upon animals, but the effect of somewhat larger and repeated doses is to impregnate the perspiration, the eructations, the dung, and sometimes the expired breath with the odor of sulphuretted hydrogen, while the pulse remains unchanged, as well as the cutaneous and mucous secretions, and the appetite becomes stronger. Still larger doses augment the secretion of intestinal mucus and procure abundant and semi-fluid dejections, but do not destroy the appetite. Very large doses are said to cause inflammation of the gastro-intestinal mucous membrane, which, however, is superficial and unattended with any violent symptoms.

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[1] Genesis, xix. 24.
[2] Lib. xxxv. 50.
[3] Lib. v. 83.
[4] ADAMS's Comment., iii. 135.
[5] GIACOMINI, Mat. Med., p. 312.
[6] WIBMER, Wirkung, &c., v. 278.

A nine year old horse, of medium strength, and affected with the glanders, had given him an ounce of sulphur the first day, two ounces the second, &c., so that by the sixteenth day he had taken one hundred and thirty-six ounces. Diarrhœa set in upon the seventh and continued until the seventeenth day; the appetite was not diminished, nor the secretion of urine changed; the cutaneous secretion was not augmented, but after the third day had a sulphurous smell, and, by blackening a paper wet with a solution of sugar of lead, was proved to contain sulphur. The other symptoms which the animal manifested might very well have arisen from the disease under which he labored. On the seventeenth day, he was killed. The mucous membrane of the stomach and bowels was reddened and softened, and its cavity contained a large quantity of sulphur. The flesh of sheep that had had sulphur mixed with their food was found to taste and smell so strongly of sulphuretted gas as to be unfit for the table.

On Man.—When applied without friction to the sound skin it exerts no sensible action, but when excoriations or ulcers exist, or the chorion is already inflamed, sulphur acts as a mild irritant. Internally, in doses of five or six grains it produces no sensible phenomena, but when a scruple, or from that to a drachm, is taken, it creates some movement in the abdomen, and a loose discharge from the bowels, without colic. At the same time whatever flatus escapes has the characteristic odor of sulphuretted hydrogen. But the greater part of the sulphur is passed unchanged. When doses of twelve grains or more are repeated at intervals of an hour or two, their action is said to be displayed by a higher temperature of the skin, and by increased perspiration and frequency of the pulse.[1] The skin exhales a sulphurous smell, and silver articles allowed to remain in contact with it, are blackened. It has happened, when a course of mercury has followed the administration of sulphur, that parts of the skin have turned black from the formation of sulphuret of mercury.[2] The expired air, the urine, and the milk, have also revealed its presence by their odor, or by the use of chemical reagents. Vogt observed that when taken for a long time, it gives a peculiar tint to the skin, and Hahnemann noticed brownish spots and other ephemeral cutaneous eruptions from its use.[3] If, according to Mitscherlich,[4] the patient is plethoric and impressionable, or is suffering under an inflammatory disease, sulphur is apt to cause excitement of the circulation, and feverishness. The stools, in general, are semi-liquid, a circumstance peculiar to the laxa-

[1] Barbier, Mat. Med., ii. 244.
[2] Headland, On the Action of Medicines, p. 289.
[3] Giacomini, loc. cit.
[4] Lehrbuch, &c., ii. 432.

tive operation of sulphur. In some cases the medicine occasions a sense of extreme anxiety and depression, which ceases upon the free discharge of fetid gas from the bowels, and is therefore thought to depend upon the action of sulphuretted hydrogen.

Some cases of almost poisonous effects, attributed to this substance, are recorded. One is related of a person who took two drachms of sulphur with wine four or five times a day. On the sixth day he was seized with nausea, bloody diarrhœa, cramp in the muscles of the legs, fever, dysury, &c. For several years his stomach remained irritable.[1] Another is recorded by Prof. Olmstead, of New Haven, of a man who, for the cure of rheumatism, took, in all, six pounds of sulphur.[2] His ordinary dose was half an ounce three times a day. Although the limbs grew distorted and thinner, and the joints stiffer and more swollen by the progress of rheumatic disease, it does not appear that the digestive organs suffered any of that derangement which occurred in the other case referred to, and which may very probably have depended upon some other cause than the sulphur, perhaps upon the presence of sulphuric acid in the parcel that was used.

Uses.—The most important application of sulphur is as a remedy for *scabies*. The ancient custom of treating this disease by sulphur, which has already been adverted to, continues at the present day. The principal modifications which modern physicians have introduced into the method have arisen from the recognition of the complete inutility of sulphur as an internal remedy for itch, and from the discovery of the itch insect (*acarus scabiei*) whose destruction by its means constitutes the cure of the disease. These two points having been settled, the use of the remedy became simplified, and the time necessary for its effecting a cure was singularly abridged. As long ago as in 1812–13 Helmerich, and also Burdin, cured the itch, the one in eighteen hours, and the other in about half that time, by means of vigorous and repeated frictions with sulphur ointment aided by warm baths.[3] Subsequently, however, the principle upon which this method was effectual having been lost sight of, the method itself fell into disuse, and the itch continued to require an average period of twelve days for its cure. Within the last few years the neglected plan of treatment has been revived, and with the most surprising results. Some of these were set forth by Prof. Hebra, of Vienna, in 1844,[4] and we have since then had an opportunity of witnessing them in the General Hospital of that

[1] Wibmer, op. cit., v. 277.

[2] Strumpf Handbuch, from Silliman's Am. Journ. of Science, viii. 394.

[3] Bull. de Thérap., xlvi. 238. [4] Annales des Mal. de la Peau, ii. 112.

city. Dr. Hebra made use of the following ointment: ℞.—Cretæ ℥iv; sulphuris, picis liquidæ, āā ℥vj; saponis communis, axung. porci, āā ℔j.—M. This quantity is sufficient for twenty persons. The chalk in the ointment is intended to act mechanically for the destruction of the burrow in which the acarus lodges; the sulphur kills the insect, and the lard, soap, and tar, give the preparation a proper consistence. After the patient has taken a tepid bath, his skin is carefully examined, in order to discover, if possible, any burrows elsewhere than upon the hands. All the parts on which they are detected are then briskly rubbed with the ointment, and the frictions are repeated twice daily. In three days the cure is complete. A similar method, and with like success, was employed by M. Bazin, of Paris. He made use of Helmerich's ointment, composed of two parts of sulphur, one of carbonate of potash, and eight of lard.[1] M. Hardy afterwards perfected the method so as radically to cure the disease in *two hours*. He proceeds in the following manner: The patient first undergoes a friction of his whole body for half an hour with soft soap, in order to cleanse the skin and break up the burrows; a warm bath of an hour's duration follows, during which the skin is thoroughly rubbed in order to complete the destruction of the burrows; after which frictions for half an hour, and upon the whole surface, are practised with Helmerich's ointment. This completes the cure. Out of four hundred patients subjected to this treatment four only returned to the hospital.[2] It is probable that such thorough frictions applied only to certain parts of the body, as Hebra recommends, would prove quite as effectual and be much less vexatious. By the method of Dr. Bourguignon, a Belgian physician, the same result is claimed to have been produced in *half an hour*. He makes use of a liquid prepared by boiling one part of quicklime with two parts of sublimed sulphur in ten parts of water, until the two former are perfectly united. During the boiling it must be constantly stirred with a wooden rod, and when the sulphur and lime have combined, the fluid should be decanted and kept in a well stoppered bottle. A pint is sufficient for the cure of several cases. It is sufficient to wash the skin well with warm water and then to rub the liquid into the skin for half an hour. As it evaporates a layer of sulphur is left upon the skin. During the half hour the acarus is killed, and the patient is cured.[3]

Sulphurous *fumigations* were long ago employed by Glauber and by J. P. Frank, who may perhaps have had the plan suggested by

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[1] Bull. de Thérap., xxxix. 137. [2] Ibid., xli. 180.

[3] Association Med. Journ. and Phil. Med. Exam., July, 1856, p. 447.

a custom which prevails among the inhabitants of the Solfaterra in Italy, of employing the sulphurous vapor which there issues from the earth in the cure of various diseases. More recently, Galés in Paris, Clarke, Wallace, and Bardsley[1] in England, and Dr. Emerson in Philadelphia,[2] made use of a similar method. The forms of disease in which it was employed are *chronic eczema*, *psoriasis*, *impetigo*, and *prurigo*, *rheumatic* and *scrofulous* affections, *paralysis*, *amenorrhœa*, &c. In many instances the plan was successful, but the accidents which it sometimes occasioned have probably led to its neglect. These are, according to Rayer,[3] irritation of the skin, great debility, syncope, suffocation, &c., effects which would render the method dangerous if indiscriminately used.

Sulphur *baths*, particularly those of natural *thermal* springs, are much safer, as well as more efficacious. In Europe these springs are numerous; they do not, it is believed, exist in the United States. With intelligent management, however, the cold sulphur waters of Virginia and New York might be rendered more useful than they now are in cutaneous and rheumatic affections, &c. The action of warm sulphur baths is thus described by Rayer.[4] After using them for several days, some of these waters produce an eruption of small red, acuminated, pruriginous elevations, and of red spots, which appear first upon the limbs, but soon spread to nearly the whole surface of the body; a febrile movement, with thirst and loss of appetite, is developed; the sleep is restless; the urine is cloudy and muddy. In from one to two weeks these symptoms disappear in the order of their coming, the epidermis separates in branny scales, but the skin continues to itch for some time longer. The same writer gives much credit to the use of lotions and douches of sulphurous waters in some local cutaneous affections, and especially in that intractable and disfiguring complaint, *acne rosacea*. Sulphur is also recommended by Dr. James Morris, whose mode of employing it is as follows: a drachm of sulphur is pulverized with alcohol, twice as much precipitated sulphur is then added, and afterwards enough distilled water to render it sufficiently liquid for use. This is smeared over the face freely at night, and more sparingly in the morning; the effect is generally very soon apparent, and is often most striking.[5]

Sulphur has enjoyed considerable reputation in *rheumatism*, and

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[1] Hospital Facts and Observations, p. 192.

[2] Phil. Journ. of Med. and Phys. Sci., iii. 126.

[3] Malad. de la Peau (éd. de Brux), p. 38.

[4] Ibid., p. 37.

[5] Lancet, Mar. 1855, p. 237.

probably in that form of it which affects the muscles and the tendinous expansions it may be efficacious through its diaphoretic action. Van Swieten, Hufeland, Cheyne, and many others, have maintained its efficacy. But they generally associated it with medicines of much more decided and established powers. The external application of dry sulphur, with friction and bandaging with flannel, has been used successfully by Dr. O'Connor in *sciatica* and *chronic rheumatism*,[1] and Gieseler states that repeated frictions with sulphur ointment, followed by the application of a flannel bandage, are very efficient in the cure of *muscular rheumatism*.[2] The sulphurous *vapor bath* is one of the most efficient of all the remedies for inveterate rheumatism, particularly when followed by a cold douche of sea or sulphurous water.

In *chronic coughs*, with profuse expectoration, its virtues are sometimes conspicuous. This is the only form of pulmonary affection to which it is appropriate, yet many writers have vaunted it in phthisis, whooping-cough, and even in pleurisy.

As a *laxative*, sulphur is appropriate when the object is chiefly to empty the bowels without exercising an antiphlogistic action. The quality it possesses of accomplishing this purpose renders it a valuable palliative in *piles*. It has also been thought to promote the *menstrual discharge* when it is scanty, to relieve *congestion of the liver*, to expel *intestinal worms*, and to cure a variety of chronic affections which depend more or less directly upon constipation of the bowels. It is popularly employed as a laxative, in the spring season, to "purify the blood."

ADMINISTRATION.—Sulphur is given as a laxative in the *dose* of from *one* to *three* or *four drachms*. For other purposes the dose is about *half a drachm*. It may be administered in milk, or with molasses or some other syrup.

MAGNESIA.—MAGNESIA.

DESCRIPTION.—Magnesia combined with various acids exists in the mineral and vegetable kingdoms, and as a product of urinary disease in man. It is prepared from the carbonate of magnesia by calcination. It is usually a light, fine, white, and inodorous powder with a faint earthy or alkaline taste. By some methods of preparation it acquires a density four times as great as that of ordinary calcined magnesia. It is almost insoluble in water, but is less so in cold than in

[1] Lancet, Feb. 1857, p. 184. [2] Journ. f. Pharm. Tox. u. Therap., ii. 227.

hot water. It was thought to be insusceptible of fusion until it was melted by the compound blowpipe of Dr. Hare. When stirred with water and then allowed to stand, it becomes hard by a partial conversion into a hydrate.

HISTORY.—Our acquaintance with magnesia is not of earlier date than the commencement of the eighteenth century, when it was vaunted as a panacea under the name of *Count Palma's powder*. For its introduction into the materia medica we are indebted to Lancisi in 1717, and to Hoffmann in 1722. The latter states that its reputation while a secret remedy was gained by the relief it afforded hypochondriacal persons, and those who suffered from acidity of the primæ viæ.[1] In 1773 Mr. Henry recommended the calcination of magnesia as rendering it a fitter medicine in certain cases; and the preparation was soon afterwards introduced into the British Pharmacopœias, under the name of *magnesia usta*.

ACTION.—The action of magnesia upon the bowels is more or less distinct according to the quantity of acid which they contain, by means of which it is converted into a neutral and purgative salt. Hence its operation is generally quickened by acidulous drinks such as lemonade. By absorbing the acids which it encounters in the stomach and intestine, it prevents the consequences of their local irritation as well as of their absorption into the system. When not enough acid is contained in the alimentary canal to combine with all of the magnesia taken, a portion of the latter is apt to be retained. Hence it has happened that when magnesia has been used daily or at short intervals for a long time, it has formed considerable masses by its union with the intestinal mucus and indigestible articles of food, and quite obstructed the passage of the bowel. Two such cases are quoted in many treatises upon the materia medica, in one of which, not less than nine or ten pounds of magnesia had been taken in the course of two years and a half; but the fact that these instances appear to be almost the only ones upon record, show that the mischievous effect alluded to must be extremely rare. Magnesia is capable of destroying the acidity of the urine when taken for some time, and may even reverse its quality and cause a deposit of the earthy phosphates in the form of white sand.

USES.—Magnesia has an advantage over nearly every other laxative, in being almost insipid and rarely causing sickness at the stomach or colic. It produces feculent discharges, and hence it does not weaken as much as the neutral salts. The dejections are also remark-

[1] Op. Omnia, iv. 479; Animadversiones et Experimenta circa Magnesiam albam, &c.

able for having very little smell. It is slow in its operation, and generally requires six or eight hours, and sometimes much longer to produce its effects. In some experiments on the comparative powers of magnesia and Glauber salts, M. Trousseau found that a drachm of the former, although it acted more slowly, still produced more evacuations than an ounce of the latter. The neutral salt also, when given for several successive days, became less active every day, while the magnesia, on the contrary, grew more so, and produced mucous and even bloody stools, with tenesmus. Similar comparisons instituted by M. Dorvault, between magnesia, the sulphate, and the citrate of magnesia, show the first named purgative to be the slowest and the mildest of the three.[1] Some experiments of Cless, coincide exactly with those of Trousseau.[2]

In most of the forms of derangement of the digestion attended with *acidity of the stomach*, magnesia is a useful palliative. It has even arrested the *vomiting of pregnancy*, when the rejected fluid was strongly acid.[3] In all those cases of *sour stomach*, *heartburn*, *colic*, *sick headache*, *mental depression*, &c., which are accompanied with constipation, this medicine affords great relief, but its use must alternate with that of tonics, a strictly regulated diet, active exercise, and the absence of mental anxiety, to be permanently beneficial. As a laxative, it is frequently used in the diseases of children arising from improper food, sometimes alone, and sometimes combined with rhubarb. It is a very appropriate agent for evacuating the bowels in piles and other affections of the rectum. When it is less active than is desired, the addition of Epsom salts renders it more efficient. This combination, with wine of colchicum, forms a very eligible prescription in gout and its allied disorders, as in the following formula: ℞.—Magnesiæ sulph. ℥j–ij; aq. menthæ f℥x; acet. colchici, syrupi simpl., āā f℥j; magnesiæ ℈viij.—M. S.—One to three tablespoonfuls every two hours till from four to six evacuations are procured in the twenty-four hours. In *colic*, particularly the flatulent variety to which infants are subject, it should be associated with some aromatic or anodyne, as in the carminative mixture of Dewees: ℞.—Magnesiæ ℥ss; tinct. assafœtidæ gtt. xl; tinct. opii gtt. xx; sacch. alb. ℥j; aquæ f℥j.—M. S.—Twenty drops and upwards.

It was early noticed that magnesia checks the formation of *acid gravel*. Hoffmann thought it the best of antilithics. Its virtues in this respect, were demonstrated by Brande, in 1813. It has been thought

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[1] Bull. de Thérap., xl. 406. [2] Canstatt's Jahresbericht, f. 1853, p. 145.
[3] Watson, Med. Obs. and Inq., iii. 325.

by some to be superior to the alkaline carbonates in lithiasis, both because it is supposed less apt to derange the general health by its absorption into the blood, and because its laxative action promotes the elimination of injurious elements from the economy. But in practice this opinion is hardly sustained.

Numerous cases may be found recorded in which magnesia has appeared to act as an antidote to *arsenical poisoning*, but as observed by Orfila,[1] the cases are not conclusive; because in all of them vomiting took place after the magnesia was administered, and consequently a large portion of the poison may have been rejected. In experiments on animals it was found by this toxicologist, that when magnesia was given along with, or directly after, arsenic, death was nevertheless the result if vomiting was prevented by ligature of the œsophagus. Besides, arsenite of magnesia is itself poisonous, although less so than arsenious acid. Magnesia may be used as an antidote to poisoning by *acids* and by *phosphorus*. In the latter case, calcined magnesia suspended in boiled water, and freely administered, is recommended by Antonielli and Borsarelli, as the best antidote, and the most appropriate purgative for eliminating the poison.[2] Schroff remarks, that magnesia acts as an antidote to arsenic or arsenious acid only when the latter is not introduced into the stomach in solution, for the soluble preparations of arsenic are too rapidly absorbed to be arrested by any chemical antidote.[3]

Cases of *diabetes mellitus* cured by magnesia have been published from time to time. Eberle found it successful in a mild case of long standing.

ADMINISTRATION.—The *purgative* dose of magnesia is about *forty grains* for adults, and *five grains* for infants. As an *antacid*, it may be taken in doses of *ten grains* and upwards twice a day. It may be given in water or milk.

MAGNESIÆ CARBONAS.—CARBONATE OF MAGNESIA.

DESCRIPTION.—This substance is prepared by decomposing sulphate of magnesia with carbonate of potassa. Its *physical properties* are almost identical with those of magnesia. It is, however, even less soluble than that substance in water. Its *uses* are the same as those of calcined magnesia, but it is less active. When sickness at the

[1] Toxicologie, i. 447. [2] Bull. de Thérap., lv. 524.
[3] Brit. and For. Med.-Chir. Rev., April, 1859, p. 518.

stomach is present, the carbonate is, perhaps, to be preferred in consequence of its evolving carbonic acid, but in general this quality is a defect, inasmuch as it is apt to cause undue distension of the alimentary canal.

Several persons have called attention to the power of this substance, when taken internally, to remove *warts* from the skin.[1] The numerous cases of its complete success in destroying these unsightly excrescences render it well worthy of being more extensively tried. The dose of the medicine for this purpose is a teaspoonful morning and evening, continued for five or six weeks.

ADMINISTRATION.—The dose of carbonate of magnesia as a *laxative* is from *half a drachm* to *two drachms;* as an *antacid*, from *five grains* to *a scruple.*

MAGNESIÆ SULPHAS.—SULPHATE OF MAGNESIA.

HISTORY AND DESCRIPTION.—This salt bears a variety of names derived from the places which furnish it, as Seidschütz, Püllna, and Seidlitz, in Bohemia, and Epsom, in England. It has also been known as *sal amarum*, *sal catharticum*, *sal anglicum*, &c. It was originally procured from the Epsom Spring, but was found to be extremely abundant in many saline mineral waters and in sea water. It also occurs native, and in the United States "is found abundantly in the great caverns so numerous west of the Alleghany Mountains." Finally, it is prepared in England from the double carbonate of magnesia and lime, and in this country, near Baltimore, from the siliceous hydrate of magnesia. As found in the shops, it usually occurs in small acicular crystals, which are inodorous, colorless, and transparent, and have a bitter, nauseous, and saline taste. It dissolves in its own weight of water at 60° F., and in three-fourths of its weight of boiling water.

ACTION.—Sulphate of magnesia is a certain, safe, and mild purgative when duly administered. When the stomach is empty, it is also very prompt in its operation, producing copious watery dejections and generally an increased discharge of urine. Indeed, if the skin be kept cool, its action is diuretic rather than purgative, particularly when the quantity of it taken is small and very much diluted. Delicate persons, especially in cool weather, are apt to feel chilly during its operation, and exhausted after it. This refrigerant action, which it has in common with sulphate of soda, renders it an appropriate purgative in febrile affections.

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[1] Bull. de Thérap., xlii. 553, xliii. 478, xlv. 383.

In large doses it sometimes occasions alarming symptoms, and what is very remarkable, purging is seldom one of them. Giacomini[1] saw two ounces taken at a single dose without producing any evacuation, but chilliness instead, with paleness, inability to move, trembling of the limbs, and repeated syncope. In another case the dose was an ounce and a half, but the same general symptoms occurred, and vomiting besides. A case is related by Christison of a boy, ten years old, who took two ounces of the salt dissolved in a teacupful of water. The same symptoms as are described above occurred; in half an hour the pulse was imperceptible, and in ten minutes more the child died without any evacuation. In all of these cases the salt was mixed with but a small quantity of water. But in a fourth case, three pints of beer drugged with Epsom salts were given to an old man who was a confirmed drunkard.[2] He was seized with violent purging, and died within forty-eight hours. After death, the lining membrane of the bowels was found to be inflamed. It is clear that the quantity of fluid in which it is taken greatly influences the mode of action of this medicine. The more largely diluted it is the more considerable are its evacuant effects. The same thing is true of all saline medicines, and is amply illustrated by the activity of natural saline waters. The proportion of mineral ingredients in a purgative dose of any one of them is quite inconsiderable.

Uses.—It is unnecessary to describe at length the cases in which sulphate of magnesia may be employed medicinally. It is taken incomparably oftener without a physician's advice than with it, and generally to overcome *constipation*, to arrest *bowel complaints* arising from irritating ingesta, and to subdue the febrile symptoms and the pain that attend the development of nearly all *inflammatory diseases*. The ordinary mildness of its action renders it a safe and efficient purgative. Sometimes it is united with tartar emetic in cases such as those referred to, either to effect a thorough evacuation of the alimentary canal, or, in addition to this, a strong sedative impression upon the system. It is also given in divided doses and with a small proportion of tartar emetic for the purpose of producing a sustained antiphlogistic action in inflammatory diseases of a high grade. Half a grain of the antimonial and an ounce of the saline medicine may be dissolved in a pint of water, and a wineglassful of the solution administered at intervals of three hours.

It has been advantageously employed by many persons in *dysentery*. M. Trousseau found it very successful in an epidemic which prevailed

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[1] Mat. Med., p. 511.

[2] Taylor on Poisons, Am. ed., p. 15.

in 1826 in the neighborhood of Tours.[1] He daily gave a solution of three or four drachms of the salt in divided doses. Giacomini[2] made use of much larger doses, such as an ounce and upwards at once, and with the effect of arresting all discharges abruptly. We have used this remedy in the same disease, dissolving an ounce of it in a pint of water and giving two ounces of the solution every two hours. From the commencement of its operation, the tenesmus and bloody discharges diminish; the former ceases altogether in a few hours, and the latter are exchanged for watery or feculent stools. It is probable that, to be successful, this method must be resorted to near the onset of the disease. It does not, of course, exclude depletion, nor, indeed, opiates, from the treatment. The latter may be exhibited at night in its stead, or on alternate days with the saline. The sthenic forms of the disease appear to show the efficacy of the method most clearly.

In *obstruction of the bowels* by hardened fæces, by ileus or hernia, &c., Epsom salts ought to be tried, largely diluted and in frequently repeated doses. In *painters' colic* one of the best purgatives is sulphate of magnesia with an excess of sulphuric acid. The experiments of Orfila, Good, and Paris, says Dr. Copland,[3] seem to favor its employment, and certainly unequivocal benefit results from the practice. "But whether the benefit arises from reducing the lead to an insoluble salt, or from the operation of the sulphates in exciting the action of the partially paralyzed muscular coat of the bowels, and thereby enabling them to expel retained matter of a morbid or noxious description, cannot readily be determined."

ADMINISTRATION.—As a purgative, the ordinary *dose* of Epsom salts is *one ounce*, but this quantity is unnecessarily large. *One-half* of that quantity, dissolved in *half a pint* of water, will generally have a full purgative effect. Still less, *one* or *two drachms* even, will suffice for thin and sensitive persons. It has been proposed,[4] in order to correct the unpleasant taste of the medicine, to add to every two drachms of it in solution half a drachm of dilute sulphuric acid. Provided that the acid do not attack the teeth, the method is a good one. A similar, but less acid, preparation is the solution of Epsom salts in compound infusion of roses. Sulphate of magnesia is frequently added to vegetable purgative infusions, and particularly to that of senna forming the so-called "black draught;" also to tonic infusions for the relief of habitual constipation. It is, however, not an eligible aperient for

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[1] Archives Générales, xiv. 33. [2] Loc. cit.

[3] Dict. of Pract. Med. (Am. ed.), i. 440.

[4] By Dr. HENRY, Edinb. Med. and Surg. Journ., xli. 48.

constant use, for it soon loses its effect, and leaves the bowels more confined than at first. When given by enema, an ounce or more may be added to a pint of warm flaxseed tea, or other appropriate vehicle.

SODÆ SULPHAS.—Sulphate of Soda.

Description.—This preparation is commonly known as Glauber's salts, from the name of a celebrated German chemist of the seventeenth century by whom its nature and mode of artificial preparation were discovered.

Next to the chloride of sodium, it is one of the most abundant of the native salts. It exists as an efflorescence upon the surface of certain rocks near the sea and elsewhere, as at Ulma in Sweden, in Siberia, Italy, Switzerland, Bohemia, &c., and in the ashes of certain marine plants. It is found also in various mineral waters, particularly in those of Marienbad, Carlsbad, Cheltenham, Leamington, &c.

There are several methods of obtaining sulphate of soda, but one of the best is by the action of sulphuric acid upon common salt in the preparation of muriatic acid. The latter having been removed, the excess of sulphuric acid contained in the residuum is neutralized with soda, and the solution is allowed to crystallize. The recently prepared salt is in oblique rhombic prisms, which are beautifully transparent (hence the salt was called *sal mirabilis*), but they effloresce upon long exposure to the air, and become covered with an opaque white powder.

Uses.—This salt may be employed in the same cases as sulphate of magnesia, but its bitter and nauseous taste renders it more repulsive, and it is therefore but little used, comparatively.

Dose.—Of the crystallized salt from *half an ounce* to *an ounce*, and of the dried salt about one-half of that quantity.

The Phosphate of Soda and the Sulphate of Potassa are both laxative salts, but neither of them is much used. The former is very mild in its operation, and has a cooling saline and not disagreeable taste. It has been employed, upon theoretical grounds, in the treatment of *rachitis*, *cholera*, and *diabetes*, but without encouraging success. Its *dose* is from half an ounce to an ounce and a half. The latter salt is less soluble than the other saline medicines which have been noticed, but a smaller dose of it is purgative. Its action is apt to be harsh, producing colicky pain and a burning sensation in the abdomen. In several instances a fatal effect has resulted from doses of it varying

from half an ounce to two ounces, and in many others it occasioned very alarming symptoms.[1] In this country it is seldom used as a purgative, nor does it possess virtues entitling it to be more frequently employed.

POTASSÆ TARTRAS.—Tartrate of Potassa.

History, Preparation, &c.—This salt was first described by Lemery in 1675, under the name of *sal vegetabilis.*

It is prepared by the reaction of the bitartrate with the carbonate of potassa. The latter salt parts with its carbonic acid which escapes, and receives instead one equivalent of tartaric acid from the bitartrate. A neutral tartrate of potassa results.

This salt is in the form of white crystals of a bitter and disagreeable taste. It is soluble in twice its weight of cold and in much less of boiling water. In alcohol, it is nearly insoluble. As found in the shops, it is generally in the form of a white, granular powder.

Action and Uses.—It is regarded as promoting all of the secretions, and that of the kidneys in particular, when it is given in small doses and much diluted. In full doses it acts upon the bowels as a laxative. It is secreted by the kidneys as carbonate of potassa. Tartrate of potassa is used as a mild, cooling purgative in all affections requiring the employment of saline evacuants, and some writers have attributed to it a special action upon the liver and upon the portal system, but it does not appear to be more operative in these respects than other medicines of its class. It is, however, a milder purgative than the sulphates of soda and magnesia. It may be used with advantage in all cases of venous congestion within the abdomen, including those in which the hæmorrhoidal sinuses are enlarged and discharge blood. Formerly it was much the habit to use it in combination with rhubarb, senna, or manna. By its action upon the urine it forms a suitable agent for correcting the acidity of this fluid.

Dose.—From *a drachm to an ounce*, according to whether it is intended to act chiefly upon the kidneys or upon the bowels.

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[1] Compare Lond. Med. Gaz., xxxiii. 54, 124; Mérat and De Lens, Dict. de Mat. Méd., v. 485; and Am. Journ. of Med. Sci., Jan. 1844, p. 88.

POTASSÆ BITARTRAS.—Bitartrate of Potassa; Cream of Tartar.

Description.—Bitartrate of potassa is contained most abundantly in grape juice, but is also a constituent of many other acidulous vegetable juices, and, in particular, of that of tamarinds. It is formed in grape juice on the Rhine and in the South of France during the process of vinous fermentation. As the proportion of alcohol generated thereby increases, the salt, which is insoluble in it, is precipitated upon the bottom and sides of the vat or cask which contains the liquor, in the form of a hard and heavy crust which has more or less of a crystalline structure. It is then contaminated with carbonate of lime and coloring and extractive matters, which have to be removed by solution, and by the action of charcoal, alumina, albumen, &c.

As imported, cream of tartar is usually in the form of white crystalline masses, but in the shops it is kept as a white powder. It has a sour but not unpleasant taste, and is gritty between the teeth. In cold water it is very slightly soluble, but in hot water much more so. It is insoluble in alcohol.

Action.—In full doses it acts as a refrigerant laxative and diuretic. The latter operation is very evident when the salt is given in small quantities and much diluted. It is apt to weaken the digestive function, to cause flatulence, griping, and, when long continued, a decided loss of flesh. According to MM. Trousseau and Pidoux, while other purgatives augment hæmorrhoidal and menstrual hemorrhage, this one moderates and even arrests them. This statement appears to require confirmation.

In large doses, cream of tartar has been poisonous. A case is reperted by Mr. Tyson[1] of a man aged thirty-seven years who took four or five tablespoonfuls of this salt. He was seized with violent vomiting and purging, had pain in the abdomen, thirst, feeble pulse, and debility of the lower limbs. The fluid vomited was of a dark green color, and the stools had the appearance of coffee grounds. Death took place in forty-eight hours. On inspection, the mucous membrane of the stomach and duodenum was highly inflamed, and the whole intestinal canal more or less so.

Uses.—In *febrile diseases* attended with great heat of skin and thirst, a weak solution of this salt moderates the vascular excitement, and increases the flow of urine. The beverage called *Imperial* is an agree-

[1] Lond. Med. Gaz., xxxi. 177.

able form of the medicine for this purpose. It is thus prepared: Take half an ounce of cream of tartar, a lemon, sliced, and half a pound of sugar. Add three pints of water, let it stand for half an hour, and strain. Under the same circumstances, larger doses of the medicine and such as will produce copious watery stools, diminish the tension of the vessels, and relieve the symptoms which their repletion occasions. As a *purgative*, also, it is frequently associated with sulphur, magnesia, or jalap. With the last-named medicine it forms an efficient hydragogue cathartic, which, in some forms of dropsy, and in simple anasarca particularly, is rapid and decided in its action. Twelve grains of jalap thoroughly triturated with thirty of cream of tartar, constitute a certain and not disagreeable purgative. It is often associated with juniper berries in infusion (bitartrate of potassa and juniper berries, bruised, of each, ℥ss, boiling water Oj), and in the passive forms of *general dropsy* few combinations are more efficient. In the form which so often occurs as a sequela of scarlatina it is of great service, either alone or associated with tincture of digitalis. With sulphur, it is a favorite laxative in hæmorrhoidal affections. With magnesia it has been recommended in habitual vomiting arising from gastric acidity or from the state of pregnancy.

Dose.—As a *cathartic*, from *half an ounce* to *one ounce;* as a *diuretic*, *one* or *two drachms* largely diluted, several times a day; or in the form of cream of tartar whey prepared by adding *two drachms* of the bitartrate to *a pint* of milk.

SODÆ ET POTASSÆ TARTRAS.—Tartrate of Potassa and Soda. Rochelle Salt.

History and Preparation.—This salt was discovered in 1672 by Seignette, an apothecary of Rochelle, hence it is generally known as Rochelle Salt, and in France as *Sel de Seignette*.

It may be obtained by adding bitartrate of potassa to a solution of carbonate of soda. In this process the excess of acid in the bitartrate saturates the soda, and liberates the carbonic acid. This salt occurs in beautiful prismatic crystals which have a saline and somewhat bitter taste. It is readily soluble in cold water.

Action and Uses.—In doses of from *half an ounce* to *one ounce* it operates as a gentle and cooling laxative, and seldom disagrees with the stomach. It is particularly acceptable in the form of *Seidlitz powders*, which form an effervescing draught. In small doses it acts as an alkali upon the urine, and its vegetable constituent is digested

and retained in the economy. As it is not incompatible with tartar emetic, the two agents may often be associated as an emeto-cathartic, or in smaller doses as an antiphlogistic medicine.

DOSE.—As a *purgative*, *half an ounce* to *one ounce*. As an *antilithic*, *one* or *two drachms* several times a day largely diluted.

OLEUM OLIVÆ.—OLIVE OIL.

DESCRIPTION AND HISTORY.—This is a fixed oil obtained by expression from the olive tree (*Olea Europœa*). This tree is a native of Asia, whence it was carried into Egypt, Barbary, Italy, Spain, and France. It is said to have been introduced into the last named country by the Phocean colony which inhabited Marseilles 680 years B. C. The history of the olive-tree runs back to the earliest period of which any record exists. The fig-tree is the only one mentioned before it. A leaf of the olive-tree was brought by the dove to Noah as a token that the waters of the deluge were abated from off the earth, and from all antiquity the olive branch has been a symbol of peace and plenty.

Olive oil, which is obtained from the fruit by expression, is of a pale-greenish or yellowish color, and when pure it is almost inodorous, and has a pleasant and somewhat sweetish taste. Its sp. gr. is 0.9192. It is soluble in nearly 1½ parts of ether, and but very slightly so in alcohol.

It appears to have been anciently used by the Hebrews as an article of food, and is so still in countries where the olive abounds, and also as a soothing and healing application to wounds, sores, and bruises, rather than as an internal medicine. Most of the early medical writers dwell upon its virtues, and Dioscorides, among them, extols it in the following terms.[1] The oil made from green olives is acceptable to the stomach on account of its astringency. It strengthens spongy gums when held in the mouth, and by inunction it represses sweating, renders the skin soft, and the limbs supple, and protects against chilliness. In its operation it is laxative, and when mixed with caustics it tempers their action. It is an antidote to poisons when taken repeatedly and as often vomited. In doses of nine ounces (?) with as much water or barley water, it opens the bowels. In like dose with wine, in which rue has been boiled, it relieves colic, and expels worms. It may be used in clysters to overcome constipation. The oil made from wild olives is more astringent, prevents sweating, cleanses the scalp from

[1] Mat. Med., lib. i. cap. 28 and 29.

dandriff, prevents the hair from falling out, and from growing gray when it is used daily. It also cleanses scabby eruptions and sores of the scalp.

Action.—In moderate quantities olive oil is very nutritious, as is proved by its general and immemorial use as an article of food, and particularly as a substitute for butter. It is scarcely less used as a condiment with salads, which it renders much more digestible. This fact has been questioned by Pereira, but it appears to have in its support the experience of all countries where this oil is much used. In the dose of one or two ounces it acts as a very mild laxative, but it is seldom administered for this purpose to adults. In drachm doses it forms a gentle laxative for infants at the breast. It is more frequently used in laxative enemata.

Uses.—Besides its occasional use as a *cathartic*, olive oil has been employed as an antidote to *poisoning* by a variety of substances, and, so far as it is effectual, may be supposed to act by enveloping the poisonous particles, and thus protecting the mucous membrane of the stomach against their action. It was formerly recommended as an antidote to the poisonous effects of *cantharides* taken internally, but its efficacy has been denied upon the ground that the active principle of these insects is soluble in oil. But since some time is required for this solution to take place, and since the object of administering the oil is to produce vomiting of the poison as well as to protect the tissues from the action of the latter, there does not seem to be a sufficient foundation for the objection referred to. The use of an ounce or two of sweet oil every morning is said to have been effectual in warding off the *poisonous effects of lead* among workers in the preparations of this metal. It has also been used in the same way as an antidote to arsenical vapors.

Many writers have related examples of the efficacy of sweet oil in poisoning by *venomous serpents* and *insects*. An instance is related in the *Philosophical Transactions*, of a peasant who was employed by the apothecaries to catch vipers, and who, whenever he was bitten by the reptiles, applied some sweet oil to the wound, and at the same time drank a glass of it. In this manner he escaped all mischief. Pouteau praised this method as effectual; but Murray, who quotes the above example as well as many others, concludes that the efficacy of the remedy is very doubtful,[1] upon the ground, chiefly, that the viper's bite is seldom mortal. Yet it sometimes unquestionably is so. Quite recently (1849), four cases of death from this cause were published by

[1] Apparat. Medicam., ii. 57.

M. Dusourd,[1] who also presents a narrative of four others in which sweet oil was administered internally, and warm oil used by friction upon the affected limbs. These cases, the symptoms of which were extremely formidable, all recovered. The same writer states that compresses wet with warm oil speedily remove the pain and swelling of wasp and hornet bites, &c. Sweet oil may also be used to destroy *insects* lodged in the auditory passage when the swelling of its walls renders other methods difficult of application. Mérat mentions the case of a gentleman who, in order to rid himself of a *tapeworm*, drank about a pound and a half of sweet oil in doses of four ounces every quarter of an hour. The tænia was expelled within twenty-four hours. Emulsions containing sweet oil are sometimes used as vehicles for various expectorant remedies, but its advantages are very questionable.

Externally sweet oil may be used as a dressing for *excoriated surfaces*, superficial *burns*, &c., but it is less grateful and less convenient than the various ointments and cerates which are intended for this purpose, and most of which contain olive oil. Inunctions with warm olive oil form an excellent remedy for promoting resolution in *sprains* and *contusions*, and have been found, like other unctuous substances, an efficient means of preventing and removing *corns*. The ancient method of anointing the body with oil as a protection against the *plague*, is still employed with confidence by the Orientals, but the ravages of the disease do not appear to be stayed by its means. Pliny mentions olive oil as a means of repressing perspiration, and in modern times it has occasionally been used to moderate the *colliquative sweats of phthisis*. Fomentations and frictions with warm oil in *general dropsy* do not appear to have any further efficacy than may be ascribed to their rendering the skin more supple and extensible, unless, perhaps, the friction may promote to some extent the absorption of the fluid. This oil is commonly used to facilitate the *introduction of sounds*, *catheters*, *bougies*, *specula*, *tents*, &c., into the natural or other cavities of the body, and some writers have recommended that in amputations the knife should be dipped into oil before the integuments are incised.

Dose.—As a *laxative*, *one or two fluidounces*; for infants, *one or two fluidrachms*.

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[1] Bull. de Thérap., xxxvii. 489.

MANNA.

DESCRIPTION.—Manna is "the concrete juice of Ornus Europæa," but it is also derived from several other trees of the genera Ornus and Fraxinus, which grow in the South of Europe, particularly in Sicily, Apulia, and Calabria, whence the manna of commerce is almost exclusively derived. It is obtained by making incisions in the bark of the tree which produces it. Straws are inserted therein, and the sap which concretes upon them is called *flake manna*. This is the finest quality. It is in light porous pieces of a pale-yellowish color, and concave upon one side. Concreted drops of this sort are called *tear manna*. Other descriptions are those which are formed by the sap trickling down the trunk of the tree, and which are gathered from its bark or from leaves heaped about its root. These are known as *fat manna*, *manna in sorts*, &c., and are more or less mixed with foreign substances.

Manna has a heavy and somewhat honeyed smell, and a mawkishly sweetish taste, which is followed by a slightly acrid sensation in the mouth. It dissolves readily in hot water and in alcohol. Its principal constituent is *mannite*, of which it contains about 60 per cent., and which has many of the characters of sugar, but, unlike sugar, it does not undergo the vinous fermentation. Besides this substance, manna contains a yellow extractive matter, which is most abundant in the coarser sorts and in portions that have been long kept. It readily excites nausea, and has been regarded as the element upon which the purgative action of manna chiefly depends. The finer qualities, which contain very little of it, are used in the East for the same purposes as sugar.

HISTORY.—The word manna has been applied to several different and quite dissimilar substances. It is of Hebrew Syriac origin, and denotes "a free gift, one which imposes no obligation on those who receive it." In this sense it was applied to the food by which the Israelites were miraculously fed in the wilderness. As this substance had a sweetish taste, and fell upon the earth about early dawn, the medicinal manna, which has also such a taste and exudes from the trees which produce it during the night, obtained the same name.[1] In Latin, the name of *ros melleus*, or honey-dew, was used as an equivalent for manna, but it was specially applied to a semi-concrete substance of

[1] HOFFMANN, De Manna ejusque Præstantissimo in Medecina Usu. Oper. Omn., vi. 24. This treatise contains the whole literary history of this subject, and a complete account of the operation and uses of the medicine. Compare also FOTHERGILL'S Observations on Manna Persicum, Works, iii. 257.

a honeyed taste which formed upon the leaves of various trees, and even upon stones and other lifeless objects, during the night. This name is also given to a substance resembling millet seed which is said to have fallen from the air on the confines of Silesia and Poland and in other places, and which was used as food. Its nature is quite unknown. Finally, the term manna was applied to a very different substance, a species of gum resin, the thus or frankincense, in allusion to the manner in which it exudes from its native tree.[1]

USES.—The medicinal qualities of manna appear to have been first pointed out by the Arabian physicians, who describe it as a laxative peculiarly adapted to children and pregnant women, on account of its mildness and as being a gentle cholagogue, and at the same time a suitable expectorant in febrile affections of the lungs. It was frequently prescribed by them in conjunction with senna, rhubarb, and tamarinds. Modern experience has added absolutely nothing to these statements. In his elaborate essay, Hoffmann has enlarged upon them as a text, but has not substantially increased our knowledge. Some modern authors have attributed to manna advantages over other laxatives in cases of disease affecting the genito-urinary apparatus. It is sometimes used instead of molasses to purge off the meconium in new-born infants.

ADMINISTRATION.—As a large proportion of the manna taken into the stomach is digested, it must be given in large doses in order to produce a movement of the bowels; it is, therefore, very apt to create flatulence and epigastric oppression, besides leaving the digestive powers of the stomach feeble. It may be administered along with other purgatives, and, indeed, is generally so prescribed. One of the most frequent uses of it is with the infusion of senna, and particularly as an ingredient of the draught composed of this infusion, Epsom salts, and fennel seed. The *dose* of manna is *one* or *two ounces;* for *young children*, as many *drachms*.

CASSIA FISTULA.—PURGING CASSIA.

HISTORY AND DESCRIPTION.—*Cassia fistula* is a native of India, whence it was introduced into Egypt and the surrounding countries, and thence into the new world. It is extensively cultivated in the

[1] From *manare*, to trickle. This word is, in its turn, derived from the Chaldaic name for water; and not improbably the same fundamental idea of trickling or distilling, like dew, is associated with all of the various products to which the word manna is applied.

tropical regions of America for ornamental as well as commercial purposes. The rare beauty of its flowers, which are large and of a golden yellow color, and are arranged in long pendent clusters, excited the admiration of the Arabian writers who furnish us with its earliest history.[1] The fruit consists of long pendulous pods, which are cylindrical, dark brown, woody, "and when agitated by the wind, strike against each other and produce a sound that may be heard at a considerable distance." Internally they are divided into numerous cells by thin transverse plates, which are covered with a soft black pulp. This pulp, which is the officinal cassia as found in the shops, is of a blackish color and sickly odor, and has a sweet but rather mawkish taste.

ACTION AND USES.—According to the Arabian authorities, cassia purges away the bile, especially when it is associated with tamarinds, moderates the heat of the blood, subdues inflammations, and acts as an expectorant. It purges, they say, without pain, and is a useful ingredient in gargles for ulcerated sore throat.

In full doses, cassia acts as a mild laxative, but is very apt to create nausea, flatulence, and some griping. It is seldom given alone, but forms an excellent adjunct to other purgative medicines. Vallisneri says that it increases the cathartic virtue of manna, and that a mixture of four drachms of cassia and one and a half or two drachms of manna will purge as much as twelve drachms of cassia or thirty-two drachms of manna by themselves.[2] In the hot season, cassia may be conjoined with tamarinds and mild salines in the treatment of febrile affections. It is most frequently used as an ingredient of the *confection of senna*, which is a mild aperient and is used in habitual constipation. Lewis states[3] that during the use of cassia the urine frequently appears of a green color, and sometimes, when the quantity taken is considerable, of a dark brown or blackish color. The same observation is made by Boerhaave.[4]

DOSE.—As a laxative, *one* or *two drachms;* as a purgative, *one* or *two ounces.*

TAMARINDUS.—TAMARINDS.

DESCRIPTION.—The tamarind is a native of India, and has been long used there as an article of diet and in medicine. It is reckoned by the natives of so wholesome a nature, that it is a constant ingredient

[1] EBN BAITHAR, i. 401.
[2] LEWIS, Materia Medica, i. 304.
[3] Ibid.
[4] The Powers of Medicines, p. 209.

in all their curries. The leaves and the bruised seeds are employed as astringent applications. The Arabs, on becoming acquainted with the tree, called it *tamr hindee*, that is, "the Indian date," whence, no doubt, the Latin name is derived.[1] It is produced in the West Indies also.

The officinal preparation is the pulp of the tamarind fruit preserved in sugar. It is at once sweet and acidulous. The latter quality it owes to the presence of citric, tartaric, and malic acids, and the bitartrate of potassa.

HISTORY.—Tamarinds are first mentioned by the Arabian writers, who ascribe to them anti-bilious virtues, but dwell particularly on their usefulness in correcting nausea, quenching thirst, and allaying febrile excitement. They also speak of their utility as a mouth-wash, and in healing aphthous sores.

ACTIONS AND USES.—Tamarinds are regarded as laxative, refrigerant, antiscorbutic, and antiseptic, and may be used, mixed with water, as a cooling drink in febrile diseases. In the dose stated below, this medicine may also be employed to open the bowels, but it is seldom used alone for this purpose, but more generally as a constituent of the confection of senna. As the tartaric and citric acids of tamarinds decompose most of the salts of potassa, tartar emetic should not be given in conjunction with them. They are also said to lessen the purgative action of senna.

ADMINISTRATION.—The dose of tamarinds is from *two drachms* to *an ounce* or *more*. By boiling an ounce of their pulp with a pint of milk, a whey is obtained which forms a pleasant and cooling drink in fevers.

OLEUM RICINI.—CASTOR OIL.

DESCRIPTION.—This oil is obtained by expression from the seeds of *Ricinus communis*, which, indeed, derives its name from the resemblance which they bear to the insect called a tick (ricinus). In its native country, Asia, the plant attains the dimensions of a tree, but in temperate climates generally, and in the United States, it is an annual plant. It is very extensively cultivated in several States of the Union, and particularly in those upon the right bank of the Ohio, for the production of castor oil. It was formerly called *castus oil*, or *agnus castus*, names which it received from its supposed power of repressing venereal passion, and from which its common title is derived.

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[1] ROYLE, Mat. Med. (Am. ed.), p. 348; AINSLIE, Mat. Med. of Hindoostan, pp. 47, 231.

Castor oil is a viscid white or pale yellow liquid, which, when fresh and pure, is nearly or quite inodorous, and has a mild taste at first, but which becomes afterwards somewhat nauseous and acrimonious. It is lighter than water, and does not congeal above 0° F. By exposure to the air it dries and becomes rancid. It is soluble in pure alcohol and in ether.

HISTORY.—Pliny describes the castor oil plant, the mode of extracting oil from its seeds, and the etymology of its name as given above. He speaks of that which is prepared in Egypt as disgusting to mix with food, but as fit for burning.[1] Dioscorides and Galen both mention the purgative properties of the seeds, and the former states that an overdose of them occasions vomiting as well as purging, and that the oil is used to burn in lamps and as an ingredient of plasters. He does not allude to its internal use.[2] Mesue gives a full account of the seeds, which he calls royal, and dilates upon their various uses as a purgative. He also describes clysters of the oil as a remedy for colic, and inunctions of it as serviceable in the piles and several external disorders, but he does not allude to its cathartic virtues. Nor do the later Arabian writers go further. They confine their descriptions to the operation and uses of the bruised leaves and seeds, which seem to have been employed chiefly in stimulating cataplasms. Indeed, there is no sufficient ground for supposing that the oil was used as a purgative until a knowledge of its properties was learned from the inhabitants of the West Indies. It was introduced into European practice through England, by Dr. Fraser, of Antigua, in 1759,[3] and shortly afterwards its many virtues were set forth, in a somewhat exaggerated strain, it is true, by Dr. Canvane, of Bath,[4] who extolled it especially "in colica pictonum, in most fevers, in all bilious complaints, in the thrush, in tetanus, in gonorrhœa, &c."

ACTION. *On Animals.*—Orfila gave a dose of castor bean varying from fifteen grains to three drachms to four dogs, tying the œsophagus in order to prevent vomiting, for the medicine invariably produced a tendency to it. The animals died in from six to twenty-four hours, without having been purged and without displaying any striking symptoms except languor and debility. On examination, traces of gastro-intestinal inflammation were discovered.

On Man.—As the oil probably derives its purgative action from the principle which renders the seeds themselves so harsh and even

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[1] Hist. Nat., xv. 7. [2] Mat. Med., iv. 158.

[3] Medical Observations and Inquiries, ii. 235.

[4] A Dissertation on the Oleum Palmæ Christi sive Oleum Ricini, &c., 2d ed., 1769.

poisonous, it may be well to describe their effects. M. Mialhe proved[1] that an emulsion made with the kernels of the seeds is violently emeto-cathartic in the dose of one hundred and fifty grains (or of seven to ten seeds), and that even a tenth part of that quantity produces both vomiting and purging. He hence inferred that the active principle of the seeds is yielded but slightly to those varieties of the oil which are obtained by pressure alone without heat. This is more fully proved by instances such as the following: Giacomini relates[2] that when a child he experienced a violent attack of vomiting and protracted exhaustion from eating nine or ten of the seeds. Bergius[3] records the case of a man in full health who eat a single seed of ricinus, which, however, left an acrid taste in his mouth. Early the next morning he was seized with violent vomiting, which continued alternately with purging throughout the entire day. Lanzoni saw a young woman attacked with violent cholera morbus, and excruciating pain in the bowels from eating three of the fresh seeds. Dr. Taylor[4] records a fatal case of poisoning from this cause. Three young women eat of the seeds, the one about twenty of them, another four or five, and a third two of them. Upon the two latter persons the effects were those of a violent cathartic, but the first was seized with vomiting and purging, and looked like one in an attack of malignant cholera; the skin was cold, pale, and shrunken, there was pain in the abdomen, and the mind was in a drowsy, half conscious state. The dejections consisted of bloody serum. No reaction took place, and death occurred within twenty-four hours. On examination, the gastro-intestinal mucous membrane was found to be abraded and inflamed.

The effect of injecting castor oil into the veins was tried by Hale upon his own person.[5] After losing eight ounces of blood from the arm, he had half an ounce of the oil injected into the vein. At the expiration of twenty-five minutes he perceived the taste of the oil in his mouth; malaise succeeded, with nausea, eructation, rigidity of the facial muscles and of the tongue, loss of speech, anxiety, faintness, with general dulness and depression. At the end of three hours there was an unsuccessful motion to evacuate the bowels. Feverishness followed, and indisposition of several weeks' duration.

Canvane states that by only rubbing the navel and hypochondria with this oil in children whom he could not get to take any medicine inwardly, he often procured one or two loose stools. The odor alone is said sometimes to produce a purgative effect upon weak and delicate

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[1] Bull. de Thérap., xxv. 42.
[2] Mat. Med., p. 508.
[3] Mat. Med., ii. 773.
[4] On Poisons (Am. ed.), p. 423.
[5] Mitscherlich, Lehrbuch, i. 150; Wibmer, Wirkung, &c., iv. 413.

children. By repeated friction with this oil the skin is reddened and ultimately vesicated. In the dose of one or two ounces it occasions an uneasy feeling in the stomach, and not unfrequently vomiting. But when taken in divided doses, as half an ounce at intervals of four hours, it seldom occasions vomiting, but more generally nausea, and the bowels are apt to be moved before the second dose. The second or even the third may sometimes be required for this purpose. It seldom produces much griping, unless the bowels are in a morbidly sensitive condition. The action of the pulse is lowered meanwhile, a sense of peculiar discomfort is felt in the abdomen, there is also an inclination to sleep, and general debility. The evacuations which it produces are, after the first one, generally liquid, but they contain more or less of the oil in the form of globules, and unchanged, or, as Dr. Bird has pointed out, converted into caseous flakes or a soap-like scum floating in the more fluid parts of the dejection. More generally it is found mixed up with the fæces as a kind of emulsion, and in some few instances it has been discharged under the form of solid tallow-like masses. Long-continued use of the oil disorders the digestion, and occasions habitual nausea, with a furred tongue, &c., particularly if the oil is acrid from having been kept, or from imperfect preparation. Cullen has stated that when taken habitually as an aperient the dose may be gradually diminished. This statement is confirmed by Burne,[1] who says that it acts quickly, does not produce a subsequent costiveness, and the longer it is given the less is the dose of it required. If taken daily, the quantity may gradually be reduced to half a teaspoonful (Dr. Thompson says to a few drops), and yet the full effect be maintained.

Castor oil has been known, instead of acting as a purgative, to exude from the skin. Such a case is related by Dr. T. O. Ward, of an hydræmic female, who also presented the remarkable phenomenon of pulsation of the veins of the forearms.[2]

Uses.—Castor oil is universally employed in this country and in England as a domestic remedy, especially in children's complaints. Its use by physicians as a purgative is hardly less general in all cases which are thought to require a mere evacuation of the bowels when they contain fæces, as in *constipation*, or irritating ingesta as in *diarrhœa* produced by unwholesome or indigestible food, or when, under the influence of local inflammation of a subacute grade, they secrete an undue quantity of mucus, or discharge blood. To all of these cases

[1] On Habitual Constipation, p. 218.

[2] Lond. Med. Gaz., x. 377.

castor oil is peculiarly adapted, because, while it impresses the general system very slightly, it has a sanative influence upon the bowels themselves. It should be given as early as possible after the onset of these affections. Even in *dysentery*, when thus employed, it is generally sufficient for the cure. It is an equally effectual remedy for *infantile diarrhœa*, as nearly all the authorities upon the diseases of early life testify. A recent writer describes the form of *bowel complaint* in which it is most beneficial[1] as an aphthous diarrhœa which occurs during the first year of life, especially among children who are improperly fed, and commences with sickness, frequent and griping evacuations varying in color from greenish-yellow to dark grass green, these becoming more liquid and more or less mixed with slimy or gelatinous mucus streaked with blood, or even at last with a predominance of blood, each evacuation accompanied with pain and tenesmus, the mouth dry and aphthous, the anus inflamed, the belly tumid and painful, the child becoming more and more feverish, emaciated, and somnolent. In such cases the castor oil emulsion made with the yolk of egg, and combined or not with very gentle opiates, will be found sufficient to effect a cure. R.—Ol. ricini ʒj–ʒiss; vitell. ovi semis., aqu. aneth. fœniculi, āā fʒj. Ft. emuls. S.—A teaspoonful twice a day. The diarrhœa of older children, and even of adults, may be treated in the same manner, but with a proportionately larger dose.

In the disease known as *Devonshire colic*, Madrid, West Indian, Poitou colic (colica pictonum), an affection produced by acid drinks containing lead, this medicine was early recommended by Canvane, who seems to have derived a knowledge of its use from the West Indian practitioners. He gave it by enema, and also by the mouth, in tablespoonful doses, every hour or half hour until an evacuation took place; but if the stomach refused to retain it, he first administered an emetic of ipecacuanha. The Spanish physicians of the present day have recourse to castor oil as a purgative in this complaint. Several writers have recommended castor oil in *lead colic*, and certainly in mild cases it is sufficiently active when given after a full dose of calomel, and in conjunction with opium, to put an end to the attack. Yet it is perhaps less efficient than the saline and antimonial purgatives, which, in conjunction with opiates, constitute essentially the treatment of *La Charité*, so famous for its success in France.

Worms.—Odier, of Geneva, first used this oil for the purpose of expelling intestinal worms, and particularly the tænia, both armed and unarmed.[2] Brera says that it both kills the worms and purges

[1] Dr. S. Thompson, Month. Journ. of Med. Sci., vi. 88. [2] Brera (Am. ed.), p. 235.

them from the patient; and he mentions two cases of armed tænia expelled by three ounces of this oil, taken by a patient during three successive days, and by another taken twice a day for a week. Bremser[1] denies that it possesses any specific vermifuge properties.

Among the numerous forms of disease for which castor oil is an appropriate medicine, acute inflammation of the lining membrane of the *bronchia* and air-passages may be mentioned. In this affection the medicine appears, more than any other of its class, to mitigate the inflammation and to promote the resolution of the disease by expectoration. The febrile symptoms after *parturition*, known as milk fever, and the forming stage of *mammary abscess*, are very generally controlled by a dose of castor oil; indeed, it is in a peculiar manner suited to be employed as a laxative in the puerperal state. Its gentle and certain action also renders it appropriate in the somewhat analogous circumstances of persons laboring under *irritative fever*, or simply from constipation after accidents or surgical operations. It is said to have a soothing influence in *nephritic inflammation* and *nephralgia* arising from the presence of calculi in the kidneys.

Externally.—Dr. Nott treated with success, in the Charity Hospital of New Orleans, two patients laboring under *amenorrhœa*, by rubbing the breasts three times a day with a decoction of the leaves of Ricinus communis, and afterwards applying to the same parts the leaves which had been used to prepare the decoction.[2] The oil forms one of the best ingredients of ointments and liniments used in the treatment of *alopecia*.

Administration.—Various methods have been contrived to diminish the repugnance of the palate to this medicine. It is frequently given in emulsion with the yolk of egg, or with gum Arabic, but these mixtures lessen its activity as a purgative. It is also administered floating upon mint-water, milk, coffee, &c.; but not only do these vehicles fail to disguise its taste effectually, they are also apt to become objects of aversion in consequence. If the mouth and fauces are washed with brandy or strong wine, and the oil is taken from a glass the interior of which has been moistened in like manner, it will not adhere sufficiently to excite disgust. But of all methods the best is to envelop the oil with foam of ale or porter in a wineglass. The oil then forms a large globule, which may be swallowed without even its presence being detected.

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[1] Ueber lebende Würmer im lebenden Menschen, p. 163.

[2] Phil. Med. Exam., April, 1855, p. 246.

SENNA.

DESCRIPTION.—This medicine consists of the leaves of *Cassia acutifolia*, *C. obovata*, and several other species of cassia. These plants are chiefly natives of Egypt and Arabia, but they have been transplanted to the East and West Indies, and are successfully cultivated there. The senna of commerce is principally derived from the port of Alexandria in Egypt. The plants which produce it are shrubs, or small trees, according to the region where they flourish. The leaves are narrow, pinnate, and lanceolate, and the legumes oblong, membranous, and about half an inch in length.

Senna has a nauseous, bitter, and viscid taste, and an extremely sickening smell, particularly when infused. It is this property, more than any other, which excites so general a repugnance to taking it. Besides other principles it contains a volatile oil, upon which its odor depends, and *cathartin*, from which it derives its characteristic taste and its purgative properties.

The principal officinal preparations of senna are the following:—

Confectio Sennæ.—CONFECTION OF SENNA; LENITIVE ELECTUARY.

This confection contains, besides senna, coriander-seed, liquorice-root, figs, pulp of prunes, tamarinds, and purging cassia, besides sugar and water. Its dose is two drachms.

Extractum Sennæ Fluidum.—FLUID EXTRACT OF SENNA.

This preparation is made by adding to a diluted alcoholic extract of senna obtained by percolation, and evaporated to a proper degree, sugar, and compound spirit of ether holding oil of fennel in solution. The dose is half a fluidounce.

Infusum Sennæ.—INFUSION OF SENNA.

The simple infusion of senna is prepared with an ounce of senna, a drachm of bruised coriander-seed, and a pint of boiling water, allowed to macerate for an hour in a covered vessel. The dose is four fluidounces.

Syrupus Sennæ.—SYRUP OF SENNA.

This syrup is a simple watery extract of senna converted into a syrup, flavored with coriander. It is a feeble preparation, which is superseded by the fluid extract, but may be given to children in the dose of one or two fluidrachms.

Tinctura Rhei et Sennæ.—TINCTURE OF RHUBARB AND SENNA; WARNER'S GOUT CORDIAL.

Its virtues are due to the rhubarb rather than to the senna which it contains.

Tinctura Sennæ Composita. *Lond.*—Compound Tincture of Senna; Elixir Salutis.

This is a strong tincture of senna flavored with caraway, cardamom, and raisins. Its dose is from two fluidrachms to a fluidounce.

Tinctura Sennæ et Jalapæ.—Tincture of Senna and Jalap.

This differs from the previous tincture chiefly in containing jalap. Its dose is the same.

History.—Arabian writers furnish the earliest notice of this medicine. One of them, Isaac Ben Honain, recommends the fruit as a purge in melancholy, and also as an application to chapped hands. He adds that it is sometimes useful in muscular cramps, alopecia, calvities, obstinate headache, phthiriasis, scabies, pustular eruptions, pruritus, the lousy disease, and epilepsy. Another writer describes it as apt to create uneasiness in the bowels, unless when associated with violets or some other corrective. He recommends an infusion or decoction of senna.[1] Haly Abbas refers to similar combinations for the same purpose, and particularly to a decoction of senna with prunes and spikenard.[2] Ever since its first introduction into the materia medica it has been very extensively used as a purgative, a fact which better than any reasoning about its powers demonstrates its value.

Action. *On Animals.*—A decoction of senna injected into a dog's veins produced agitated movements of the abdomen and bilious vomiting.[3] It readily purges swine, dogs, and cats, and in large doses horses also.[4]

On Man.—The odor of senna-leaves, or that of its infusion, is sufficient to cause an evacuation of the bowels in certain susceptible persons. Bergius states that it renders the milk of a nursing female purgative to her infant. This fact proves the absorption of its active principle. It is very apt to create flatulence and colic, unless associated with some aromatic substance. Schwilgué describes it as exciting a sense of warmth in the abdomen, and some acceleration of the pulse; he states, also, that it produces yellow stools, and that its action is not followed by constipation. It is, hence, probable that the action of senna is exerted chiefly upon the small intestine. There is, perhaps, no instance on record of its having produced hypercatharsis. Its operation is said to be much increased by an association with bitter medicines, and such a combination becomes, therefore, a valuable one in constipation from debility.

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[1] Ebn Baithar, Heil- und Nahrungslehre, ii. 58.

[2] Adams, Comment. on Paul. Æginet., iii. 432.

[3] Wibmer, Wirkung, &c., ii. 67.

[4] Mitscherlich, Lehrbuch, &c., ii. 633.

Regnaudot injected an infusion of senna into the veins, which occasioned both vomiting and purging.[1]

USES.—Senna is employed in cases which require a prompt and copious evacuation of the bowels. Hence it is a favorite remedy in constipation and indispositions depending upon this state, both as an occasional and as an habitual purgative. Its peculiarity of not leaving the bowels confined renders it a valuable medicine in such cases.

ADMINISTRATION.—Senna is seldom given alone, but generally along with some corrective of its griping qualities, or else associated with other purgative medicines. The *infusion* of senna in which it is united with ginger, the infusion of senna with tamarinds, and the infusion of senna with Epsom salts, manna, and fennel seeds, known as the *black draught*, are the most ordinary and efficient modes of administering this medicine. Care should be taken not to let the leaves macerate too long, nor to use any compression of them when the liquid of the infusion is removed, lest their acrid principle should be taken up and produce griping. The dose of either of these preparations is from *two to four fluidounces*. The *confection* of senna forms an eligible basis for various purgative compounds, and is itself a mild and efficient laxative in the dose of *two drachms*. The *fluid extract* is the most concentrated and active of all the preparations of this medicine; it forms an excellent purgative for children in the dose of *a fluidrachm*, and of *a fluidounce* for an adult. The *syrup* is better adapted to infants, and may be prescribed in doses of *one or two fluidrachms*. The *tinctures* are chiefly used as cordial purgatives in persons of gouty habit; this is particularly the case with the tincture of *rhubarb* and *senna*, known as *Warner's gout cordial*, which is prescribed in doses of *half a fluidounce*, and from that to *two fluidounces*. The compound tincture of senna (*elixir salutis*) and the tincture of senna and jalap are given in doses of from *two fluidrachms* to a *fluidounce*.

CASSIA MARILANDICA.—AMERICAN SENNA.

DESCRIPTION, &c.—This beautiful and showy plant, says Griffith, is found in most parts of the United States, in moist situations, and along water courses. It is about three feet high, with many stems, arising from a woody, perennial root. The leaves are alternate, and are composed of eight or nine pairs of ovate and lanceolate leaflets. The legume is long, narrow, arcuated, and contains many seeds.

[1] WIBMER, loc. sup. cit.

The Shakers cultivate it to some extent. It is generally held to be inferior to Alexandria senna, and is said to require a dose one-third larger to produce an ordinary cathartic effect. But "those who have given it the fairest trial consider it equal to the generality of the imported article." Dr. Eberle frequently employed it instead of the latter, and always found it a certain and safe purgative.[1]

RHEUM.—Rhubarb.

Description.—The plant which produces the best qualities of rhubarb is still unknown. The United States Pharmacopœia refers the drug to "Rheum palmatum, and other species of Rheum." The root is the officinal part. All the plants of the genus Rheum "are perennial and herbaceous, with large, branching roots, which send forth vigorous stems from four to eight feet or more in height, surrounded at their base with numerous very large petiolate leaves, and terminating in lengthened branching panicles composed of small and very numerous flowers, resembling those of the rumex or dock."[2] The roots are thick, ligneous, and of a yellowish color.

The greater part of the rhubarb of commerce comes from the North of China through Tartary and Russia. It is generally known as Turkey rhubarb, because it anciently, and, indeed, until recently, entered into commerce through that country alone. The plant which produces it is entirely unknown. Another portion derived from the same original source is imported from Canton, and is called India rhubarb. It is also cultivated for medicinal purposes in England and France.

As found in commerce, the several varieties of rhubarb differ somewhat among themselves in physical characters, but the following are the most essential: It consists of sections of the root without the cortex, which are more or less cylindrical in shape, and either of a bright or brownish-yellow color. The fracture is uneven, and presents a mixture of brownish-red and yellowish veins and spots. The odor is peculiar and somewhat aromatic, particularly in the Russian variety. Its taste is slightly bitter and astringent, and, owing to the presence of crystals of oxalate of lime, in the proportion of thirty-five or forty grains to one hundred of the root, it feels gritty under the teeth. When chewed, it colors the saliva yellow. The English and French rhubarbs are rather reddish than yellow, are of lower specific gravity,

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[1] Griffith, Med. Bot., p. 261; Eberle, Mat. Med., p. 147. [2] U. S. Dispensatory.

more mucilaginous and astringent than aromatic, and scarcely feel gritty when chewed. It yields its medicinal properties to water and alcohol. It is uncertain upon what elements these properties depend; but probably not upon any single one, but rather upon the resinous, astringent, and bitter principles combined. The active principles of rhubarb, according to Schroff, are *chrysophanic acid*, *rhein* and *rhabarbarin*. All of these substances are purgative, but the second is the most so.

The following preparations of rhubarb are officinal:—

Extractum Rhei.—Extract of Rhubarb.

This extract is prepared by percolation from one pound rhubarb in coarse powder with alcohol, until four pints of filtered liquor are obtained, and by evaporating the product to a proper consistence. Its dose is from ten to thirty grains.

Extractum Rhei Fluidum.—Fluid Extract of Rhubarb.

In making this preparation, eight ounces of rhubarb are treated as in making the simple extract, and the alcoholic solution is evaporated to five fluidounces. Five ounces of sugar are then added, and half a fluidounce of tincture of ginger holding in solution four minims each of oil of fennel and oil of anise. The dose, as a purgative, is half a fluidrachm.

Infusum Rhei.—Infusion of Rhubarb.

A drachm of rhubarb is infused in half a pint of boiling water, digested for two hours in a covered vessel and strained. Dose, one or two fluidounces repeated every three or four hours till it operates.

Pilulæ Rhei.—Pills of Rhubarb.

Six drachms of rhubarb and two drachms of soap are beaten into a mass, and divided into one hundred and twenty pills. Each pill contains four grains of the mass, or three of rhubarb and one of soap. Dose, three or four pills, as a laxative.

Pilulæ Rhei Compositæ.—Compound Pills of Rhubarb.

To make these pills, an ounce of rhubarb, six drachms of aloes, half an ounce of myrrh, and half a fluidrachm of oil of peppermint are beaten into a mass, and divided into one hundred and forty pills. Each pill contains about five grains of the mass. Dose, from two to four pills.

Syrupus Rhei.—Syrup of Rhubarb.

This preparation is made by forming a syrup with the tincture of rhubarb. It is used as cathartic for infants in the dose of one or two fluidrachms.

Syrupus Rhei Aromaticus.—Aromatic Syrup of Rhubarb.

This syrup is made by first forming a tincture of rhubarb, cloves, cinnamon, and nutmeg, and adding to it simple syrup. The dose for an infant is a fluidrachm.

Tinctura Rhei.—Tincture of Rhubarb.

This is a simple tincture made with three ounces of rhubarb and two pints of alcohol, and flavored with cardamom seeds. This and the three following tinctures are seldom used alone, but generally to qualify the action of saline purgatives, or in gouty or in other feeble states of the system requiring a stimulant as well as a laxative operation.

Tinctura Rhei Composita.—Compound Tincture of Rhubarb.

This tincture contains, besides rhubarb, liquorice root, ginger, and saffron.

Tinctura Rhei et Aloes.—Tincture of Rhubarb and Aloes; Elixir Sacrum; Sacred Elixir.

This is a tincture of rhubarb and aloes with cardamom seeds.

The dose of either of the preceding tinctures is from half a fluidounce to a fluidounce, as a purgative.

Tinctura Rhei et Gentianæ.—Tincture of Rhubarb and Gentian.

This is a simple alcoholic solution of rhubarb and gentian.

Dose, as a purgative, the same as the preceding; as a stomachic, one or two fluidrachms.

Tinctura Rhei et Sennæ.—Tincture of Rhubarb and Senna; Warner's Gout Cordial.

In the preparation of this tincture are used, besides rhubarb and senna, coriander and fennel-seed, red saunders, saffron, liquorice and raisins. It is adapted to relieve constipation in persons debilitated by gout, and in whom the digestive organs are impaired. Its dose is from half a fluidounce to two fluidounces.

Vinum Rhei.—Wine of Rhubarb.

Two ounces of rhubarb and a drachm of canella are macerated with two fluidounces of diluted alcohol, and exhausted by means of sherry wine. It has the same general properties as the tinctures of rhubarb, but is less stimulating. Dose, from one to four fluidrachms, repeated if necessary.

History.—The names Rhabarbarum and Rheum are derived from that of the river Rhâ (Volga) which empties into the northern extremity of the Caspian Sea, because from this direction rhubarb was anciently, as at present, brought to the countries bordering on the Levant. The term Rha-pontic, applied to the species of rhubarb described by Dioscorides, refers to its source in ancient Thrace, near

the Pontic or Euxine Sea. The name Rhabarbarum, whence Rhubarb is immediately derived, is applied by several ancient writers to the drug brought from the barbarous regions of the north, for Mesue[1] describes three sorts of it (rhâ), viz: "Indianum, *Barbarum*, et Turcicum."

The Rhaponticum possessed no purgative properties, but was used as a stimulant astringent.[2] The first definite knowledge of the purgative rhubarb is contained in the works of the Arabian physicians. Thus, Ebn Dschamia mentions four varieties of the drug. The first, which he calls Syrian, was probably the non-purgative variety; the others were the Chinese, the Tartar, and the Turkish or Persian. The Arabians describe the last three as purgative, and the Turkish as pre-eminently so. Ebn Baithar[3] speaks expressly of the ignorance of the earlier physicians of the cathartic properties of rhubarb, and ascribes the publication of them to his countrymen. They have proved, he says, that it acts as a deobstruent by removing inspissated mucus and all concocted juices, and strengthens the liver, the stomach, and the rest of the internal organs. It is useful, he continues, in mental disorders, and in all dropsies except those which depend upon atony of the intestines. In chronic diarrhœa depending upon abdominal infarctions it is curative when mixed with wine and Indian spikenard, and in dysentery also when combined with medicines which abate its purgative operation and promote its astringent and healing action. It cures the stone in its forming stage and favors its disintegration; is useful in uterine hemorrhage, in hemicrania depending upon disordered digestion, and as an external application with vinegar to various dry eruptions of the skin. These form but a small portion of the cases in which Arabian authors recommend rhubarb, but they are also the most important and intelligible. Matthiolus states that powdered rhubarb is astringent, and becomes more so when it is roasted.

Action. *On Animals.*—In large doses it purges horses; in doses of one or two drachms it sometimes acts on dogs as a cathartic, but not uniformly. Tiedemann and Gmelin[4] found that after the exhibition of rhubarb the serum of the blood of the mesenteric, splenic, and portal veins was tinged yellow, but the chyle was unaffected; the urine was of a dark yellow color, and on the addition of caustic potash turned brown.

On Man.—The primary effect of rhubarb is purgative; its secondary effect astringent. According to Bergius, a dose of two scruples pro-

[1] Matthiolus, Comment., iii. 2, p. 247.
[2] Dioscorides, iii. 2.
[3] Heil- u. Nahrungsmittel, i. 484.
[4] Mitscherlich, Lehrbuch, i. 333.

cures from three to five stools, but they are not as liquid as those produced by saline or by drastic purges. A much smaller quantity, taken daily in mass and allowed to dissolve in the mouth, will for a long time continue to act as a mild laxative. This medicine does not weaken the digestion, but rather tends to strengthen it, and hence Richter assigned it a place between the bitter tonics and the resinous cathartics. Chapman asserts that, however, combined with opium its operation is not at all restrained, but the statement seems to need confirmation. Rhubarb, before it manifests its action upon the bowels, tinges the urine of a reddish yellow color, like that it acquires in jaundice or in febrile diseases. The milk of nursing women also assumes a yellow tinge and a bitter taste, and the linen is sometimes stained of the same color by the perspiration. The yellowness it imparts to the fæces no doubt led to the notion that it promoted the biliary secretion. Nearly all recent writers deny this operation, but Mitscherlich advocates its reality; but he does not, therefore, regard the action as peculiar to rhubarb, but only as one which it possesses in common with most other purgatives. Sachs, however, goes so far as to assert that the purgative action of the medicine is subordinate to its cholagogue properties. This notion is clearly hypothetical, for in cases of complete obstruction of the biliary ducts the stools produced by rhubarb are none the less yellow. Rhubarb is said by Alibert to purge when it is incorporated with saliva and rubbed upon the abdomen.

Uses. *As a Purgative.*—Rhubarb is not a suitable evacuant in *symptomatic* febrile affections, and particularly in those of the lungs, which it, on the contrary, tends to aggravate. But in nervous and putrid *fevers* it is preferable to saline and other purgatives.[1] It is also recommended in non-febrile *disorders of digestion* following acute diseases and accompanied with a bitter taste in the mouth, slight pain in the epigastrium, and constipation; in those also which result from over-eating, sexual excesses, and loss of sleep; and in such as occur in chlorotic and nervous females and in hypochondriacs.[2] Dr. S. Jackson, late of Northumberland, speaks of it as a remedy of surprising efficacy in *piles* when laxatives are needed.[3] He directs a piece about ten grains in weight to be chewed or rather slowly dissolved in the mouth every night, or less frequently, according to the degree of constipation present. He estimates its power when thus employed as equal to that of five times the quantity in powder. He also recom-

[1] Murray, App. Med., iii. 391.
[2] Trousseau and Pidoux, Thérap., i. 730.
[3] Am. Journ. of Med. Sci., vi. 315.

mends it as a convenient and certain means of combating the costiveness incident to pregnancy and the hæmorrhoidal swellings which are incident to this state. We can add our testimony in favor of this method, which has a great advantage over the use of occasional laxatives.

In the forms of *diarrhœa* incident to debility of the bowels, either when this condition depends upon general causes alone or is the immediate effect of irritating ingesta, rhubarb is superior to almost every other medicine. Experience has also shown it to be a useful purgative in the bowel complaint of summer, and particularly among children. In this disorder it is that the aromatic syrup of rhubarb is so generally and beneficially employed. The combination of rhubarb with tonic infusions is also serviceable in the same affection; if the stools are pale and mucous, it may be associated with mercurials, and if there is a predominance of acid, magnesia may be substituted for the latter, or given in addition. Burnt rhubarb has already been mentioned as an old remedy for diarrhœa. It has recently been recommended anew by Mr. Hoblyn.[1] He caused rhubarb to be burned in an iron crucible, stirring it until it was blackened; it was then smothered in a covered jar. For more than twenty years he says that he used it successfully in incidental diarrhœas, giving it in doses of from five to ten grains. After one or two doses the pains quickly subsided, and the bowels returned to their natural state. He found it equally useful in the diarrhœa of phthisis.

According to Murray, opinions are unanimous in favor of its use in *dysentery*, but they differ in regard to the proper occasion for its employment. The best authorities do not, on the whole, confirm this statement. Degner is perhaps the only one who is an exception. He recommended the medicine in all stages of the disease as abundantly able to effect the cure alone. Pringle, after the example of Barbette and of Degner, made use of the remedy in "winter and vernal fluxes," but he does not seem to have depended much upon its efficacy.[2] Murray, himself, thought it most suitable when the disease tends to become chronic, and debilitating evacuants are no longer proper. It then, he says, acts as an astringent and tonic.[3] Richter, and also Cullen,[4] condemned it in acute dysentery; and Zimmerman[5] agrees with Monro and Brocklesby, whom he quotes, that in general the medicine is appropriate only after the acute stage of the disease. In certain epi-

[1] Lancet, Feb. 1841, p. 790.
[2] Diseases of the Army, p. 235.
[3] Apparat. Med., iii. 396.
[4] Mat. Med., ii. 530.
[5] Traité de la Dysentérie, chap. iv.

demics, when the stomach rejected manna, tamarinds, and neutral salts, he found the tincture of rhubarb sometimes advantageous. On the whole, it is evident that rhubarb is of very subordinate value in the treatment of dysentery.

Externally.—Powdered rhubarb has been recommended by Home as an application to *old* and *indolent ulcers* for the purpose of promoting their granulation. Eberle says that he has derived much benefit from sprinkling indolent chancres with a powder composed of about one drachm of very finely-powdered rhubarb with twenty grains of calomel and ten of powdered opium. The share of the rhubarb in the benefit must, however, have been trifling.

ADMINISTRATION.—Rhubarb is administered in a great variety of forms, including the powder, infusion, tincture, syrup, and in combination with nearly all medicines of the cathartic class. In *powder*, the average dose, as a purgative, is twenty grains; as a gentle aperient and tonic, five grains. When associated with calomel, its action is prompt and efficient; this combination is much used at the commencement of autumnal fevers. With magnesia it is employed in dyspepsia with acid eructations and torpor of the bowels. As a mild laxative for habitual or occasional use, the simple rhubarb pill (*Pil. rhei*) which contains soap, is an eligible form. The *infusion* is generally employed as a vehicle for other purgatives or for vegetable tonics. The *tinctures* of rhubarb are almost exclusively used in cases which require a stimulant cathartic; those most employed contain either aloes or senna, as *tinct. rhei et aloes*, and *tinct. rhei et sennæ*, or a bitter tonic, as *tinct. rhei et gentianæ*. Their dose is from half a fluidounce to a fluidounce. The simple and the aromatic *syrups* of rhubarb, the latter especially, are very useful laxatives in the bowel complaints of children, particularly during the summer season. The *fluid extract* is an efficient preparation of rhubarb in the dose of half a fluidrachm. The various combinations of this medicine, which are only of secondary importance, need not here be mentioned.

JUGLANS.—BUTTERNUT.

DESCRIPTION.—*Juglans cinerea* is a native American forest tree. Its immature fruit is familiarly used in the preparation of pickles, and when ripe its kernel is eaten by those who do not object to its strong and oily taste. The inner bark of the root is its medicinal portion. Applied to the skin it is capable of producing vesication. A decoction

of it is sometimes used in domestic practice, but the extract (*Extractum juglandis*) is generally preferred. In doses of fifteen to thirty grains the latter is an active cathartic, and operates without occasioning heat or irritation.

It is said to be peculiarly applicable as an aperient in habitual costiveness, since it does not tend as much as many other purgatives to leave the bowels in a confined state.

COLOCYNTHIS.—Colocynth.

Description.—Colocynth is the fruit of *Cucumis colocynthis*, a plant which grows wild in Asia Minor, Syria, Nubia, Egypt, the Greek Islands, Japan, and at the Cape of Good Hope. It is cultivated in the South of Europe, and especially in Spain, and is about the size of an orange-tree. The fruit is globose, and measures from two to four inches in diameter; it has a yellow, smooth, hard, and thin rind, which is generally removed before the fruit enters into commerce. The pulp is nearly white, light, spongy, porous, tough, elastic, and contains numerous seeds around its circumference, arranged in double rows. It is intensely bitter and nauseous. These qualities are supposed to be derived from a proximate principle called *colocynthin*, a reddish-brown or light-yellow, brittle, and pulverizable substance, of an extremely bitter taste, and soluble in water and in alcohol.

The principal officinal preparation of colocynth is

Extractum Colocynthidis Compositum.—Compound Extract of Colocynth.

This preparation contains colocynth, aloes, scammony, cardamom, and soap, united by solution in alcohol. It is an efficient cathartic in the dose of ten grains.

History.—Hippocrates directed a tampon covered with colocynth to be introduced into the os uteri for the purpose of bringing on labor artificially in cases in which abortion takes place regularly at the same period of pregnancy.[1] Dioscorides speaks of the intense bitterness of the fruit, of its cathartic properties, which he describes as so powerful as sometimes to produce bloody stools, besides thoroughly cleansing the bowels. He alludes to the use of it described by Hippocrates, and recommends a suppository of it as a purgative, and also states that its fresh juice is useful in sciatica when rubbed upon the painful part.[2] Galen notices the fact that, in spite of its bitterness, it has none of the

[1] De Superfœtatione, xii.

[2] Lib. iv. chap. clxxi.

properties of bitter medicines, but is an active cathartic. Rhazes and other Arabian writers state[1] that it purges mucus and bile, is useful in paralysis, spasmodic diseases, headaches and other head affections, including insanity. It was much recommended in gout and rheumatism. In cold weather it is said to be very apt to occasion borborygmi and colics, and during the heats of summer to bring on dysentery. One writer speaks of it as an ingredient in a hair-dye, and another as a remedy for alopecia and scaly eruptions of the scalp. It was held in great esteem as a cure for scorpions' bites, and a decoction of it in oil was used by dropping into the ear to relieve tinnitus. Its acrimony was said to be corrected by an admixture with gum Arabic or tragacanth, and the addition of aromatics, salines, and aloes was advised to render its purgative action more gentle. Its poisonous effects are described by Matthiolus as identical with those of scammony and other drastics, viz., bloody stools, with violent pain and inflammation of the bowels.

ACTION. *On Animals.*—Unless in large doses, it acts but feebly upon horses, sheep, and swine.[2] According to Orfila's experiments on dogs,[3] this substance purges, inflames the lower bowels, and at the same time depresses the nervous system. In doses of about seven and four grains, administered to two rabbits, Schroff found that *colocynthin* proved fatal in the course of four hours, after producing copious fluid dejections. The gastro-intestinal mucous membrane was found to be highly inflamed.[4]

On Man.—At the Cape of Good Hope colocynth is said to be eaten by the inhabitants as a pickle, without injury. In the North of Africa the seeds are reported to be extensively used as an article of food, and to be mild, oleaginous, and nutritious. But the seeds of the commercial colocynth have been found to produce purgative effects on dogs. In small or moderate doses colocynth appears to quicken the peristaltic action of the bowels, and to augment their secretion and that of the liver. The stools are generally mucous and watery, and are accompanied with colicky pains. If any faith can be reposed in the experiments of Hechenberger, a single drop of the tincture of colocynth (*Pharm. Austr.*), taken twice a day for several weeks, produced looseness of the bowels at the expiration of this period! The same quantity, taken every two hours by susceptible persons, occasioned diarrhœa in the course of the day or the next morning, with griping pain in the abdomen. A pregnant female, who took a teaspoonful of

[1] EBN BAITHAR, ed. Sontheimer, ii. 284.
[2] WIBMER, Wirkung, ii. 230.
[3] Toxicologie, ii. 108.
[4] REIL, Mat. Med., &c., p. 129.

the tincture, was seized with a dysenteric flux, a burning pain in the loins, swelling of the vulva, and a sense of bearing down and heat in the vagina.[1]

In very large doses colocynth acts as a violent irritant poison. Murray relates several cases in which the effects produced were excruciating pain in the abdomen, vomiting, mucous, serous, and bloody stools, and muscular spasms.[2] Tulpius, Plater, Fordyce, and others, report fatal cases of its operation.[3] In one recorded by Caron and d'Annecy[4] the medicine produced frequent stools, with tormina, and, some hours afterwards, intolerable heat in the abdomen, dryness of the throat, and intense thirst. Somewhat later the signs of peritonitis supervened, a small and frequent pulse, red tongue, tumid and tender abdomen, severe pain near the umbilicus, and suppression of the stools. On the third day these symptoms were succeeded by the collapse of approaching dissolution, which took place on the same night. The peritoneal cavity was found to contain much serum and fibrin, and the intestinal mucous membrane was ulcerated. Dr. Christison quotes the case of a female who died, after incessant vomiting and purging, within twenty-four hours after having swallowed, by mistake, a teaspoonful and a half of colocynth powder.[5] According to Richter, all the symptoms of a violent irritant poison may be produced by rubbing the abdomen with a solution of colocynth. Salgues, of Dijon, removed obstinate constipation by applying powdered colocynth to the denuded cutis of the abdomen.[6] It is a popular custom in Italy and some parts of Spain to apply poultices made with garlic, wormwood, and colocynth, to the abdomen, to cause the expulsion of intestinal worms.[7]

Uses.—It is difficult to estimate with accuracy the value of colocynth as an ordinary purgative to overcome *constipation*, because it is seldom or never administered alone, but is nearly always associated, under the form of an *extract*, with aloes and scammony (as in *Ext. Colocynth. Comp.*), with jalap, calomel, and gamboge (as in *Pil. Cathart. Comp.*), or with rhubarb. These compounds are extremely convenient and efficient in cases of obstinate constipation, when more bulky medicines would very probably be rejected by vomiting. Colocynth has been much used as a *vermifuge*. An example has already been cited, but the medicine does not appear to have any specific power of destroying intestinal worms. As a hydragogue cathartic it is sometimes

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[1] Strumpf, Handbuch, ii. 279.
[2] Apparat. Med., i. 584.
[3] Wibmer, ii. 227.
[4] Orfila, Toxicologie, ii. 110.
[5] Beck's Med. Jurisp. (6th ed.), ii. 518.
[6] Dieu, Mat. Méd., iii. 539.
[7] Trousseau and Pidoux, Mat. Méd., ii. 716.

useful in *dropsy*, provided the strength of the patient enable him to sustain its debilitating influence. It has also been prescribed by Hufeland[1] with a view to a diuretic operation, which there is no evidence of its possessing; for, as he administered a decoction of it in beer, whatever diuresis ensued may fairly be attributed to a property of the vehicle. In *coma*, *apoplexy*, and *paralysis*, so far as these affections are susceptible of relief by a derivation upon the bowels, colocynth will often be found useful as an active cathartic. In paralysis of the bladder, for which it has been especially recommended, the local irritant action of the remedy upon the rectum may perhaps combine with its evacuant properties in attaining the object proposed. It has been employed successfully as a cathartic in *melancholia* and other forms of mental derangement depending upon, or at least connected with, torpor of the intestinal canal. Chrestien professed to have cured *mania* by frictions of the abdomen with a solution of the extract of colocynth. He affirmed that it produced diuresis as well as purged.[2] This medicine, like other drastic purgatives, was anciently resorted to, and is still used, to promote the return of *suppressed menses*, as well as with the criminal purpose of producing abortion. Either of these results it may sometimes bring about, but the danger of committing a double crime in the latter case, and of occasioning violent symptoms in the former, ought to be sufficient to dissuade from its use generally in amenorrhœa, and universally in pregnancy. Like various other purgatives, colocynth has been found useful in subacute *gonorrhœa*, or after the acute stage of the ordinary form.

ADMINISTRATION.—Colocynth, or its extract, is seldom administered alone, but nearly always in such combinations as are supposed to mitigate the severity of its operation. As a *stimulant* to the digestive organs the pulp is recommended (*Richter*) to be given in doses of from one-eighth to one-half of a grain, and gradually increased until the urine becomes more copious, or some looseness of the bowels supervenes. As a *laxative* the dose is from two to five grains, and as a *drastic* purgative from five to ten grains, three or four times a day. "It is best administered in a state of minute division, effected by trituration with gum or farinaceous matter." The simple *extract* of colocynth is not officinal in this country. Its dose is from five grains to half a drachm. It may be applied *endermically* to the epigastrium, after having been dissolved in alcohol and incorporated with lard. The *compound extract* described above is an excellent purgative in cases of constipation attended with torpor of the liver, and whenever

[1] RICHTER, Ausfürl. Arzneim., ii. 363. [2] Ibid., p. 364.

copious evacuations from the bowels are desired. It forms the basis of the compound cathartic pills, which contain, in addition, extract of jalap, calomel, and gamboge, and which may be given in the dose of about ten grains, or three pills.

JALAPA.—JALAP.

HISTORY AND DESCRIPTION.—Jalap was first introduced into Europe about the year 1610, and before the end of the seventeenth century from five to ten thousand pounds' weight of it was every year imported into Marseilles alone. It is the root of the *Ipomœa Jalapa*, a native plant of Mexico, and derives its name from the city of Xalapa, in the neighborhood of which it grows, at a height of about six thousand feet above the level of the sea. When dried, it is a roundish, somewhat pear-shaped tuber, smaller than the fist, blackish externally, but grayish-white internally, and presenting a shining undulated fracture containing many resinous points. It has a heavy nauseous smell, and, when fresh, a sweetish and acrid taste. The powder "is of a yellowish-gray color, and, when inhaled, irritates the nostrils and throat, and provokes sneezing and coughing." Its active properties depend upon two resinous elements, of which the one is hard and the other soft. Under the name of *jalapin* a resinoid substance has been described which does not differ in its operation essentially from jalap itself.

The following are officinal preparations of jalap:—

Extractum Jalapæ.—EXTRACT OF JALAP.

This extract is prepared by exhausting coarsely powdered jalap in a percolator by means of alcohol and water. It is of a dark-brown color, and is slightly tenacious unless perfectly dry. Its dose is from ten to twenty grains.

The *extract of jalap* prepared by alcohol alone contains only the resinous portion of the root. According as it is obtained, merely by decoction and filtration, or by precipitation with water from its alcoholic solution, it is dark-colored or purely white. Its dose is from three to five grains.

Pulvis Jalapæ Compositus.—COMPOUND POWDER OF JALAP.

This consists simply of one part of jalap to two parts of bitartrate of potassa, rubbed together. Dose, thirty grains to a drachm. The purgative effect of the mixture may be increased by using a larger proportion of jalap.

Tinctura Jalapæ.—TINCTURE OF JALAP.

This is a simple tincture made with six ounces of jalap and two

pints of alcohol. It is seldom used except as an addition to other purgative tinctures, &c. It may be prescribed in the dose of one or two fluidrachms.

Tinctura Sennæ et Jalapæ.—TINCTURE OF SENNA AND JALAP.

This tincture is prepared by means of percolation with three ounces of senna and one ounce of powdered jalap, half an ounce each of bruised coriander and caraway seeds, two drachms of bruised cardamom seeds, four ounces of sugar, and three pints of alcohol. It is the officinal form of the *elixir salutis*. Dose, from two fluidrachms to an ounce or more.

ACTION. *On Animals.*—Wepfer found that ten grains of the resin of jalap, given to a young dog, produced giddiness, vomiting, and purging. The animal was then killed, and the mucous membrane of its stomach and rectum found to be injected. The experiments of Cadet de Gassicourt[1] on dogs show that moderate doses of this substance produced severe colic, and thin evacuations mixed with mucus and bile, and that larger doses occasioned vomiting and profuse diarrhœa, with inflammation of the stomach and rectum (as proved by dissection), and even death. The extract of jalap, made into an ointment and rubbed upon the shaven skin of a dog, is said to have produced diarrhœa with tenesmus and bloody stools. When given to horses in large doses, jalap sometimes acts as a purge, but experiments with it upon these animals have yielded no very uniform results. In some cases the discharge of urine was increased, in some the animals were purged, in one gastritis and death followed, and in others little or no effect was produced.

On Man.—Jalap is thought to hold a middle place as a purgative between gamboge and senna, and closely to resemble scammony in its action. When chewed it is apt to produce a flow of saliva and a pricking sensation in the fauces. Murray says[2] that daily experience proves it to be a safe and efficacious purgative in chronic diseases, although, in consequence of the variable proportion of resin which it contains, the effects are somewhat uncertain. He adds that it is best suited to persons of lax fibre, and agrees with Wedel that it may be advantageously used as a purgative even for the youngest children, and for persons advanced in life. The peculiarities of jalap as a cathartic have been accurately described by Wedekind.[3] The nausea, he remarks, which jalap often occasions shows that it is not without an irritant action upon the stomach, but as this is transient, and the

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[1] WIBMER, Wirkung, &c., iii. 181.

[2] Apparat. Med., i. 758.

[3] Beiträge zur Erforschung, &c., p. 83.

stools which speedily follow are watery, its operation appears to be expended upon the intestines, and, indeed, upon their glandular element. The copious secretion which it excites dissolves and dilutes the fæces. Its rapid action and the character of the discharges suggest the belief that it is at first absorbed into the blood and is afterwards secreted from the bowels; and this is the opinion of the most recent investigators of the subject.[1] It does not, however, appear to communicate its cathartic properties to the milk of nursing women, nor to be absorbed by the skin. The form in which Wedekind used the medicine was the following: ℞.—Resinæ jalapæ ʒss; pulv. lycopodii gr. v; saponis medicin. ʒiss; amygdal. dulc. excorticarum ʒij.—M. exacte triturando. Ft. pil. cxx. Consp. pulv. lycopodii. Four of these pills contain only one grain of the resin of jalap. Two of them are sufficient to produce one copious stool, four of them three or four stools, and eight of them seven or eight liquid discharges in a healthy condition of the bowels. In many cases a single pill suffices for one evacuation. Soon after being taken, slight nausea and a movement in the stomach is perceived. Within a quarter of an hour more, a like sensation is felt near the centre of the abdomen; in another half hour it is experienced near the cæcum, followed by movements in the transverse colon, with slight colic and flatulent rumbling, and in two hours from the commencement there is a disposition to go to stool. Whether one, two, or eight pills were taken, they operated within the same space of time or not at all. The first discharge was generally thick but mixed with liquid, and had rather a sour smell. The daily and habitual use of the jalap did not appear to lessen its effects. The operation even of large doses (*e. g.*, eight or ten pills) seldom continued longer than two hours, nor did it, like that of aloes, produce any excitement, but, on the contrary, the pulse and animal heat subsided during its operation, and the appetite was but momentarily diminished. The medicine always acted with less energy when the bowels were affected with cramps or pain. It did not, like aloes, aggravate hæmorrhoidal symptoms nor increase a tendency to uterine hemorrhage. The experiments of Willemin[2] agree with the foregoing in proving that the number of stools produced by the resin of jalap is not proportioned to the dose of it administered. Thus, eight grains produced, on an average, three stools, and fifteen grains an average only of four.

Uses.—The forms of *constipation* which jalap is most adapted to relieve are the accidental without colic, and the habitual with dryness of the intestines. In the latter a small dose of jalap, or of its extract,

[1] Headland, on Medicines, p. 84. [2] Archives Gén. de Méd., 4ème sér., xiv. 441.

which is preferable, should be taken before rising in the morning, and an hour afterwards a glass of cold water. Wedekind, who recommends this method, adds that when the secretion of bile is deficient, an aloetic pill may also be taken the night before, so that its operation, which does not occur sooner than at the end of eight or ten hours, may coincide with that of the jalap. He states also that the combination is a very useful one for travellers and for those persons whose sedentary habits dispose them to torpor of the bowels.

Many cases are on record to attest the virtues of jalap as a *vermifuge* for tape-worms as well as lumbricoid worms. As early as 1788, Bloch made use of this, in conjunction with other medicines, as a vermifuge.[1] Wedekind was of opinion that it not only expelled intestinal worms, but also destroyed them as a poison. Bremser says that jalap is indisputably one of the most powerful and efficient of purgatives, and one which, perhaps beyond all others, has most decidedly anthelmintic properties. Wepfer and Van Swieten both used it successfully.[2]

Margrave called jalap *panacea hydropicorum*. It is not equalled by any medicine of its class in the power of evacuating *dropsical effusions*, and of curing those which are independent of an organic lesion. Associated with bitartrate of potassa it forms a safe and certain hydragogue cathartic. Sydenham, who thought that *gonorrhœa* is best cured by purgatives, gave a preference to the most drastic, and especially to jalap, after reduction of the inflammatory symptoms by salines.[3] But since he assigned five or six weeks as the ordinary duration of the cure by this method, there is little encouragement to imitate his practice.

Administration and Dose.—The dose of *jalap* is from *fifteen to thirty grains*. The powder should be very carefully triturated with sugar, and some aromatic added to the mixture. By this expedient its action is rendered more certain. Ten grains of jalap and as many of calomel are frequently associated as a purge in biliary disorders, at the commencement of autumnal fevers, in cerebral congestions, &c. One or two drachms of bitartrate of potassa with ten or fifteen grains of jalap forms an excellent hydragogue cathartic much used in dropsy. The *extract*, being made with water as well as alcohol, contains gum as well as resin. It has no advantage over the powdered root, but is generally prescribed in about one-half the dose. The resin or *alcoholic extract* is reckoned to be from two to four times as strong as jalap itself, and may be given in doses of from *four* to *twelve grains*. It

[1] Traité de la Génération des Vers. [2] Ueber lebende Würmer, &c., 1819, p. 163.
[3] Works, ed. Syd. Soc., ii. 38.

should be thoroughly triturated with sugar, almond emulsion, or some other proper substance, in order to promote its subdivision. The syrup of rhubarb is said to have the property of completely dissolving it, so as to favor its operation in a remarkable degree.[1] The *tincture* of senna and jalap (*Elixir salutis*) which is prepared with aromatic seeds, may be given as a purgative, in the average dose of *half an ounce*, when the digestive powers are enfeebled by too stimulating a diet.

SCAMMONIUM.—Scammony.

Description.—Scammony is the concrete juice of the root of *Convolvulus scammonia*, a native plant of Syria and the adjoining countries. It comes in masses or cakes of a dark olive or slate color on their external surface, but somewhat lighter within. It is pulverizable, almost insoluble in water, with which it forms a milky and somewhat greenish emulsion, is rather more soluble in vinegar, and still more so in ether, alcohol, or a solution of potassa. It has a strong and peculiar odor, which has been compared to that of old cheese, and when held in the mouth for some time it has a slightly acrid taste.

The officinal preparations of scammony are,

Extractum Colocynthides Compositum.—*Vid.* Colocynth.

Extractum sive Resina Scammonii.—Extract or Resin of Scammony. *Ed.*

This is an alcoholic extract of scammony which is free from the impurities of the original drug. The dose is from five to twelve grains. It is best administered by being rubbed up with unskimmed milk, in the proportion of seven grains of the resin to three fluidounces of milk.

History.—It has been questioned whether the scammony (σκαμμονιον) of Greek physicians was the same as our own. Dr. Adams says that without doubt it was.[2] They employed it in febrile as well as non-febrile affections, when the stools were bilious, &c. Pliny[3] describes it as a cholagogue, alludes to its griping operation, and recommends its combination with aloes. Celsus[4] speaks of it as a remedy for tape-worm. Dioscorides states[5] that it purges mucus and bile; that to increase its action black hellebore may be associated with it; that boiled in vinegar and mixed with barley flour it forms a useful poultice in sciatica; that a tampon saturated with its juice destroys the fœtus in utero; and that prepared with vinegar it is used as a local application in

[1] Bull. de Thérap., xxvi. 488.
[2] Comm. on Paul. Æginet., iii. 341.
[3] Hist. Nat., xxvi. 38.
[4] On Medicine, iv. 17.
[5] Mat. Med., lib. iii. cap. 145.

cutaneous diseases. Hobaisch speaks of its causing borborygmi, colic, and excoriation of the bowels, to which a later Arabian writer adds colds sweats, syncope, and sometimes even death.[1] Others of the early writers, and in particular Mesue, dwell upon the irritating properties of the medicine, and the danger of its causing superpurgation, which they advise to guard against by associating with it gums, oils, mucilage, &c.[2]

Action. *On Animals.*—The results of experiments upon animals with this substance are contradictory. Those of Orfila[3] upon dogs show that it acted as a purge, and the animals died in the course of six or seven days. According to Ollivier,[4] the resin of scammony is almost without action upon dogs, unless it is given in very large doses; it then inflames the bowels, but causes no evacuations.

On Man.—Willemin[5] observed the effects of one hundred and thirteen doses of scammony and of fifty-one of its resin, prescribed by Rayer. The quantity of the former in each dose varied from five to twenty grains. In doses of from three to eight grains the effect was slight; or on an average two stools. Doses of from fifteen to twenty grains occasioned no more. They seldom gave rise to colicky pains. The resin was prescribed in doses of from four to twenty grains. It was more uncertain in its action than the gum-resin, and, all things considered, was evidently less active than the latter, unless it was very finely divided by trituration or solution. In that case eight grains of the resin appeared to have about the same effect as fifteen of scammony. Beyond the dose of fifteen grains, the effects of both preparations were very nearly the same. In the time required for it to operate, in the character and number of the stools, the colicky pains produced, and the diminution of the effect when doses of more than fifteen grains were given, scammony displays a very close analogy to jalap. It is more apt than the latter to produce heat of the rectum, and tenesmus. As scammony is nearly insipid, it is administered more readily than jalap to children and squeamish persons.

Uses.—Scammony is seldom used alone, but may be so in cases of great torpor of the bowels, when a derivation upon them is intended to be made from the brain or some other remote organ. It is most frequently associated with calomel, which renders the discharges very copious, and, it is supposed, tends to unload the portal circulation, and relieve the abdominal organs from congestion. This combination is also useful as a *vermifuge*. Scammony is sometimes conjoined with

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[1] Ebn Baithar, ed. Sontheimer, ii. 27.
[2] Matthiolus, Comment., p. 453.
[3] Toxicologie, ii. 155.
[4] Archives Gén., xvi. 141.
[5] Ibid., 4ème sér., xiv. 425.

jalap, but the advantage of uniting two substances so nearly identical in their action, is not very apparent.

ADMINISTRATION.—The dose of ordinary commercial scammony as a purgative is from *ten to twenty grains*. Of pure scammony, or of its resin, the dose is from *five to fifteen grains*. It should be made into an emulsion with milk, almonds, mucilage, or other demulcent, and sweetened. It may be given in pill, but is less active in that form. It is an ingredient of the compound pills of colocynth.

GAMBOGIA.—GAMBOGE.

DESCRIPTION.—Gamboge is a gum resin, consisting of the concrete juice of an unknown plant which grows in Ceylon and the Indian Archipelago. It is obtained by incisions made in the bark of the trunk, twigs, and leaves of the tree, and is allowed to harden upon these parts, or is collected in cocoa-nut shells, or in the hollow of bamboo stems. This substance is brittle, and has a conchoidal fracture, the surface of which is somewhat shining, and of a reddish-yellow color. In the mouth, its taste is not at first perceived, but if retained for some time it makes an acrid impression, and renders the fauces dry. It stains the saliva yellow, is inodorous and inflammable, burning with a white, sparkling flame, and abundant smoke. It is entirely soluble by the successive action of ether and water.

Gamboge is a constituent of the following pills:—

Pilulæ Catharticæ Compositæ.—COMPOUND CATHARTIC PILLS.

Compound extract of colocynth, extract of jalap, calomel, and gamboge are beaten together with water, and divided into pills. Three pills, or about ten grains of the mass, are an active purgative dose, of which gamboge forms less than a tenth part.

Pilula Cambogiæ Composita.—COMPOUND PILL OF CAMBOGE. *Lond.*

Camboge, aloes, ginger, and soap constitute this pill, which is an active purgative in the dose of ten or fifteen grains.

HISTORY.—Gamboge became known in Europe in the year 1603, through Clusius, who received some of it from Cochin China. Its source was indicated by a Catholic missionary in that country, who also described the mode of preparing it. The officinal name is said to be derived from the province, Cambodia, in which the drug is collected. The natives make use of it as a pigment, and also as an emeto-cathartic medicine, and a hydragogue in dropsy. The females

resort to it as a means of procuring abortion.[1] After its introduction into Europe, gamboge was employed in congestion of the brain, jaundice, rheumatism, and other diseases in which a powerful purgative action was thought useful; but the harshness of its operation soon caused it to be laid aside, or used only as an adjuvant to other purgatives. By some it was associated with acids, which were supposed to mitigate the severity of its action.

ACTION. *On Animals.*—The effects of gamboge vary considerably in different animals, and also in the same species according to the dose and mode of administration. Flohrmann found that fifteen grains given to a horse two years old produced malaise, agitation, a frequent pulse, twitching of the muscles, distension of the abdomen, thin alvine discharges, and trembling of the whole body. Viborg gave an ounce to a nine months' foal, producing eleven evacuations within four hours, while a like dose administered to a horse had no effect whatever.[2] The last-named experimenter, and also d'Aubenton, found that sheep were purged by from twenty to sixty grains, and that two drachms were often fatal. Drachm doses caused vomiting and purging in dogs, but if the œsophagus was tied the animal only made straining efforts, trembled, grew faint, and was purged. In an experiment of Orfila,[3] half an ounce caused efforts at vomiting, but *did not purge*, and the animal died within twenty-four hours without any active symptoms whatever. In such cases the mucous membrane of the stomach, as well as of the rectum, was reddened, but not disorganized. When finely powdered, and applied to a wound in considerable quantity, gamboge appears to produce local inflammation, and death without signs of pain, and without vomiting or purging. These experiments are very far from rendering clear the *modus operandi* of gamboge. The immediate phenomena, both local and general, and the lesions found after death, are insufficient to explain the fatal result. Few of the symptoms which a local irritant produces are displayed; there is but little expression of pain, and seldom either fever, convulsions, or coma, so that the action of the medicine must be regarded as very obscure and different from that of the drastic purgatives with which it is classed.

On Man.—A. L. Richter found that when applied to the skin, gamboge produced no effect while the cuticle was whole, and that when the latter was removed it acted simply as a local irritant, causing a secretion of fibrin, and a sore which healed with difficulty.[4] Taken

[1] MURRAY, App. Med., iii. 110 and 654.
[2] WIBMER, Wirkung, &c., ii. 388.
[3] Toxicologie, ii. 112.
[4] STRUMPF, Handbuch, ii. 286.

internally, and in small doses, it acts as a stimulant to the abdominal organs, augmenting the secretion of the glandular apparatus; in larger doses it purges, generally causing severe colicky pain and tenesmus, and often vomiting besides. Rayer observed the effects of this substance upon persons who either had no acute disease or were convalescent from sickness.[1] It was first given to fifteen persons, in doses of five grains each. All of them vomited bile within an hour or an hour and a half, and had from two to six stools with little or no colic. There were no symptoms of local inflammation or general fever. The reduced dose of three and a half grains was afterwards given, and occasioned slight nausea, but no vomiting, and from two to six stools, with slight colic or none at all. Several writers have attributed a diuretic operation to gamboge. This quality was long ago pointed out by Lewis,[2] who says: "Solutions of gamboge in alkaline water, ... act only by stool and urine." Abeille found[3] that when given in small but gradually increasing doses until it reached the quantity of about twenty grains a day, it no longer purged, but seemed to produce copious diuresis, and the evacuation of dropsical effusions, for the removal of which it was prescribed. This agrees with Ferriar's experience given below.

It is usually stated that large doses of gamboge have proved fatal. After a diligent search for the foundation of an assertion so confidently made and so often repeated, we have discovered none other than a single case published a hundred and eighty years ago by Paullinus.[4] It seems that a barber surgeon administered a drachm of the medicine, for what purpose is not stated, and produced violent vomiting and purging, with fainting and "six hundred other mischiefs which deserve to be mourned with tears of blood." The patient, however, did not die immediately, but after some time and much suffering perished. In all of the fatal or imminently dangerous cases attributed to the action of gamboge the effects appear to have been produced by excessive doses, not of gamboge, but of certain quack pills, of which aloes and colocynth as well as gamboge, and perhaps other substances still more acrid, were constituents. The most definite notions of the operation of gamboge in disease are presented by the results of Rasori's experiments.[5] The views of this author were originally published in 1807, and are contained in the following proposition: "A disease distinguished by certain symptoms, and an agent having the property of

[1] Annales de Thérap., iv. 256. [2] Mat. Med., i. 458.
[3] Bull. de Thérap., xxxvii. 329; xxxviii. 275.
[4] Ephemer. Natur. Curios., Dec. 1, Ann. viii. p. 139.
[5] Opuscoli di Med. Clin., ii. 73.

producing like symptoms being given, the latter, instead of aggravating the disease, will remove it, provided that the remedy be in opposition to the existing diathesis."[1] After showing that nearly all preceding writers regarded gamboge as a violent and dangerous remedy, Rasori relates a number of cases in which he employed it for the cure of diarrhœa and dysentery, in doses of from five to twenty grains in twenty-four hours. They seldom excited vomiting, and never colic; but, on the contrary, relieved the latter symptom if it was present. Identical results have been published by Castiglione,[2] who, like Rasori, insists upon the fact that the medicine is much more readily tolerated when the bowels are inflamed than when they are in their natural condition. This assertion is directly opposed to the general belief of physicians.

Uses.—Gamboge is recommended in obstinate *constipation* connected with congestion of the liver or spleen, and serving directly either to cause jaundice or to prolong intermittent fever, &c. It is, however, seldom given alone, but either with calomel, which is said to render its action much milder, or combined with other resinous cathartics, as in the compound cathartic pills.

Many writers might be cited in proof of the efficacy of gamboge in *dropsy*, and particularly in *anasarca*, although some insist upon its efficacy in *ascites* also. Nearly all of them admit the extreme harshness of its action, and seem solicitous to devise means of correcting this objectionable quality. The greater number caution against its use in atonic dropsy, as well as when the patient is feeble; but some, like Werlhof, insist upon its superiority to other cathartics, whatever may be the state of the patient's strength. Cullen, who was led to abandon the exhibition of the medicine in full doses on account of the severity of its operation, found it very effectual when given in divided doses. "Observing," he says, "that it was a purgative which passed through the intestines more quickly than almost any other, I have judged that moderate doses of it might be repeated soon after one another with more safety and with more effect than by giving large doses at once. Accordingly, I have given doses of three or four grains, rubbed with a little sugar; and repeating these every three hours, I have found it operate without vomiting or griping; and, at the same time, after three or four such exhibitions, a great deal of water was evacuated

[1] This doctrine, which is nearly identical with that of Hahnemann, was evolved quite independently of the latter, and led to a far different, and indeed diametrically opposite, system of therapeutics.

[2] Annales de Thérapeutique, iii. 444.

both by stool and urine."[1] Ferriar, in speaking of the remedies for dropsy, uses the following language: "After a long and extensive experience of the qualities of gamboge, I can recommend it as one of the gentlest, most certain, and least nauseous laxatives in the materia medica. Being nearly free from either smell or taste, it is particularly well adapted to the management of children, with whom its anthelmintic power is likewise valuable. A very commodious form of exhibiting it is a solution in distilled water, in the proportion of half a grain of gamboge to half an ounce of water. A tablespoonful may be given to an adult every hour till it operates. A teaspoonful of the solution, given in the same way, is a dose for a child under twelve years of age. When given in this manner, doses of seven or eight grains have been found necessary to move the bowels, and it has proved strongly diuretic."[2] Most generally it is associated with other purgatives, and especially jalap and bitartrate of potassa, but the advantage of such an union is perhaps overrated.

Gamboge has been used externally as an *anthelmintic*, and particularly as a remedy for tapeworm; and not a few of the most reliable authorities attribute to it a high degree of efficacy. It formed an ingredient of Madame Nouffer's specific for tapeworm. Werlhof, Bissett, and others, regard it as a specific against this and other species of intestinal worms, but Bremser did not consider it a true anthelmintic.[3] Indeed, it does not appear to possess any specific virtues, but to act only as a powerful cathartic, after the administration of calomel, wormseed, pinkroot, male fern, or some other substance capable of exerting a directly poisonous influence upon the worms.

Administration and Dose.—The best mode of administering gamboge alone is that recommended by Cullen, to give three or four grains of it rubbed up with a little white sugar every three hours; or that proposed by Ferriar, to give half a grain every hour in solution. By these means it seldom occasions vomiting, and yet purges freely. The full purgative dose is generally stated at *ten* or *fifteen grains*. When given in pilular form, its action is retarded and impaired. The alkaline solutions above referred to may be prepared as follows: ℞.—Gamboge ℈ss; solution of carbonate of potassa ʒss; cinnamon water ʒj.—Mix. S.—Twenty to thirty drops in water three or four times a day; or ℞.—Gamboge ʒss; carbonate of potassa ʒj; brandy Oj.—Mix. Dose, one or two fluidrachms. (*Oesterlen.*)

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[1] Mat. Med., ii. 542. [2] Med. Histories (Am. ed.), p. 217.

[3] Ueber lebende Würmer, &c., p. 164.

ALOE.—Aloes.

Description.—Aloes is the inspissated juice of *Aloe spicata* and other species of aloe. The plants which furnish this medicine belong to the natural family of *Liliaceæ*, and are very widely disseminated. They abound upon the shores of the Mediterranean and of the Red Sea, at the Cape of Good Hope, and in the East and West Indies. They are usually from one to two feet in height, and have fleshy, ensiform leaves armed on the edges with spines or serratures. The aloes of commerce is obtained by evaporating the juice which exudes from transverse incisions made in the leaves, or from the footstalks of the latter when they are torn from the stem. The principal commercial varieties are the following: 1. *Socotrine* aloes, also known as *Indian* aloes, *Turkey* aloes, and extract of *spiked* aloes. The hardened portions are of various colors. Sometimes they are of a garnet red, sometimes of a pale or golden red, and, when powdered, of a bright yellow color. Their fracture is vitreous and generally conchoidal; the odor of the freshly-broken pieces, especially when breathed upon or heated, is very fragrant, and the taste is bitter and somewhat aromatic. 2. *Hepatic* aloes is darker and more opaque and less fragrant than the Socotrine, but is thought to be derived from the same source. 3. *Cape* aloes is the most abundant variety of this drug. By the German writers it is called *shining aloes*. When freshly broken, it has a very dark olive or greenish color approaching to black, presents a smooth, bright, almost glassy surface, and, if held up to the light, appears translucent at the edges. The powder is of a fine greenish color. The odor is strong and disagreeable, but not nauseous, nor, on the other hand, aromatic.[1] 3. *Barbadoes* aloes is of a dark brown or blackish color, and sometimes of a reddish brown or liver color, like the hepatic variety; the fracture is generally dull, the taste nauseous and bitter, and its odor, which is unpleasant, is rendered still more so by breathing upon it. The powder is of a dull olive yellow color.

Aloes contains a *bitter* principle called *aloesin* (but which is probably a compound of several proximate principles), a peculiar *resin*, and an acid having a close affinity to gallic acid. It is soluble in alcohol, ether, and boiling water. Messrs. T. and H. Smith obtained from aloes a substance which they regard as its cathartic principle, and which they term *aloin*.[2] It is crystalline and soluble in alkaline

[1] U. S. Dispensatory.

[2] Month. Journ. of Med. Sci., Feb. 1851, p. 127.

liquids and hot alcohol. It operated as a purge in doses of one or two grains.

The officinal preparations of aloes are very numerous, but the following are the most important.

Decoctum Aloes Compositum.—Compound Decoction of Aloes. *Lond.*

In this preparation aloes is associated with extract of liquorice, myrrh, saffron, and cardamom, which qualify its irritant effects, and with carbonate of potassa, which promotes its solution. Its dose is from half a fluidounce to two fluidounces.

Enema Aloes.—Clyster of Aloes. *Lond.*

Two scruples of aloes, fifteen grains of carbonate of potassa, and half a pint of barley water, form this mixture, which is used in amenorrhœa and for the destruction of ascarides of the rectum.

Extractum Colocynthidis Compositum.—Compound Extract of Colocynth. *Vid.* Colocynth.

Pilulæ Aloes.—Aloetic Pills.

Aloes and soap are combined in equal parts. Each pill contains two grains of each of the ingredients. Dose, as a cathartic, five pills; as a laxative in habitual costiveness, one or more pills. The Compound Pills of Aloes (*Dub.*), made with aloes and gentian, are employed for the latter purpose especially, in the dose of from five to ten grains.

Pilulæ Aloes et Assafœtidæ.—Pills of Aloes and Assafetida.

In these pills, aloes, assafetida, and soap, are united in equal parts, and each one should contain about four grains of the mass. From two to five pills are a purgative dose.

Pilulæ Aloes et Myrrhæ.—Pills of Aloes and Myrrh.

One part of saffron, two of myrrh, and four of aloes, with syrup in sufficient quantity, form these pills, known as *Rufus's pills*, and much used in amenorrhœa. Dose, from ten to twenty grains.

Pulvis Aloes et Canellæ.—Powder of Aloes and Canella; Hiera Picra.

One part of canella mixed with four parts of aloes forms this popular remedy for amenorrhœa and constipation. Dose, ten to twenty grains.

Tinctura Aloes.—Tincture of Aloes.

This is a solution of one ounce of aloes and three ounces of liquorice in half a pint of alcohol, and a pint and a half of distilled water. After maceration, it is filtered. Dose, from half a fluidounce to a fluidounce and a half.

Tinctura Aloes et Myrrhæ.—Tincture of Aloes and Myrrh; Elixir Proprietatis.

This tincture is made by macerating aloes and saffron in tincture of myrrh. Like the pills of aloes and myrrh, it is adapted to torpid conditions of the bowels and of the uterine system, but, owing to the alcohol contained, it is more stimulant than the pills just named. Dose, from one to two fluidrachms.

Tinctura Benzoini Composita.—Vid. *Expectorants.*

Vinum Aloes.—Wine of Aloes.

This wine is made by macerating aloes, cardamom, and ginger in sherry wine. It is a warm laxative and cathartic in the dose of from half a fluidounce to two fluidounces.

History.—Pliny gives a description of the aloes plant and of its concrete juice.[1] He says of the latter that "it is chiefly used to open the bowels, and of all cathartics is almost the only one which is at the same time stomachic and aperient, so free is it of all mischievous operation upon the stomach." He states that it is most active when taken before a meal, and that in dyspepsia it is to be used after eating. He describes many external uses to which it is adapted; for instance, it relieves headache when it is applied with vinegar to the temples, and its vinous tincture prevents the hair from falling out; it is mixed with honey as a stimulant in ophthalmia, to cleanse ulcers of the mouth and throat, to promote the healing of wounds and sores of the penis, anus, &c. The description of Dioscorides is almost identical with that of Pliny, and Galen does little more than copy it. Mesue states that aloes aggravates piles and inflammations about the anus. Nearly all of the writers mentioned, as well as those of the Arabian school, attribute to aloes a special power of purging off the bile, and curing affections of the abdomen, and of the head supposed to depend upon derangement of this secretion. Some of them praise it as a topical application to condylomata and external piles, and in those affections for which Pliny recommends it. Nearly all agree with Mesue in the statement that when taken internally it is apt to create or to aggravate hæmorrhoids, and several insist upon its combination with other laxatives in order to obviate this effect.[2]

Action. *On Animals.*—Experiments on horses, oxen, sheep, swine, and dogs, show that aloes acts upon these animals as a slow but certain cathartic. It is very commonly employed in veterinary medicine. The dose usually given to horses is from five to seven drachms, and it operates in from eighteen to twenty-four hours. Moiroud

[1] Hist. Nat., xxvii. 5.

[2] Ebn Baithar (ed. Sontheimer), ii. 120.

injected a solution of four drachms of aloes into the veins of a horse, but no purgative effect ensued. The discharge of urine was thought to be increased.

On Man.—Several ancient writers state that aloes acts as a purgative when rubbed upon the skin.[1] Wedekind says that an ointment made of aloes and ox-gall and applied by friction, purges. Monro noticed this effect from the application of aloes to a carious ulcer, and others have observed it when it was used to promote the discharge from an issue. Dr. Gerhard, of Philadelphia, found it the medicine best adapted for endermic uses, as its application does not irritate a blistered surface very powerfully. Ten grains of it thus employed produced five or six stools, which were generally accompanied with griping.[2] Infants have been purged by the milk of nurses who had taken aloes.

In very small doses aloes operates as a gentle stimulant to the stomach and bowels, increasing the appetite and promoting the digestion. Fallopius states that two grains will cause an evacuation, but only after the lapse of twenty-four hours, and that a scruple is necessary to procure watery dejections.[3] Cullen makes an almost identical statement, and adds that the stools appear to consist merely of what may be supposed to have been present in the large intestines, but that doses of more than twenty grains produce liquid stools, with pain and griping. He regarded the medicine as a mere evacuant of the fæces, producing its effect very slowly, and by means of its specific action upon the colon and rectum.[4] These views have acquired strength and precision from the experiments of Wedekind and of Giacomini. The former concluded[5] that the primary action of aloes is to augment the biliary secretion, and its secondary effect, or consequence of the former, is to purge. This general result is in exact conformity with the conclusions of the ancient, and especially of the Arabian writers. The more particular results obtained by Wedekind are these: After a dose of from four to eight grains of aloes, neither nausea nor any other disturbance is perceived, except, perhaps, some eructation, and occasionally warmth and uneasiness in the region of the liver, before the commencement of the purgative operation. The latter seldom begins in less than from eight to twelve hours, and the size of the dose has but little influence on the length of this period. The evacuation is sometimes preceded by griping, and several stools succeed one another, accompanied with slight tenesmus. They are feculent, and of a

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[1] Murray, Apparat. Med., v. 251.
[2] N. Am. Med. and Surg. Journ., x. 155.
[3] Murray, op. cit., p. 252.
[4] Mat. Med., ii. 525.
[5] Beiträge zur Erforschung, &c., p. 60.

natural constitution; but if several follow one another closely, they are bilious and mucous, but never watery nor very abundant. They, as well as the discharged flatus, have a peculiar and characteristic smell. Their number depends more upon the state of the bowels than upon the dose of the aloes. Half a grain will sometimes produce as much effect as ten or twenty grains, and the more the patient is disposed to secrete bile the greater will the effect be. Purging by aloes is stimulant rather than sedative, causing acceleration of the pulse, dryness of the fauces, thirst, scantiness and heat of urine, an unpleasant warmth in the abdomen, and sometimes tension and throbbing in the right hypochondrium. But these phenomena are seldom observed when the medicine is taken in doses of less than four grains as an habitual laxative. Its action is not lessened by habit, on the contrary, it produces the same effect although given in a diminished dose. When a predisposition to hæmorrhoidal or uterine flux exists, aloes is very apt to bring on the discharge, and in varices of the bladder and in dysuria it ought to be avoided. Small doses are apt to increase a tendency to erections and excite the sexual appetite. When other and quickly operating cathartics are taken along with aloes, it does not appear to modify their action; but if it is administered seven or eight hours before a saline purgative, for instance, a combined and very active operation is the result. When it is given by enema, and is retained, it is said by Wedekind to operate at the expiration of seven or eight hours, in the same manner as when taken by the mouth, but without producing irritation of the rectum. If this statement be correct, it would seem to warrant his inference from it that the last named symptom is due not so much to the direct action of the aloes as to the secretion of bile which it induces. But general observation will scarcely sustain this judgment; and it is, moreover, certain that aloetic enemata frequently repeated produce intolerable tenesmus.

The experiments which Giacomini made upon himself[1] are so nearly identical in their results with those just given, as to render a detailed account of them unnecessary. He found that one grain doses taken fasting only produced eructations of a peculiar odor, and that two or three grain doses, besides this effect, occasioned, after the lapse of eight or ten hours, a soft and copious stool of a brownish-yellow color, and characteristic smell. Larger doses did not appear to increase the effects much; fifteen grains, indeed, produced no discharge at all, and twenty-four grains taken in two doses occasioned two liquid stools on the following day.

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[1] Mat. Med., p. 522.

The tendency of aloes to produce hæmorrhoids has already been referred to as having been noticed by ancient writers. In times more nearly approaching our own, the same tendency of the medicine has been insisted upon. Fuchsius was of opinion that of one hundred persons who should take aloes frequently as a laxative, ninety would be attacked with piles.[1] Murray blames physicians who are induced by the gentle and certain action of the medicine to expose their patients to so serious a consequence, and Fothergill[2] reprobates its habitual use in menstrual disorders at the critical period for the same reason. It was to this purgative that Fonseca attributed the prevalence of piles among the inhabitants of Padua, and Stahl makes a similar statement in regard to the people of Hamburg. Calvin is cited as a prominent example of this mischief produced by aloes; for the celebrated reformer is said to have died ultimately from the effects of the piles which it gave rise to;[3] but as he was also of frail constitution, subject to quartan ague, gout, and gravel, the part which aloes bore in his demise may reasonably be judged to have been small. Cullen regarded a belief in the tendency of aloes to produce piles as much exaggerated, and to have been suggested by the effects of large doses of the medicine. He believed the costive habit for which the aloes is given, and not the medicine itself, to be the real cause of the disease. Sachs and Dulk make a very similar statement,[4] and add that they have uniformly failed in establishing hæmorrhoids artificially by its means. Trousseau and Pidoux arrived at the same result. Sir B. Brodie's experience confirms these conclusions. He states that from his own observation he could not be certain that aloes is productive of piles at all, and, like Cullen, he attributes this infirmity, not to the medicine, but to the constipation which aloes is used to remove.[5]

Uses.—Trousseau and Pidoux state that aloes was successfully employed by Esquirol to counteract a tendency to *cerebral congestion* in the insane, and they themselves cured with it cases of *neuralgic* headache which no other treatment relieved. Ollivier found it of service in the treatment of certain *paraplegiæ*. Except so far as these affections were aggravated by constipation, which aloes was fitted to remove, its utility may very well be questioned.

Several modern writers, among whom may be mentioned Janin, Boerhaave, Reil, and Beer, have imitated the ancient method of using

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[1] Mangetus, Bibl. Med. Pract., ii. 41.

[2] Works, ii. 211.

[3] Dict. de Méd. en 60 vol., xx. 505.

[4] Handwörterbuch der prakt. Arzneim, i. 223.

[5] Clinical Lectures on Surgery (Am. ed.), p. 308.

aloes for *affections of the eyes*, such as weakness with lachrymation, opacities of the cornea, &c.[1] But as the medicine is in every case recommended to be associated with stimulant or sedative agents, its proper and separate effects must be extremely small.

Aloes is very frequently employed as a *stomachic*, and forms the basis of numerous pills such as the *Pilules des gourmands*, *Pilulæ ante cibum*, or dinner pills, which have long enjoyed a high repute for their virtues in atonic dyspepsia. The dose ought not to exceed two grains, and should be taken before meals.

As a *purgative* simply to overcome *constipation*, this agent is, perhaps, the best of its class. It is unsuitable for persons of a plethoric, bilious, or hemorrhagic constitution, and for pregnant females, whenever the liver is congested or inflamed, when there is general fever, or inflammation of the bowels, and particularly irritation of the rectum from piles. On the other hand, it is particularly indicated when the secretion of the bile is scanty or suspended, when there is atony of the colon depending upon accidental or constitutional debility, and particularly upon the advance of old age, sedentary habits or occupations, and, in females, upon repeated pregnancy. It has already been mentioned that the dose of this medicine need not be increased, but may, on the contrary, be diminished after the habitual use of it. This circumstance renders it invaluable in the cases indicated. Its utility is much insisted upon when the habitual hæmorrhoidal flux has been suspended, but it depends not so much upon the tendency of the medicine to renew the salutary depletion, as to free the bowels of accumulated fæces. There is, too, a form of *piles* which it is said to cure, one connected with an extremely relaxed state of the system, and of the rectal tissues in particular. It has also been recommended as very efficient in removing *ascarides* of the rectum. There are few means of regulating the alvine discharges which have not the same effect, but it has been asserted, and is possible, that aloes possesses specific anthelmintic virtues.

Wedekind states that during sixteen years' service in the French military hospitals, he had a great many cases of *simple atonic jaundice*, all of which he cured in a week's time by means of aloes alone, and often when saline and other purgatives had failed to give relief. He administered the medicine twice a day in doses of ten grains each, and found that no effect was produced until the stools began to be colored, when a cathartic action was at once manifested. When once the stools

[1] Richter, op. cit., ii. 346.

became bilious, small doses of aloes were sufficient to maintain a purgative operation.

In imperfection or suppression of the *catamenia*, without congestion of the pelvic organs, aloes is often useful in restoring the natural condition of the discharge, if taken a few days before the menstrual period. The greater the torpor of the uterine system, the more appropriate does the use of aloes become, and hence it is most applicable to suppression of the menses in females of a phlegmatic temperament, or who are indisposed to nervous or inflammatory disorders. It is not less useful in certain forms of *menorrhagia* which appear to depend upon debility. Eberle says: "This article given in small doses, but frequent ones, deserves to be accounted the best remedy we possess for those protracted, exhausting, and obstinate hemorrhages from the uterus which occur in those of relaxed, nervous, and phlegmatic habits, about the critical period of life." This author also employed aloes in conjunction with prussiate of iron, and Dewees used it associated with canella in passive and protracted hemorrhage from the womb. In all cases care should be taken to ascertain that the suppression of the catamenia is not the consequence of pregnancy.

It has been proposed by Sandras[1] to use aloes in the treatment of *gleet*. He found that it may sometimes be cured, within the space of about a week, by pills of two or three grains of aloes taken three times a day. This method might be tried where special objections exist to the use of copaiba or of astringent injections.

Aloetic enemata are reported by M. Aran to be remarkably successful in the treatment of *uterine leucorrhœa* or *catarrh*, while they fail entirely in effecting analogous discharges from the vaginal mucous membrane, and even from the neck of the uterus. It is, however, a condition of its success that this treatment should not be applied in cases which involve an active inflammatory element. From seventy to one hundred and fifty grains of aloes, and as much Castile soap, are dissolved in three ounces of boiling water. This is administered daily, or every other day, at bedtime, after the use of an injection of simply tepid water. In the most favorable cases it arrests the discharge in the course of from four to six days.[2]

The *cicatrizing* virtues of aloes were, as we have seen, much valued by the ancients, and they have at all times been in the highest popular repute. This is proved by the number of nostrums believed to possess such virtues, and into the composition of which aloes enters, such as Turlington's balsam, Wade's balsam, Friar's balsam, *baume du com-*

[1] Bull. de Thérap., xxiv. 16.

[2] Times and Gaz., Sept. 1858, p. 303.

mandeur, &c. The reality of this virtue has been proved by the observations of M. Chaussit on the glycerole of aloes, or a solution of aloes in glycerin. He prepared it by evaporating from four to eight parts of tincture of aloes, and then gradually adding thirty parts of glycerin. He employed it with remarkable success in healing *fissures and excoriations of the skin* caused by lichen agrius, sycosis of the upper lip and nares, eczema, &c. Five or six applications, at most, sufficed to heal old and obstinate fissures.[1]

ADMINISTRATION AND DOSE.—The ancients seem to have prescribed aloes in much larger doses than are now thought proper. One or two drachms were commonly given, and the same quantity is directed by Fallopius. Alston prescribed half a drachm as sufficient. At the present day it is generally acknowledged that little or no increase of effect is obtained by doses of more than *ten* grains. As an evacuant in habitual constipation, a daily dose of *two* grains is sufficient. Its combination with other purgatives adds little or nothing to its efficacy. To unite it in a pill with two grains of rhubarb is illusory, as the latter medicine, in such dose, must be almost or quite inert; to combine it with drastic hydragogue cathartics, which are rapid and energetic in their operation, must be to neutralize its peculiar action. Hence it is best administered *alone*, or merely with soap to promote its solution. If, however, it is desired to exercise a depletory action upon the bowels as well as to promote the discharge of bile, or to palliate the irritation which the medicine is apt to create in the rectum, it may be taken at bedtime, and be followed by a saline draught in the morning.

Numerous formulæ for the administration of aloes have been proposed, and many of them, which are enumerated at the beginning of this article, are officinal. It is associated with *tonics*, such as gentian or iron; with *antispasmodics*, such as myrrh or assafœtida; with *purgatives*, such as colocynth, rhubarb, gamboge, or simply with soap, in the form of pills; with canella, in the powder known as *Hiera Picra;* with liquorice, carbonate of potash, myrrh, and saffron, in the Compound Decoction of Aloes (*Lond. Ph.*); with saffron and myrrh, in the *Elixir Proprietatis* (Tinct. Aloes et Myrrhæ), &c. &c. Of these, its combinations with rhubarb, with canella, and with myrrh are probably the most important, although, as remarked above, the quantity of the first-named ingredient can add but little to the efficacy of the preparation which contains it, and the utility of the two latter is far from being evident.

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[1] Times and Gaz., Jan. 1858, p. 123.

OLEUM TIGLII.—Croton Oil.

Description.—This is the expressed oil of the seeds of *Croton Tiglium*, a small tree or shrub which grows upon the continent of India and the islands of the Eastern Archipelago. These seeds are rather larger than a grain of coffee. Before being pressed they are divested of the internal seed-coat, which is extremely acrid. The kernels are themselves but slightly less so, although their taste is at first mild and oleaginous. The burning sensation which they produce is very persistent. Croton oil varies in color from very pale yellow to dark reddish brown; it has a nauseous and unpleasant odor, and a hot and acrid taste. When pure, it is soluble in alcohol and ether, and in the fixed and volatile oils. It has an acid reaction.

When croton oil is repeatedly agitated with alcohol of 74 per cent., and allowed to stand, the supernatant alcohol becomes intensely acrid, while the oil itself has lost nearly all its acrid taste. If, however, the latter is treated with liquor potassæ, it fully regains this quality, which is supposed to depend partly upon a volatile principle, and partly upon an acid called *crotonic*.

Linimentum Crotonis.—Croton Oil Liniment. *Dub.*

A fluidounce of croton oil is mixed by agitation with seven fluidounces of oil of turpentine. It is more rapid in its action than croton oil alone.

History.—The Arabian writers were the first to notice this medicine, under the name of *Dend*. They describe several varieties of it. Honain remarks as a wonderful fact that its active principle is oily. He describes its drastic properties, which, he says, render it unsuitable for use in hot climates. Rhazes mentions the violence of its action, and its occasionally fatal effects, and recommends cold affusions to moderate their force. He alludes also to the irritant action of the seeds upon the mouth when they are chewed, and to the eruption which they sometimes produce. He recommends them to be administered in conjunction with milder purgatives. Isa Ben Ali says that Dend purges violently, and excoriates the bowels, and advises to counteract its irritation with an emetic, followed by butter, milk, and mucilages.[1] The croton seeds were also described by Acosta,[2] under the name of *Pignoli di Maluco*. He says that they are used by the inhabitants of Malabar, in clysters, as a remedy for sciatica and dysuria, and by the mouth as a purge. He adds that water in which they

[1] Ebn Baithar (Sontheimer), i. 427. [2] Trattato delle Droghe, &c., 1585, p. 238.

have been infused cures recent impetiginous eruptions, although it causes much smarting.[1] The purgative qualities of the seeds were described by the Dutch naturalist Rumphius, who, about the close of the seventeenth century, lived for many years in Amboyna, one of the Molucca islands. He speaks of the persistent acrid taste of the whole plant, so that chewing a leaf of it causes the mouth and fauces to burn for several days; also of the use of the seeds in the East Indies as a hydragogue cathartic. This writer adds that in Europe the oil is used as a common purge, in the dose of one drop.[2] Hermann alludes to the purgative action of the oil when rubbed upon the abdomen, and Cohausen to the use of the seeds as a remedy for tapeworm.[3] To this statement Murray subjoins that the medicine has gone out of use. Attention was directed to it anew by the publication of Ainslie's *Materia Medica of Hindoostan* in 1813. The descriptions of the properties and uses of the seeds by the native practitioners correspond very closely with those of the Arabian writers already referred to. They also used the oil as an external application in rheumatism. It was introduced into England in 1820, by Dr. Conwell, who, as well as one or two other East Indian practitioners, published accounts of its operation and uses.

ACTION. *On Animals.*—The experiments of Landsberg and others upon horses show that these animals are but slowly affected by the croton *seeds*, although the symptoms ultimately developed are severe and even fatal. The most striking of them are these: loss of appetite, frequency of pulse, debility, signs of abdominal pain, foaming or unusual dryness of the mouth, grinding of the teeth, short, quick, and laborious breathing, flatulent distension of the abdomen, diarrhœa, tenesmus followed by paralysis of the rectum, cold sweating and death. The gastro-intestinal mucous membrane is found injected and softened, and the bowels are filled with a bloody liquid. In these experiments a dose of from ten to forty of the seeds was given, but the latter quantity only was fatal.[4] Orfila gave a dog three drachms of the *seeds*, which had been beaten to a paste, and then tied the œsophagus. In three-quarters of an hour the animal made strong efforts to vomit, and in an hour and a quarter more lay insensible upon his side. In another hour he was dead. The whole intestinal canal was highly injected, and the mucous membrane of the stomach had a dark red color. Other experiments furnished similar results. When the

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[1] This author subjoins: "Le buone donne anco di quelle parti, amiche de' loro mariti gliene danno fin quattro per bocca, per mandare i pover' uomini all' altro mondo."

[2] Herbarium Amboinense, iv. 98.

[3] Apparat. Med., iii. 149.

[4] WIBMER, Wirkung, &c., ii. 222.

paste was introduced into the subcutaneous cellular tissue, it produced the same general symptoms, but neither vomiting nor purging, and the intestine was not found inflamed.

In Java the seeds are said by Rumphius to be employed for killing fish.

The action of the *oil* upon dogs is very speedy and decided. Conwell found that a single drop given to one of these animals produced a discharge from the bowels within forty minutes; twelve drops caused vomiting, and, on the animal being sacrificed, the whole intestinal canal was found inflamed. Five drops injected into a vein produced vomiting, purging, debility, and, in two hours, death. The gastro-intestinal mucous membrane was highly inflamed.

In three instances, Hertwig injected three or four drops of croton oil into the jugular vein of a horse. Immediately, the respiration became rapid and irregular, the pulse almost imperceptible, the muscles very feeble, and the animal showed signs of pain, followed by apparent insensibility. After half an hour, these symptoms remitted, but in the course of three hours more returned again. Death took place in eight hours without there having been any disturbance of the bowels. On dissection, the alimentary tube presented no alteration, but the heart was spotted with ecchymoses, and the pericardium contained a large quantity of bloody serum. The lungs were also much congested.

The more recent experiments of Bucheim correspond in their results with these. In no instance after injecting croton oil, either pure or from which the free acrid principle had been removed by alcohol, into the veins of an animal, was diarrhœa produced, or inflammation of the intestinal canal excited. Vomiting and the discharge of natural fæces were observed.[1]

On Man.—After chewing one of the *seeds*, which he then spat out, Buchner experienced a prolonged burning pain and constriction of the throat, with sweating of the face. In about an hour afterwards, purging commenced, and eight stools were voided. Lansberg swallowed the half of a croton seed. At first it tasted sweet and oily, but afterwards, and for some time, extremely bitter and acrid; the saliva flowed abundantly; over the whole body, but especially upon the face, there was a sense of heat, and the pulse was quickened; nausea, eructations, distension of the abdomen and colic followed. In two hours and a half the tongue became coated, a sickening taste was perceived in the mouth, and a burning sensation in the fauces. These symptoms continued until the next day, in the course of which three stools were

[1] Virchow's Archiv, xii. i.

voided; the urine was increased, and had a clouded aspect. For several days afterwards there was some degree of debility and malaise, with soreness of the gums. The laborers in the Calcutta Botanical Garden are said to be in the habit of taking one of these seeds as a purgative, and on one occasion the dose is reported to have proved fatal.[1] The dust of the dried seeds, when inhaled in large quantities, has been known to produce poisonous effects. In a case related by Pereira, the symptoms were loss of appetite, a burning sensation in the nose and mouth, tightness of the chest, copious lachrymation, and epigastric pain. Giddiness and insensibility followed, and then a burning heat in the throat and stomach with numbness and insensibility of the tongue. The bowels were not moved; on the contrary, they required castor oil to open them. Hot brandy and water and the warm bath appeared to relieve the symptoms, which indeed were all, except the epigastric pain, removed in the course of two or three days.

According to Fossati, croton *oil* given *internally* in the dose of from half a drop to one drop, will produce fifteen or twenty stools, and that "without the least disturbance or pain." It is seldom that such marked effects are observed from so small a dose. In general, a drop given in emulsion or in pill, produces more or less of an acrid and burning sensation in the fauces and œsophagus, and warmth of the stomach, with nausea and sometimes vomiting. In the course of an hour or two some gurgling and slight colic are perceived in the bowels, followed somewhat suddenly by a watery stool which produces tenesmus and heat about the anus. Within twenty-four hours, eight or ten more stools follow, and there is little general disturbance of the economy further than considerable weakness. According to Sigmond,[2] where proper care has been taken, the effects are quite over by the following day, the tongue wears its wonted appearance, there is no fever, no abdominal tenderness or pain, and not unusually the secretions of perspiration and urine have been increased. In some cases the oil produces no purgative effect, but, on the other hand, oppression and uneasiness at the epigastrium, general restlessness, violent palpitations of the heart, pains in the limbs and headache, with confusion of ideas, followed by flushes of heat, perspiration and sleep, and a sense of weariness upon the following day.[3] Bucheim maintains that the acrid principle of croton oil is not the only source of its cathartic action, because even where the oil by thorough washing with alcohol

[1] Pereira, 3d Am. ed., ii. 365.
[2] Lectures, Lancet, July, 1838, p. 573.
[3] Piedagnel, Bull. de Thérap., vii. 102.

is rendered perfectly mild to the taste, and incapable of pustulating the skin, it is still strongly purgative. This effect he attributes to the reaction which takes place between the oil thus prepared, and the alkaline liquids of the stomach and duodenum.

In large doses croton oil acts as a violent poison. In a case related by Giacomini, twenty-four grains of the oil mixed with two of castor oil, were swallowed by mistake.[1] The patient survived twenty-four hours, during which period he had but four stools. His features were sunken, the tongue pale and moist, the pulse thready and irregular, and the skin was bathed in a cold sweat, but the mind was clear. The intestines are said to have presented after death no other lesion than a superficial redness. One hundred and fifty grains by weight were taken by mistake in another case, which is quoted by Orfila. The patient was in the fourth week of an attack of typhoid fever. There was a general collapse, such as is observed in malignant cholera, the pupils were motionless and insensible, the abdomen tender, and there were efforts at vomiting. Profuse diarrhœa set in, and the patient died about four hours after having swallowed the oil. No marked change was found in the mucous membrane of the stomach. The absence of local lesions in these two cases, proves clearly that the poisonous effects of the oil are not due to its primary action upon the parts to which it is applied. A case is related by Dr. Adam, of a man who swallowed by mistake a liniment containing about a drachm of croton oil, as much oil of turpentine, and twice as much camphorated oil. He experienced a violent burning sensation from the fauces to the stomach, and a convulsive gasping, and in about ten minutes was attacked with violent purging and vomiting. Sulphate of zinc was administered, and tickling of the fauces employed to keep up the vomiting, but it was not until these measures had been maintained for an hour that the patient became faint, cold, and pale, and his lips livid, while his pulse was almost imperceptible, and the patient could no longer maintain a semi-erect posture. These symptoms were relieved by rest and laudanum. At the end of twelve hours, there was tenderness of the epigastrium and along the track of the colon, but it had greatly diminished by the following day. Rawness of the mouth was still felt, and after two or three days its epithelium came away in shreds. Within a week the patient had quite recovered, but felt rather feeble.[2]

Externally, croton oil is a powerful and peculiar irritant. Applied to the eye it excites severe and persistent burning pain, with violent

[1] Op. cit.

[2] Edinb. Med. Journ., i. 932.

inflammation and redness even of the adjacent skin. Rubbed upon the skin it occasionally demonstrates its absorption by producing diarrhœa. A case is related of two attendants in Guy's Hospital, who were attacked with nausea, and unpleasant taste in the mouth, and diarrhœa after rubbing the abdomen of another person with an embrocation containing croton oil.[1] Piedagnel produced diarrhœa by applying it upon adhesive plaster to the chest and neck of a tuberculous patient.[2] Schneider describes its endermic use as producing alvine evacuations in children.[3] Such effects are very unusual. Andral observed diarrhœa in not more than one out of thirty cases in which he used frictions of this oil upon the skin. The testimony of other observers is nearly the same. The author has been much in the habit of using croton oil to pustulate the skin, but has never met with a case in which it seemed to exert a purgative action. Bucheim introduced nearly five grains of crotonate of potassa under the integument of a cat, and although excessive local inflammation resulted, the bowels of the animal were unaffected. The same dose of the compound having been thrown into the small intestine of a cat, violent bloody diarrhœa speedily came on, and the animal perished. Sometimes when applied by friction to the integument, it fails altogether to produce its characteristic effects. But such examples are rare. In general it brings out, after a few hours, an eruption of minute red pimples, which are always more numerous in proportion to the delicacy and vascularity of the skin, and which gradually are converted into pustules. Some of these have the flattened and umbilicated aspect of the variolous or the tartar emetic eruption, but the greater number are acuminated or rounded. Many of them are apt to be confluent. They are surrounded by a red areola, and accompanied with a more or less severe burning pain and itching. The eruption augments for three or four days, and then remains stationary. Somewhat later, the pustules break in part and form scabs, and in part wither away. If they are numerous and large they become confluent, and form thick and extensive crusts. Between the sixth and twelfth day they separate, and leave no cicatrix behind them.[4]

Uses.—In obstinate *constipation* of the bowels and when there exists no contraindication arising from inflammation or structural alteration, croton oil is one of the most appropriate of the purgative class of medicines. It is particularly so when bulky doses are objectionable, and when the patient resists the administration of more ordinary

[1] Lond. Med. and Surg. Journ., Dec. 1828. [2] Loc. sup. cit.
[3] Richter, Ausfür. Arzneim., ii. 375. [4] Andral, Archives Gén., xxviii. 275.

medicines. Of the former description are cases of intestinal obstruction from accumulated fæces produced by simple torpor of the bowels, diseases of the nervous centres, the poison of lead, &c. Of the latter sort are the frequent instances of a refusal to take medicine, among children and insane persons. The oil may in these cases be mixed with milk or soup, and is then generally swallowed unsuspectingly. With the insane, however, the expedient will seldom bear frequent repetition, for they speedily grow suspicious of food which has so unwonted an operation. On account of the smallness of its dose, croton oil has has been recommended as a purgative for children whenever they require one of active powers. By carefully proportioning the quantity there need be, it is said, but little fear of its producing injurious effects.[1] But the safer counsel would be to exclude so powerful an agent from the therapeutics of the young, unless in wholly exceptional cases.

This medicine is a very efficient purgative in *lead colic*. It was much recommended by Kinglake, and was used successfully by Andral. The conclusion of the latter was that it is quite equal to the treatment known as that of *La Charité*.[2] Tanquerel des Planches conceived that it cures a larger proportion of cases and with more promptness than the treatment just mentioned, and Grisolle is of the same opinion. The mode in which these physicians administered it is extremely simple, and consists in giving one drop twice a day at intervals of seven or eight hours. The patients are meanwhile directed to drink freely of barley-water or other similar liquid.

It has sometimes been used successfully to expel the *tapeworm*, and this effect is even said to have been produced by frictions of the abdomen with the oil. Sandras gives an example of its success. Puccinotti one, also, in which it was systematically administered after two or three days of strict dieting. The natives of the East Indies made use of this medicine extensively as a remedy for *dropsy*. It is certainly a powerful hydragogue cathartic, producing large serous evacuations, and at the same time augmenting the secretion of the kidneys and of the skin. Richter used it successfully in some cases of ascites and of anasarca, but advises that it should not be given to persons of an irritable constitution or liable to inflammatory complications.

Korropleff, a Russian physician, has recommended croton oil as a remedy for *dysentery*. He prescribes a mixture of from one to three drops of the oil in about six fluidounces of mucilage flavored with orange-flower water, of which a tablespoonful is to be given every half hour. After three or four doses, it is said, several copious stools take

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[1] Cory, Lond. Med. Gaz., July, 1833. [2] Archives Gén., 2ème sér., ii. 549.

place, the first mixed with blood, the others not; and if the mixture is continued, it generally suffices for the cure.[1]

Cerebral affections which call for purgation, such as *apoplexy*, *congestion*, or *dropsy* of the brain, are conveniently treated by this medicine on account of its speedy and searching operation, and the first mentioned disease, particularly, because the oil can be given with more ease than any bulkier agent. From its successful employment in some cases of *epilepsy* it has been supposed by Dr. Newbigging to possess some specific influence over this affection, and Mr. Cochrane, from its effects in several of his own cases, made the same inference.[2] But the conclusion is scarcely an admissible one, for in the cases which seem chiefly to have been benefited by the oil, the alvine discharges gave evidence of great torpor and other derangement of the digestive organs.

Externally, croton oil has sometimes been used with advantage to remove *cerebral symptoms* produced by the suppression of a cutaneous eruption, or by any other cause. Indeed pustulation in this manner is one of the most efficient methods of counter-irritation that can be employed under the circumstances mentioned. It is less severe, and is more under control, than tartar emetic, and is more permanent in its action than fly-blisters. A case of simple meningitis, which illustrates the efficacy of the remedy, has been published by M. Henriette.[3] As a remedy for spinal *neuralgia* and *sciatica*, Joret gives it a preference over all other counter-irritants. The inhabitants of Molucca used it for the latter affection. It has also been recommended internally by Mr. Hancock[4] for sciatica, upon the ground that the disease is often produced and maintained by hardened fæces in the colon, and especially in its sigmoid flexure. The results of his treatment appear to sustain this view, but at the same time render it probable that any other active cathartic would be equally effectual by removing the morbid cause. Croton oil is, however, more convenient on account of the facility of its administration, and its thorough operation. In *chronic rheumatism* croton oil has sometimes been used *externally* with decided advantage, but it is, on the whole, less useful than stimulant embrocations which do not vesicate, and than plasters of cantharides which do. Chronic inflammations of the *laryngeal* or *bronchial* mucous membrane are sometimes greatly mitigated by pustulation of the skin of the throat or chest; for such affections it greatly excels in efficacy the other counter-irritant applications just alluded to.

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[1] Archives Gén., 5ème sér., iv. 94. [2] Edinb. Month. Journ. of Med. Sci., i. 475.
[3] Bull. de Thérap., liv. 46.
[4] Lancet, March, 1854, p. 242 and p. 268; and April, 1855, p. 428.

ADMINISTRATION.—Croton oil may be given in emulsion, or mixed with some other oil, or in pill. Of these forms the last is generally to be preferred. The *dose* is from one-quarter of a drop to two drops. A safe and convenient mode is the following: Add to two drops of croton oil enough alcohol to dissolve them, and then of bread crumb a sufficient quantity. Make from four to eight pills, of which one may be taken every hour or two.

The oil may be applied externally by means of a feather, brush, or other convenient instrument, and friction made with a rag until the skin becomes dry. Or it may be mixed with olive or castor oil, or with soap liniment, alcohol, or ether, and applied as before. Or, again, a piece of adhesive plaster may be moistened with it, except at the edges, and then applied to the skin.

ANTIDOTES.—Milk, olive oil, mucilages, &c., may be given to dilute and envelop the acrid substance; and, when there is a tendency to collapse, opium and alcoholic drinks, and warm stimulating baths should be employed.

HELLEBORUS.—BLACK HELLEBORE.

DESCRIPTION.—This is the root of *helleborus niger*, a native plant of Auvergne and Burgundy, in France, of Switzerland, Austria, and Greece. It was long regarded as identical with the black hellebore of the ancients. The latter has been shown by Tournefort and Sibthorp to have been more probably *H. officinalis* or *orientalis*, which abounds in Greece. But as black hellebore is also a native of that country, and as the properties of both species are nearly identical, no practical objection exists to including both in the general medicinal history of hellebore.

Black hellebore is a low herbaceous plant, which, between December and February, bears a large white flower, whence in England it receives the popular name of Christmas rose, and in Germany is called *snow rose* (Schnee Rose). The root is composed of a black, contorted, and knotty root-stalk and the fibres or radicles which arise from it. The latter, which are usually recommended for medicinal use, are about the thickness of a straw, of a dark brownish-black color externally, whitish within, spongy, and brittle. When fresh, their taste is said to be extremely acrid; when dry it is less so, but is rather nauseous and bitter. Bastick obtained from it a peculiar principle which he called *helleborin*. It forms white shining crystals, dissolves with difficulty in water, but readily in ether or alcohol, and has a bitter

and acrid taste. It is neutral in its reaction, and combines both with alkalies and acids.

The officinal preparations are:—

Extractum Hellebori.—Extract of Black Hellebore.

A pound of the root, in coarse powder, is treated with four pints of diluted alcohol by percolation; the filtered liquor is then distilled, and evaporated to a proper consistence. Dose, as a drastic purge, twelve or fifteen grains.

Tinctura Hellebori.—Tincture of Black Hellebore; Tinctura Melampodii.

Four ounces of black hellebore, in powder, are treated with diluted alcohol, by percolation, until two pints of filtered liquor are obtained. Dose, from thirty minims to a fluidrachm.

History.—In the Hippocratic writings this medicine is frequently mentioned, but it is described at length by Pliny,[1] who distinguishes the black and the white hellebores, and states, what modern observation has only confirmed, that the latter acts upon the nervous system, but the former upon the bowels as a drastic purge. Both were, however, more or less employed for the same class of diseases, particularly dropsies, paralysis, epilepsy, and insanity. He alludes to the occasional violence of their action. The species which grew in the island of Anticyra was renowned for its efficacy in mental disorders, so that the phrase *navigare Anticyras* was equivalent to saying that one had become insane. Pliny states that Anticyra produced a sort of sesame (*reseda undata*, L.), which greatly modified the action of the hellebore. The completest account of the subject is given by Dioscorides,[2] who clearly contrasts white hellebore (veratrum album) and black, for he attributes to the former emetic and to the latter purgative qualities, a distinction which had, indeed, already been made by Hippocrates. Black hellebore was called *Melampodion*, from Melampus, who is said to have cured the daughters of Prætis of insanity by purging them with this plant. Dioscorides states distinctly that the black was the species produced in Anticyra. He attributes to it emmenagogue properties in addition to those enumerated by Pliny, and adds that it is apt to destroy the fœtus in utero. Both of these writers, as well as Galen, recommend it for cutaneous eruptions, and as a maturative for the cure of fistulous sores. The Arabian physicians add but little to the above account, but, while dwelling on the valuable cathartic properties of the medicine, insist upon its being dangerous to life, unless

[1] Hist. Nat., xxv. 21.

[2] Lib. iv. cap. 145 and 146.

duly guarded by diluents, and the preparation of the system for its use by abstinence.[1]

ACTION. *On Animals.*—The ancients had already remarked that hellebore is poisonous to birds and several other animals, but modern experimenters have demonstrated the peculiarities of its action upon quadrupeds, reptiles, insects, &c. They are sufficiently illustrated by its effects upon dogs, horses, cats, &c., as shown in the experiments of Schabel and Orfila.[2] When its powder is applied to the cellular tissue, it speedily gives evidence, by vomiting, debility, insensibility, &c., of having been absorbed, and at the same time excites some degree of local inflammation. Its constitutional effects upon the higher animals, particularly when given internally, may be thus described. Soon after its administration the animal's breathing grows laborious and slow, the pulse slackens, and in a few minutes a disposition to vomit is apparent, mucus and bile are thrown up, saliva is copiously discharged, and there are signs of abdominal pain. The animal moves with a tottering and feeble gait, has muscular tremors of the hinder and then of the anterior extremities, pants in breathing, and lies powerless upon the ground. At this stage the efforts at vomiting cease; convulsions set in, and from time to time increase, and the animal perishes in tetanic spasms. After death the gall-bladder and ducts are found distended with bile, and a large quantity of this fluid is contained in the small intestines. The liver is often congested; the gastric mucous membrane, that of the small intestine, and, if the animal has long survived, of the rectum also, is inflamed.

On Man.—It is said that hellebore-flowers, when crushed and applied to the skin, produce redness, and even vesication; but neither the root nor the leaves have such an effect.[3] In small doses, however, it appears to stimulate the abdominal organs, augmenting the secretions of the liver and pancreas, quickening the peristaltic movements of the bowels, and augmenting catamenial and hæmorrhoidal discharges. The symptoms produced by an overdose are the following: The digestive organs denote the operation of an acrid irritant, by vomiting, colic, purging, thirst, spasm of the throat, and a burning sensation in this passage and in the stomach. The derangement of the nervous and circulatory systems is shown by convulsions, muscular cramps, anxiety, exhaustion, fainting, delirium, sunken features, a small, feeble pulse, cold sweats, coldness of the extremities, and death by collapse. After this event the whole intestinal canal is found to be more or less inflamed, according to the time which has elapsed since the ingestion

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[1] EBN BAITHAR. [2] Toxicologie, ii. 454. [3] DUBOIS, Mat. Méd. Indigène, p. 367.

of the poison. A case was reported by Mr. Massey, of Nottingham, England, in which a strong infusion of black hellebore was taken, in mistake, for infusion of gentian. Besides the symptoms just described, except the last (for the patient recovered), a painful pricking in the tongue and fauces was experienced, the tongue swelled, and much viscid mucus was voided from the mouth.[1]

USES.—This medicine was once famous for its use in the treatment of *insanity*, both of the maniacal and the melancholic forms. The latter would seem to have been very decidedly benefited by it, and in proportion to the dependence of the disease upon hepatic or intestinal disorders. In modern times this practice has not been generally imitated, yet cases are not wanting in which the medicine seems to have been prescribed with advantage. They were, however, examples of active acute insanity, and some of them, perhaps, of meningeal inflammation, but certainly of febrile delirium. Such cases are reported by Kerr,[2] Gozzi, Roques, Miquel, and others.[3]

The *emmenagogue* properties of black hellebore, which are very decided, were familiar to the ancients. Among modern physicians, Mead has recommended it most highly, saying that he "found in it so singular a virtue that it hardly ever failed in answering his expectations." In proof of its efficacy, this writer alleges that when it failed to restore the catamenia, it produced some other discharge of blood.[4] In suppression of the menses from external causes, and particularly from cold, it is probable that this medicine, like other emmenagogues of the cathartic class, is chiefly serviceable. In such cases we have used it successfully.

Black hellebore has been much recommended as a purgative in *dropsy;* and doubtless, like other drastic cathartics, it is capable of causing the evacuation of serous effusions. But it exerts no specific control over even this common symptom of various pathological conditions, and, on account of its harsh operation, is less eligible than other medicines of the same class, and particularly jalap. It is also thought to possess *anthelmintic* properties.

ADMINISTRATION.—The dose of the powdered *root*, as a purgative, is from five to twenty grains. A *decoction* may be prepared by boiling two drachms in a pint of water; a fluidounce may be given every two or three hours until it operates. Of the *extract* the dose is from ten to fifteen grains. The *tincture* is given in doses of from thirty to sixty minims.

OLEUM TEREBINTHINÆ, vid. *Stimulants.*

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[1] Lancet, July, 1856, p. 100.
[2] Medical Sketches.
[3] DUBOIS, op. cit., p. 330.
[4] Works, p. 429.

EXPECTORANTS.

EXPECTORANTS are medicines which directly modify the character of the bronchial secretions, and promote their discharge.

All of the other classes of evacuant remedies, except anthelmintics, are intended not only to act upon the organs to which they are especially addressed, but also through these to influence other organs neighboring or remote, and to remove or palliate the disorders which exist in them. But expectorants, as their name implies, are addressed to the lungs alone, and even to a single element of the pulmonary apparatus, the mucous membrane of the bronchial tubes. Their application is even more limited still; for it is not every condition of this membrane which these medicines are adapted to cure. They are addressed only to that one in which the bronchial secretion is excessive and morbid.

Every mucous membrane, like every other secreting surface, when it is attacked with inflammation, undergoes certain definite changes, which succeed one another in regular order, each one being the proper consequence of that which preceded it. In the first stage, the part becomes a seat of vascular congestion which either momentarily augments its secretion, or immediately diminishes it, so that directly, or after a brief interval, the part becomes swollen, and the surface of the membrane ceases to be bathed in the secretion which is intended to protect and render it pliant. The natural solution of this morbid state is the discharge of more or less fluid, consisting of the natural secretion of the part mingled with the products of the inflammatory process.

In the case of the pulmonary mucous membrane, this termination is speedily brought about by the unaided powers of nature, when the inflammation is slight and superficial, and external causes tending to aggravate it are carefully withdrawn. Or it may be induced artificially by the administration of medicines of the purely stimulant class, which, by exciting the whole vascular system, including that which is especially affected, forcibly overcome the stagnation of the blood in the vessels of the bronchial mucous membrane, and prevent the ulterior changes which it there tends to produce. This action is illustrated by the familiar method of administering a diffusible stimulant,

such as a hot alcoholic drink, or a hot infusion of some stimulant herb, at the commencement of an attack of pulmonary catarrh, with or without the addition of an opiate, and a revulsive agent in the shape of a warm stimulating foot-bath. Thus derivation and general stimulation combine to relieve the lungs of a congestion which, were it allowed to continue and increase, might involve a prolonged and possibly a serious inflammation.

If the natural powers, or the employment of such remedies produce their proper effect, there may be no increased bronchial secretion accompanying the resolution of the attack. But if they have not been used, or have proved inadequate to the removal of the bronchial congestion, an inflammatory state results, the bloodvessels are overstrained, and permanently enlarged and weakened, and the interstitial tissue becomes the seat of a sero-albuminous effusion, and more or less fever and local distress occur. The subsidence and removal of these symptoms can only be accomplished by the removal of their physical cause, the combined congestion and effusion which have been referred to. As the morbid elements involved are those of simple inflammation, so their cure is, in the first place, to be intrusted to antiphlogistic remedies, strictly so called, such as depletion, cathartics, and arterial sedatives, and afterwards to diluents and lenitives. The former remove the tension of the bloodvessels, and permit their contraction, and consequently, their resumption of their functions, one of which will then be manifested by the occurrence of a greater or less degree of secretion into the bronchial tubes, which tends still further to diminish the vascular infarction. The latter furnish a larger quantity of aqueous fluid to the blood, and probably, also, other principles which further modify the quality of this liquid, and render its secretions less acrimonious. Such remedies, then, promote the secretion of the bronchia as they do that of all the other organs at the same time. They have no specific direction to the lungs, nor do they tend to modify the condition of the lining membrane of these organs, nor the amount or kind of its secretion more than they do that of any other mucous membrane similarly inflamed, with which they are not brought directly into contact. They may promote expectoration by their influence upon the qualities, and especially the tenacity of the bronchial mucus, but as they do not exert this influence upon the mucous membrane of the lungs more than upon other tissues in other parts of the body which happen to be similarly affected, they have no peculiar claim to the title of expectorants.

Again, there are certain medicines upon which it would be equally improper to confer the title of expectorants, although they promote

expectoration in a more literal sense than those just referred to. Such are sternutatories, which, by exciting the act of sneezing, assist in discharging the contents of the air-passages. Their action is quite mechanical, and that of emetics differs from it in nothing except that some among them, of the nauseant division, promote at the same time the bronchial in common with all the other secretions of the body. A similar observation is applicable to general stimulants, which, although in states of great physical depression, they render expectoration possible, and often become thereby the means of saving life, exert no more direct influence upon the lungs than upon any other part of the economy.

True expectorants are those which appear to have an especial direction towards the bronchial mucous membrane alone, or towards it in common with the mucous membranes of other organs. They are all stimulants, and the greater number of them contain a resinous element more or less modified by its association with other principles. With such qualities, and such a tendency to the seat of bronchial inflammation, it is evident that if they are administered during the active stage of such inflammation, they must almost of necessity aggravate it, by arresting that process of restoration of which the inflammatory symptoms are the signs, and which, it has before been intimated, is to be palliated by remedies which diminish the vascular engorgement of the affected membrane. If these measures are duly applied in regard to time and degree, and if the patient be of good constitution, they will suffice for his perfect cure; but if, as so constantly happens, the original bronchitis is neglected, or not efficiently treated by the proper remedies, it merges gradually into a chronic form which can only be aggravated by the antiphlogistic measures which at first were appropriate. As in chronic inflammation of all mucous membranes, the bronchial bloodvessels remain enlarged, the membrane itself is thicker than in health, and from its surface mucus is secreted of various degrees of consistence and shades of color, more or less mixed with a serous liquid, and ultimately containing more or less pus. Under these circumstances, as in similar conditions of the mucous membrane of the eye, the nasal passages, the fauces, urethra, and vagina, a stimulant treatment is found to be the most successful, and it may consist of stimulant vapors directly applied to the diseased surfaces by inhalation, or of stimulant medicines of the class of true expectorants.

As it has been stated in the introduction to this work, the inhalation of medicinal vapors for the cure of bronchial disease is a remedy of ancient date, and its efficacy renders it more than probable that when the same medicines are administered internally they are absorbed, and

have a peculiar tendency to be eliminated by the air-passages. That this is the case with some among them, as the terebinthinates, garlic, and assafœtida, there can be no doubt; and the striking effects of the others renders it probable that they also are discharged in part by the bronchial mucous membrane, and, during their passage, modify its secretion by a stimulant action upon the nerves and bloodvessels concerned in elaborating it.

Now, between the mildest degree of chronic bronchitis which tends to a spontaneous cure, and the gravest in which dilatation of the bronchia and a profuse purulent secretion from them are present, every degree of inflammation may exist, and a demand, therefore, for various degrees of expectorant stimulation. In cases which have the character of a subacute bronchitis unduly prolonged, the milder articles, such as garlic, seneka, and squill, will be found appropriate. If the secretion is dense and tough, muriate of ammonia and ipecacuanha are to be preferred; and if, on the contrary, it is profuse and more or less purulent, sulphur, ammoniac, benzoin, tar, and, above all all, copaiba, should be employed. If the cough is paroxysmal and spasmodic, garlic or ammoniac, but more particularly assafœtida, will be most suitable; and if the secretion is very abundant, but not purulent, seneka or squill, in conjunction with sulphate of zinc, is a useful combination. But in all cases such as the last there is reason to suspect a mechanical obstacle to the circulation through the lungs or the heart, and an attempt to arrest the pulmonary secretion might be attended with serious consequences. On the other hand, when the cough is dry and harassing, the administration of nauseants, sedatives, or even of muriate of ammonia, whose direct influence on the promotion of the bronchial secretion is so decided, ought to be entered upon very cautiously, and only after a thorough examination of the lungs has rendered it probable that the cough is not excited by a tubercular deposit.

SENEGA.—Seneka.

Description.—The root of *Polygala senega*, or *seneka snakeroot*, a plant which grows wild in the United States throughout its southern and western parts. Its stalk, which is from nine to twelve inches high, is purplish below but green near the top. The leaves are alternate, sessile, pointed, and paler beneath. The flowers are small and white, and form a spike at the summit of the stem.

The roots are perennial and branching. As found in commerce, they vary in size from that of a writing quill to that of the little finger.

They are contorted, marked by rough protuberances, and a projecting line which extends the whole length of the root. The bark is corrugated, grayish-yellow, hard, and resinous. It contains the active principles of the root. When chewed its taste is at first sweetish, but it soon grows acrid and pungent. Its yields its properties to water and to alcohol. They are supposed to depend upon two acids, the *polygalic* and the *virgineic*. The latter has only been found by Quevenne.

Polygalin, polygalic acid, or *senegin* (for it has received all of these names), is a white, pulverulent substance, without smell, and at first slightly, but afterwards extremely acrid to the taste. It undergoes no change in the air, is slowly soluble in cold water, but dissolves rapidly and completely in boiling water, as well as in alcohol. It is insoluble in ether and the fixed oils. Its watery solution foams greatly when agitated.

The following are officinal preparations of seneka:—

Decoctum Senegæ.—Decoction of Seneka.

An ounce of bruised seneka in a pint and a half of water is boiled down to a pint, and strained. The addition of an ounce of liquorice root masks the acrid taste of the seneka. Dose, a wineglassful three or four times a day. An *infusion of seneka* may be prepared by macerating ten drachms of the root for four hours in a pint of boiling water in a covered vessel, and straining off the liquid. It may be given in the same dose as the decoction.

Syrupus Scillæ Compositus.—Compound Syrup of Squill. *Vid.* Scilla.

Syrupus Senegæ.—Syrup of Seneka.

This syrup is prepared by extracting the virtues of four ounces of seneka with half a pint of alcohol and a pint and a half of water, in a percolator, and making a syrup with the addition of fifteen ounces of sugar. Dose, one or two fluidrachms.

History.—Seneka was introduced into practice by Dr. Tennent, of Virginia, as an expectorant, and as a specific for the rattlesnake bite, but it has long since lost all claim to the latter distinction. Its efficacy in pulmonary affections was very early appreciated, and it continues to enjoy a high repute in their treatment.

Action.—The operation of seneka closely resembles that of squill. Sundelin took a scruple of the powdered root three times within six hours. It produced a smart and unpleasant irritation of the posterior fauces and throat, with a copious flow of saliva. Soon afterwards a decidedly burning sensation was experienced in the stomach, which, after the third dose, was replaced by painful choking and a violent

vomiting of thin mucus. The skin, meanwhile, grew moister and warmer. Sharp colics ensued, and a watery diarrhœa. The urine was at the same time augmented, and scalded somewhat when voided. On the following day a painful constriction at the epigastrium was experienced, with loss of appetite. In larger doses seneka excites severe burning pain in the stomach, with violent vomiting, purging, anxiety, and giddiness.[1] Sundelin compares it to arnica in its operation on the nervous system, although it excites the secretory functions much more than that medicine. While it stimulates the circulation, it is not heating in its action. From Böcker's experiments, seneka would appear to act but slightly upon the urinary secretion. It merely increases somewhat the proportion of solid matters in that fluid.[2] Schroff found that polygalin, in the dose of one-third of a grain to three grains, greatly augmented the secretion of bronchial mucus.

Uses. *As an Expectorant.*—It was employed in the treatment of *pneumonia* and *pleurisy*, by Tennent (1736), after the febrile action had been somewhat reduced by depletion. But it was soon found to have little efficacy, and, indeed, to be positively injurious, in the active inflammatory forms of the disease. In *typhoid pneumonia*, in the decline of the ordinary form of the disease, or when it attacks old or feeble persons, seneka may appropriately be used, as Chapman judiciously advised.[3] It is also decidedly beneficial in *subacute* and *chronic inflammation of the bronchia*, and in *bronchorrhœa*. On the other hand, also, when the pulmonary secretion is tenacious and scanty, this medicine appears to render it more abundant and more liquid. It is this property which induced Bretonneau to employ seneka associated with calomel, in *croup*, when the mucous membrane is dry and the cough hard and unproductive.[4] The use of seneka in croup originated with Archer, of Virginia, in 1791, but he by no means confined the treatment to this remedy. On the contrary, he used depletion, purgatives, calomel, and even tartar emetic. It is probable that many of his cases were examples of spasmodic laryngitis. However this may be, many American and European physicians at first confirmed his estimate of the remedy.[5] But after a time the more sober and settled judgment seemed to be that seneka is very useful in the catarrhal stage which succeeds an attack of croup, by restoring the mucous membrane of the larynx to its normal condition.

Seneka was first employed in the treatment of *amenorrhœa*, by the late Dr. J. Hartshorne, of this city, previous to 1809. He used the de-

[1] Heilmittellehre, ii. 176.
[2] Beiträge zur Heilkunde, ii. 38.
[3] Therapeutics, i. 358.
[4] Traité de la Diphthérite, p. 241.
[5] Valentin, sur le Croup, p. 371.

coction, administering it during the fortnight preceding each menstrual epoch, and found that it sometimes induced a flow of the menses without alleviating the disease which accompanied their suppression.[1] After him, Dr. Chapman made use of this remedy with sufficient success to warrant him in recommending it as "one of the most active, certain, and valuable of emmenagogues." He directed about four ounces of the decoction during the day, and increased the dose as far as the stomach would bear on the approach of the menstrual period. Other writers, and Dr. Eberle among them, have regarded the above estimate of its emmenagogue virtues as altogether exaggerated.

The experience of Dr. Chapman bears out the results of Böcker's experiments cited above. Dr. C. states that he did not discover any extraordinary operation from it on the *kidneys*, and that the cases of dropsy in which it seemed chiefly useful, were those connected with a constitutional cachexia.

Wendt, Chelius, v. Ammon, and other German writers, attribute to this medicine a very problematical influence over *scrofulous inflammations* of the conjunctiva, cornea, &c., including those which involve a rheumatic or gouty element.[2]

ADMINISTRATION.—The dose of powdered seneka is from *ten* to *twenty* grains. The dose of the *decoction* is *two fluidounces*. The *syrup* is used as an expectorant in the dose of *one fluidrachm*.

CIMICIFUGA.—BLACK SNAKEROOT.

DESCRIPTION.—The root of *Cimicifuga racemosa*, or *cohosh*, a native plant of the United States. It grows in shady and rocky woods. The stem is from three to eight feet high, herbaceous, and somewhat furrowed. The leaves are decomposed; the flowers are white and arranged in a long terminal raceme. When fresh, the root is large, black, and fleshy; as found in the shops, it consists of a blackish, rough and contorted body furnished with slender radicles. It is whitish internally, and has a peculiar and disagreeable odor, and a bitter, astringent, and somewhat acrid taste. It yields its specific virtues to alcohol and water, but more perfectly to the former.

HISTORY.—We are indebted to Dr. Garden, of Wyliesburg, Virginia, for its introduction into medicine, in 1823, but this gentleman states that it was previously in common use as a popular remedy in many parts of the western country.[3]

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[1] Eclect. Repert., ii. 101.

[2] STRUMPF, Handbuch, ii. 118.

[3] Med. Recorder, vi. 609.

Action.—Dr. Chapman[1] says that, "given so as to affect the system, we find, first, some nausea, followed by greater freedom of expectoration and more or less relaxation of the surface, with slight nervous tremors, and vertiginous affections. The pulse, during this state, is considerably lowered, and is apt to remain so for some time." This statement is essentially confirmed by Dr. Davis,[2] the most recent writer upon the subject, who says: "In large doses it produces vertigo, dimness of vision, and a depression of the pulse, which continues for some time." In medicinal doses, Dr. Young[3] did not find it either to vomit or purge, nor yet to increase the perspiration or the urine, nor did it affect the pulse, but produced only an uneasy feeling amounting to an ache through all the extremities and lasting from one to four hours. Dr. Davis, like previous observers, could not detect any perceptible increase in any of the secretions, nor the manifestation of any stimulating qualities. On the whole, it seems to present a striking analogy to colchicum in its action.

Uses.—The success of cimicifuga as a popular remedy for *chorea*, led to its being introduced into the regular treatment of that disease, by Dr. Young, of Chester County, Pennsylvania, in 1831. It had, however, been used by Dr. Physick, as much as ten years earlier. Dr. Young prescribed the powdered root in teaspoonful doses three times a day.[4] Successful cases were also reported by Dr. Lindsly,[5] and by Dr. Kirkbride,[6] which were treated by himself and by Drs. Otto and Wood. There is no doubt that it is one of the most valuable remedies which can be employed in this disease. The cases which are peculiarly adapted to its use, are those in which the nervous derangement is independent of any definite disease in other parts of the body. The remedy, too, must be used in doses of sufficient strength to develop its specific effects, particularly vertigo and confusion of sight.

Dr. F. N. Johnson, of New York, used cimicifuga with very satisfactory results in many cases of *acute inflammatory rheumatism*.[7] It induced no sensible evacuations, and no symptoms except diminishing the force and frequency of the pulse, and causing the pain to disappear. In chronic rheumatism it does not seem to have any peculiar value.

Pulmonary Affections.—The original use of the medicine by Dr. Garden, was in cases of what he regarded as *tuberculous consumption*. It is, however, easy to perceive that they were not tuberculous, but

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[1] Elem. of Therapeutics, 6th ed. (1831), i. 357.
[2] Trans. Am. Med. Assoc. (1840), i. 352.
[3] Am. Journ. of Med. Sci., ix. 313.
[4] Ibid., and xiii. 57.
[5] Ibid., xxiii. 254.
[6] Ibid., xxv. 288.
[7] Trans. Am. Med. Assoc., loc. cit.

inflammatory, cases in fact of bronchitis, attended with profuse purulent expectoration. In this affection it was eminently beneficial, administered as it was until its effects upon the head were perceptible. A criticism like that just suggested, may be made upon cases reported by Dr. Hildreth, as of phthisis cured by cimicifuga.[1] They appear to have been instances of *bronchitic inflammation*, and perhaps of "scrofulous induration" (which is only a form of *chronic pneumonia*), at the summit of one or both lungs. They were, however, vastly benefited, if not cured, and plainly owed their improvement to the use of the medicine.

ADMINISTRATION.—Cimicifuga yields its specific virtues to alcohol more perfectly than to water. Hence it should generally be used in the form of a saturated *tincture*, or in *substance* pulverized. (*Davis.*) In acute rheumatism, from *thirty to sixty drops* of the *tincture*, or *twenty grains* of the powder, may be given to an adult every two hours, until its effects are manifested. The *decoction* is prepared by boiling for a short time an ounce of the bruised root in a pint of water. *One or two fluidounces* may be given for a dose.

ALLIUM.—GARLIC.

DESCRIPTION.—Under this head we shall include all the species of the genus *Allium*, of which there are said to be more than one hundred and sixty.[2] They abound in almost every part of the world, but *A. sativum*, or garlic, *A. cepa*, or onion, and *A. porrum*, or leek, which are most commonly in use, especially for culinary purposes, are not indigenous to this country. The bulb is the part employed in the kitchen and in the laboratory. In garlic it is composed of prismatic segments called *cloves*, but in the onion and leek it is tunicated.

These plants contain a strong volatile principle on which their acrid taste depends, and a peculiar penetrating odor, termed *alliaceous*, which is apt to excite a flow of tears. When the juice of garlic is applied to the skin, it acts as a rubefacient, and even as a vesicant, in virtue of this principle. It is wholly driven off by boiling, which renders the bulb mild and somewhat sweetish to the taste. Wertheim describes the ethereal oil of garlic as producing, when rubbed upon the skin, severe pain and inflammation.

Syrupus Allii.—SYRUP OF GARLIC.

This preparation is made by macerating six ounces of fresh garlic

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[1] Am. Journ. of Med. Sci., Oct. 1842, p. 281. [2] DIEU, Mat. Méd., iii. 83.

with a pint of diluted acetic acid, filtering the liquor, and converting it into a syrup with two pounds of sugar. Dose, for a child a year old, a teaspoonful.

History.—Several species of allium, and especially those already named, have been known from a high antiquity. They are mentioned by Hippocrates, and Pliny treats of them separately and fully. By these and subsequent writers all of their qualities are fully described which modern observation has detected. Dioscorides states that fresh onions are stronger than such as have been kept, or have been prepared with vinegar and salt. They are, he says, biting, carminative, appetizing, and attenuating; they excite thirst, produce nausea and vomiting, and loosen the bowels. Of garlic, he adds that it is a rubefacient, stimulant, and diuretic. Several ancient writers state that the juice of these plants clears the sight and removes opacities of the cornea and granulations of the conjunctiva; that ointments into which it enters cure alopecia and various chronic eruptions of the skin, form an excellent stimulant dressing for excoriations, and relieve deafness and singing of the ears when instilled into the auditory canal. Garlic was likewise held to be a sovereign remedy for the bites of serpents and of mad dogs, and onions roasted or boiled in water or milk were universally used as poultices for boils, carbuncles, unhealthy sores, &c. Garlic is recommended externally and in gargles for quinsy; and in amenorrhœa a clove of garlic, or the juice of a leek, is directed to be applied to the os tincæ.

Internally, garlic is said to dissipate intoxication from wine, and also to be an aphrodisiac. Hippocrates declared leeks and garlic to be emmenagogue, and an Arabian writer asserts that the latter renews the vigor of persons exhausted by venereal excesses. All are agreed on its excellence in pulmonary disorders, particularly those of a chronic sort and attended with purulent expectoration. It is marvellous in commencing dropsy, says one writer, and Hippocrates declares its peculiar power to be diuretic. Several laud it as a remedy for intestinal worms, and particularly tænia and ascarides.[1]

Action.—Applied to the skin, bruised garlic produces redness and painful irritation, and sometimes even vesicates. Internally, it is a gentle stimulant of the digestive organs, and is supposed to augment the secretion and muscular vigor of the stomach. In overdoses, it occasions nausea, vomiting, colic, and diarrhœa. Its secondary action is to increase the renal and cutaneous secretions. Its absorption is

[1] Compare Ebn Baithar, Heil- und Nahrungsmittel, i. 142, 230; Pliny, Hist. Nat., lib. xx. ch. xx. et seq.; Oribase, Trad. de Bussemaker and Daremberg, ii. 190, 363, 364.

demonstrated by numerous facts; the breath, the urine, the perspiration, the milk, all exhale its characteristic smell, which has also been detected in the secretion of ulcers upon persons who had eaten of garlic. Even when it is applied to the soles of the feet, its taste has been perceived in the mouth and upon the breath of the patient. Owing to its stimulant properties, garlic is extensively used as a condiment in warm climates, and particularly in the southern countries of Europe, where it is held to facilitate the digestion of fatty substances and crude vegetables, such as salads. Garlic is said[1] to possess the property of hindering animal decomposition, whence it is a prominent ingredient of the sausages of Spain, Italy, and the South of France. It is also alleged to have the power of preventing the fermentation of must, *i. e.*, the unfermented juice of the grape.

USES.—The smell of bruised garlic is frequently employed to rouse persons from a *swoon*, or to put an end to *hysterical* paroxysms. In modern times, as in ancient, cases have been reported of persons cured of *hydrophobia* by eating a large quantity of garlic.[2] In a somewhat analogous disease, *tetanus*, Valentin states that he made use of this medicine successfully by administering it internally and by frictions along the spine and limbs. When the *digestion* is feeble from mere exhaustion, a very small quantity of garlic taken with the food enables the stomach to digest it, particularly in hot seasons or climates. The habit of mixing sliced onions and cucumbers together is a familiar illustration of this dietetic truth. Garlic is still thought to have power as a *vermifuge*,[3] and it has even been found successful in expelling tænia. Clysters of milk containing the juice of garlic, and also the vapors of garlic introduced into the rectum through a funnel, have been used to destroy *ascarides*, but are somewhat objectionable on account of their offensive smell. Onions have been used successfully to procure the evacuation of *dropsical effusions*, and particularly of anasarca produced by cold. Sydenham and Cullen both recommended garlic as a remedy for dropsy. Cases of excessive *anasarca* are reported by M. Claudot[4] in which the patients were restricted to a diet of bread and milk with onions, both raw and cooked. Copious diuresis followed, and a perfect cure.

Syrup of garlic, or the domestic onion syrup, is one of the most generally used of all the *expectorant* remedies, particularly with children. It should not be administered during the febrile stage; but when

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[1] DIEU, op. cit., iii. 90. [2] Ibid.

[3] EBERLE says (Thérap., p. 417): "I have known it to be given with decided advantage for the purpose."

[4] Bull. de Thérap., xlv. 363.

this is past, it contributes materially to the resolution of the attack. In the chronic forms of *infantile* and also of *senile catarrh* it will be found a useful medicine. Cazin reports that in epidemic *pseudo-membranous angina*, or *diphtherite*, he found a local application of lemon-juice and garlic-juice, with the internal administration of one part of this mixture to three of syrup of hyssop and one of gum syrup, a very efficient remedy.[1]

Externally, a cataplasm of bruised garlic is often applied to the chest or throat in catarrhal and other inflammations of these parts. Anciently it was used as a *revulsive* to the feet in affections of the head. The juice, mixed with oil or spirits, is a popular embrocation in *convulsions*, *whooping-cough*, and other nervous disorders among children. A clove of roasted garlic, or a pledget of wool saturated with garlic-juice, is a good stimulant application to the auditory canal in deafness produced by cold. In *abscess of the ear*, the central portion of a roasted onion, introduced into this tube, forms a convenient and admirably soothing application. Roasted onion may be of use as a poultice to the perineum in *strangury* and other *irritations of the bladder;* and bruised garlic in *atony* of this organ.

ADMINISTRATION.—The modes of employing the alliaceous vegetables have been chiefly indicated in the course of this article. The cloves may be given in substance, after having been cut into small pieces, or the expressed juice administered with milk or sugar, in the dose of *half a fluidrachm*. Of the syrup *a teaspoonful* may be given to a child one year old.

AMMONIACUM.—AMMONIAC.

DESCRIPTION.—Ammoniac is the concrete juice of *Dorema ammoniacum*, a plant which grows in Southern Persia, between Ispahan and Shiraz, in warm, sunny localities, and in dry and stony soils. The sap, which is very abundant, exudes from small punctures made in the leaves and tender twigs, artificially or by the sting of an insect, and, on hardening, forms the rounded masses which occur in commerce. These may be either separate or more or less fused together. They vary from the size of a pea to that of a walnut, are more or less spheroidal, of a reddish-yellow color and waxy lustre without, and white within, opaque, more or less adherent to one another, and softening by the heat of the hand. It has a peculiar and unpleasant smell,

[1] Bull. de Thérap., lv. 327.

particularly when heated, and a bitter, acrid taste. It consists chiefly of an essential oil, resin, and gum.

The principal officinal preparations of ammoniac are these:—

Emplastrum Ammoniaci.—Ammoniac Plaster.

The ammoniac is reduced to the proper consistence by solution in diluted acetic acid, and evaporation. It is an active stimulant of the skin.

Emplastrum Ammoniaci cum Hydrargyro.—Plaster of Ammoniac with Mercury.

This plaster is best made by melting together one part of ammoniac plaster and two parts of mercurial plaster. It is a valuable discutient and alterative application to swellings produced by chronic inflammation.

Mistura Ammoniaci.—Ammoniac Mixture.

This is made by simply rubbing two drachms of ammoniac with half a pint of water, and straining the mixture. Dose, one or two tablespoonfuls.

Pilulæ Scillæ Compositæ.—Compound Pills of Squill. *Vid.* Scilla.

Action.—According to the greater number of writers, ammoniac excites the circulation and promotes the organic functions. Its continued use enfeebles the digestive organs, and in large doses it purges and is said to produce a measly eruption. In overdoses it causes colic, diarrhœa, and vomiting. Externally, in the form of a plaster, it occasions a papular eruption. For these reasons it is generally regarded, and with sufficient reason, as a stimulant. It is, however, stated by MM. Trousseau and Pidoux[1] that the persons to whom they administered it gave no indication of its stimulant action either locally or generally. One of these gentlemen took two drachms of it without experiencing any symptoms of the sort referred to.

Uses.—The most important application of this medicine is to certain *bronchial* complaints in which the secretion is superabundant and its expectoration difficult, and when there is also an entire absence of febrile excitement. The latter condition is insisted upon by all competent authorities, a fact which shows a belief in the stimulant tendencies of the medicine. Indeed, some have declared that, neglecting this precaution, they have seen the medicine produce dyspnœa, and even hæmoptysis. In forms of bronchorrhœa accompanying emphysema of the lung and asthma it is eminently beneficial.

By some writers, particularly of the German schools, it is recom-

[1] Thérapeutique, ii. 188.

mended with marked emphasis in various hypothetical states of the *abdomen*, as infarction, torpor, &c., of the lymphatics and portal circulation, and in dropsy depending upon these conditions. So far as it is possible to conjecture, the states corresponding to these descriptions constitute organic diseases of the liver, spleen, mesentery, uterus, ovaries, &c., in which it is evident that ammoniac can be of no avail whatever. Indeed, this is rendered certain by the medicine having been in every instance combined, by those who prescribed it, with purgatives, diuretics, mercurials, and other alteratives, to which alone whatever benefit accrued can be attributed.

Externally, plasters of ammoniac operate as discutients in chronic rheumatism, white swelling, and other chronic affections of the joints, as well as in cold abscesses and subcutaneous effusions of blood, and indolent tumors generally.

Administration.—Ammoniac may be given in pill, but is preferable in emulsion. From ten to thirty grains may be taken at a dose. Several plasters containing ammoniac, besides the *Emplastrum Ammoniaci*, are officinal; one of the most efficient is the *Empl. Ammon. cum Hydrargyro*, which is much employed as a discutient. The mercury which it contains sometimes affects the gums.

MYRRHA.—Myrrh.

History and Description.—Myrrh was very anciently employed in medicine. The earliest account of it is contained in the description of the ointment which the Jews employed in the rite of consecration.[1] It is also mentioned in the Bible amongst the articles used in the purification of women,[2] as an emblem of purity and soundness,[3] as a perfume,[4] and as one of the substances employed in embalming.[5] By the Greek physicians myrrh was applied externally for ophthalmia, for painful swellings and wounds, along with other local excitants for alopecia, with vinegar for freckles, in order to dry up chronic discharges, to correct fetid exhalations from carious teeth, from the axillæ, and other parts, &c. Internally it was directed for the relief of chronic pulmonary catarrh and chronic fluxes of the kidneys and bowels, for hysteria, for promoting menstruation and procuring abortion, for intermittent fever, &c. In nearly all these cases myrrh was given in combination with various stimulants and tonics.

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[1] Exodus, xxx. 23. [2] Esther, ii. 12. [3] Psalms, xlv. 8.
[4] Proverbs, vii. 17. [5] St. John, xix. 39.

Notwithstanding the ancient and general use of myrrh, the plant from which it is procured remained undescribed until within a few years, when an account of it was furnished by Ehrenberg and Hemprich, under the title of *Balsamodendron Myrrha*. This is a thorny shrub which grows in Arabia Felix, Upper Egypt, Nubia, and Abyssinia. A juice exudes from its surface, which at first is thin and of a light-yellow color, but subsequently concretes and acquires a darker and reddish hue.

Myrrh has a strong, pleasant, aromatic, and peculiar odor; its taste is warm, aromatic, bitter, and somewhat acrid. It grows soft by chewing, and is ultimately dissolved by the saliva. It is readily inflammable, and is partially soluble in water, rendering the fluid milky. Alcohol and ether dissolve its resinous portions only. Alkaline solutions dissolve it very well, but not so completely, it is said, as may be done by triturating it with four parts of hydrochlorate of ammonia and one hundred and sixty of water. The difficulty of dissolving myrrh arises from its containing, besides ordinary gum and resin, a volatile oil and a gum insoluble in water.

Myrrh enters into the composition of several officinal preparations described in other articles, viz., *Compound Mixture of Iron*, *Pills of Aloes and Myrrh*, *Compound Pills of Iron*, *Compound Pills of Galbanum*, and *Compound Pills of Rhubarb*.

Tinctura Myrrhæ.—Tincture of Myrrh.

This is a simple solution of four ounces of myrrh in three pints of alcohol. It is hardly ever used internally, but may be prescribed in doses of half a fluidrachm.

Action.—In small doses myrrh increases the appetite and quickens the digestion. In somewhat larger quantities it promotes the intestinal secretions, and in doses of thirty or forty grains it excites a disagreeable sensation of heat in the stomach, with nausea, vomiting, and even diarrhœa; the pulse is at the same time rendered fuller and quicker, a warmth is diffused through the whole body, and is most sensibly felt in the mucous linings of the air-passages, while all of the secretions are promoted. Myrrh has been supposed to possess a specific property of promoting menstruation; but whether this be really so, or the effect merely of the stimulating qualities of the medicine, is still undetermined. According to Richter,[1] it is peculiarly adapted to relieve states of torpor, inactivity, and insensibility, with deficient excitability, of the vascular system, but is contraindicated by plethora, inflammation, active hemorrhage, and morbid susceptibility combined

[1] Op. cit., ii. 43.

with either of these states. The same author dissuades from its use during pregnancy. On the whole, myrrh may be regarded as at once tonic and stimulant. Its local action is moderately astringent and stimulant.

USES.—Myrrh is seldom employed alone, but is prescribed in various combinations with advantage. It has been found very useful in *atonic dyspepsia* characterized by flatulence, mucous evacuations, constipation, and by associated nervous disorders of a hysterical or hypochondriacal nature. In this affection it is advantageously associated with vegetable bitters and ferruginous preparations.

Myrrh was formerly much employed in *pulmonary diseases*, and was indeed supposed to possess specific virtues in such complaints; but its tendency to excite hæmoptysis and produce oppression of the breathing has tended to direct its use rather to *chronic* pulmonary catarrhs, with profuse expectoration, but unaccompanied with fever. The more unequivocal is the absence of vascular excitement, the greater is the benefit to be expected from myrrh. It, however, does not excel, if indeed it equals, under these circumstances, the terebinthinate preparations, with which it may be advantageously associated, or with tonic expectorants such as Iceland moss, or with preparations of cinchona, iron, and other pure tonics. The celebrated *Griffith's mixture* (*Mistura Ferri Composita*), which contains both myrrh and iron, owes its efficacy in chronic catarrhs to these ingredients. Chronic mucous fluxes of the *digestive and urinary organs*, when once the inflammatory element has disappeared, are favorably influenced by myrrh, alone or in combination with astringents. Like all excitants, however, it must be used in these diseases with great circumspection. *Amenorrhœa* and scanty menstruation, when they depend upon a cold, relaxed, and torpid state of the system, are benefited by myrrh, especially when in combination with iron, as in Griffith's mixture.

The *external applications* of myrrh are not unimportant. It has been recommended as a dressing for wounds that are slow of healing, when the granulations are pale and flabby and the pus is of an ichorous nature, for those in which the discharges are offensive, and for all the morbid conditions that denote a feeble recuperative action in ulcerated surfaces. One of its most familiar uses is to remedy the softened and swollen condition of the gums which is apt to accompany dyspepsia and scorbutic affections. In such cases the repeated use of a mixture of tincture of myrrh with water (f℥j to f℥vj) tends to strengthen the gums and promote their healing, while it corrects the offensive odor of the breath.

ADMINISTRATION AND DOSE.—Myrrh may be given in *substance*, in

pill, or *powder*, and in doses of from *five* to *fifteen* or even *thirty grains*. The *emulsion* may be conveniently administered as an *enema*. The *tincture* is seldom prescribed internally, but is of common use as a mouth-wash and gargle.

BALSAMUM PERUVIANUM.—Balsam of Peru.

Description.—The juice of *Myrospermum Peruiferum*. This is a tree "which grows in Central America, in the State of St. Salvador, upon the Pacific coast."

It is of a deep reddish-brown color, resembles honey in consistence, and has a very fragrant smell, which has been compared to that of vanilla and benzoin, and which is rendered more powerful by heat. Its taste is warm and bitter, and it leaves an acrid sensation in the fauces. On burning, it gives off a dense white smoke. Its principal constituents are resin, a peculiar oil, and cinnamic acid.

Action.—Balsam of Peru is a general stimulant, but acts most decidedly upon the mucous membranes. According to Mitscherlich,[1] it promotes digestion, but in large quantities excites heat and oppression in the stomach, nausea, vomiting, colic, and diarrhœa. In full medicinal doses, and long continued, it occasions some degree of general excitement and warmth, renders the pulse more frequent, and augments the secretions of the skin and kidneys. In common with other balsamic agents, it has long been thought to exert a healing influence upon wounds, ulcers, and almost every lesion of the solids. Indeed, the very term balsam has become a universal name for that which heals and soothes: *dulcissimum balsami nomen est*, says Hoffmann.

Uses.—The remark was very justly made by Dr. Chapman, that our resources in the treatment of pulmonary affections have been injuriously abridged by the fears which have been entertained of stimulant remedies. The abuse of them must unquestionably be pernicious, and their employment in febrile affections of the chest was justly, as well as strongly denounced by Fothergill. This led to their comparative neglect, and the evil influence was sustained by the lukewarm if not mischievous apathy of the physiological school of physicians. There is now a tendency to a more rational and humane practice, and thousands of cases of bronchial disease are cured, which formerly would have been allowed to run their course without active resistance,

[1] Lehrbuch, ii. 236.

and many lives are prolonged which once were listlessly permitted to terminate prematurely.

At one time the balsams were celebrated as remedies for "consumption," a term which included several forms of disease besides the tuberculous, and particularly *chronic bronchitis*, which even now in its more aggravated varieties is constantly mistaken for true phthisis. The celebrated balsamic pills of Morton[1] were used by him, and long after him, in every form of chronic pulmonary disease, attended with copious and especially purulent expectoration. Hoffmann, referring, no doubt, to the forms of disease which Morton had in view, says: "I have seen persons laboring under perfectly-formed phthisis, and seriously affected for several years, happily restored by the use of this very balsam." It is certain that at the present time such stimulant expectorants are too much neglected, even in cases of tubercular phthisis, when the secretion is so excessive as by its quantity alone to undermine the patient's strength. The only contraindication to their use is fever.

When the *larynx* is the seat of *chronic inflammation*, and even of ulceration, which is nearly always tuberculous, the inhalation of the vapors of benzoin, Tolu, or balsam of Peru, diffused through the air of the patient's room by being thrown upon hot coals, or inhaled from a proper apparatus, as originally recommended by Hoffmann,[2] tend materially to promote the healing of the ulcers, and to lessen the discharge, and thus, by diminishing the necessity for coughing, to husband the patient's strength.

Hoffmann also recommended this medicine in *chronic fluxes* of the bowels, to be given by the mouth or in enemata, and MM. Trousseau and Pidoux, in imitating the practice, declare it to be of great service when the bowels continue to be irritable after *typhoid* fever, and when after *dysentery* mucous dejections and tenesmus persist. In flatulent and *colicky* affections of the intestinal canal, with a disposition to nausea and vomiting, this balsam may be used with great benefit if associated with tonics and stimulants.

In *gonorrhœa* it is inferior to copaiba, but after purgation it is sufficient, according to Hoffmann, to accomplish the cure of both mild and malignant gonorrhœa. It may also be used advantageously in *leucorrhœa* if associated with bark and iron.

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[1] "Take of the powder of wood-lice, prepared, three drachms; of the finest gum ammoniac, a drachm and a half; of the flowers of benzoin, two scruples, or a drachm; extract of saffron, balsam of Peru, of each, half a scruple; of balsam of sulphur, terebinthinate or anisate, a sufficient quantity. Mix them and make them into pills, &c."

[2] De Balsamo Peruviano, Op. Om., Suppl. i. 741.

It is said to have been successfully employed in *convulsions* produced by suppressed perspiration, and even in those of a *tetanic form*.[1] Such is also the assertion of Dr. Kollock, of Savannah, who used it both internally and externally, and found that of itself it "restored the patient when rapidly sinking under the very liberal use of opium, wine, and bark." The maximum dose given by this physician was two drachms in twenty-four hours. In these cases it must be suspected that the balsam had but little to do with the cure, apart from its stimulant action, which co-operated with that of the wine.

Externally, balsam of Peru has been much employed to promote the healing of wounds in parts of inferior vitality, and in phagedenic and indolent ulcers. In ulceration of the nipples, the following preparation will be found useful: ℞.—Balsam. Peru ʒj; ol. amygdal. ʒiss; gummi Arab. ʒij; aqu. rosæ fʒj.—M. S.—Apply five or six times daily. Or, simply, one drachm of balsam of Peru to two drachms of glycerin ointment. If pain is then excited, the proportion of balsam may be diminished. A liniment containing some astringent substance with the addition of balsam of Peru, is an excellent application to parts discharging offensive pus, such as the ears, the nose, the vagina, &c. A plaster composed of diachylum, opium, and Peruvian balsam is recommended as a palliative for chilblains.

Internally, the dose is *half a fluidrachm*, which may be given in emulsion of almonds, gum Arabic, or the yolk of eggs, with the addition of sugar. Balsam of Peru is an ingredient of the compound tincture of benzoin.

BALSAMUM TOLUTANUM.—Balsam of Tolu.

Description.—This substance is the concrete juice of *Myrospermum Toluiferum*, a tree which grows upon the mountains of Tolu, and in other districts of South America and Mexico. It is procured by making incisions in the bark. When fresh, it is soft and tenacious, but it becomes hard and brittle by age. It is yellowish, transparent, and fragrant; it softens under the heat of the hand, and has a pleasant sweetish and aromatic taste. It readily inflames, and diffuses an agreeable odor. It is soluble in alcohol, ether, and the volatile and fatty oils. It contains resin, a volatile oil, and cinnamic acid.

The officinal preparations of Tolu are:—

Syrupus Tolutanus.—Syrup of Tolu.

This syrup is prepared by evaporating the alcohol of the tincture,

[1] Richter, Ausferlich Arzneim., ii. 85.

to which sugar is added, and preparing a syrup with the addition of water. It is a pleasant ingredient of pectoral and other mixtures, but possesses no medicinal virtues.

Tinctura Tolutana.—Tincture of Tolu.

This is a solution of three ounces of balsam of Tolu in two pints of alcohol. It is used for the same purposes as the syrup, and for flavoring troches.

Tinctura Benzoini Composita.—*Vid.* Benzoin.

Action and Uses.—They are the same as those of the balsam of Peru, but less remarkable. Its more agreeable flavor and milder qualities render the balsam of Tolu an eligible ingredient of mixtures, lozenges, vapors, &c., intended to modify subacute and chronic inflammations of the mucous membranes, and those of the lungs especially. It is also much used by perfumers, particularly as an ingredient of burning pastilles.

Balsam of Tolu may be administered in emulsion, and in doses of from *ten* to *thirty* grains. The *syrup* is most generally used to flavor mixtures. It is associated with benzoin, storax, and other stimulants, in the compound tincture of benzoin and in the preparation known as Turlington's balsam.

BENZOINUM.—Benzoin.

Description.—The concrete juice of *Styrax benzoin*. This tree is a native of Sumatra and the neighboring islands of the Eastern Archipelago. It has a trunk of one or two feet in diameter, from which the juice is obtained by incisions in the bark, and sometimes by boiling the wood. In commerce, that obtained by incisions is generally found in the form of whitish *tears*, and is the purest variety; the other occurs in brownish or blackish masses, generally without tears. But the two sorts are often mixed.

Benzoin has a very fragrant odor; its taste is at first sweetish and aromatic, but it leaves behind an acrid irritation in the mouth and fauces. It is readily pulverized, and its particles diffuse themselves through the air and excite sneezing. It is wholly soluble in alcohol, and partially so in boiling water. When thrown upon hot iron it emits thick and penetrating fumes of benzoic acid chiefly, which readily condense upon any cold substance. This acid (Acidum Benzoicum) is officinal, and is prepared from benzoin by sublimation. It constitutes between eight and fifteen per cent. of benzoin, and unites with lime and alkaline bases. Crystals of benzoic acid are known as *flowers*

of benzoin. They are colorless, have a faint aromatic odor, and a warm, acrid and acidulous taste. They are soluble in two hundred parts of cold and thirty of boiling water, in alcohol, ether, and the fixed oils. Benzoin contains also a trace of a volatile oil, and a resinous substance which forms more than four-fifths of its whole bulk.

ACTION.—We possess no accurate experimental knowledge of the operation of benzoin upon the human economy. It is generally said to have little or no influence upon the digestion, but in large doses to quicken the circulation and increase the urine and the exhalation of the skin. These properties are usually attributed to the benzoic acid which it contains; but, however true this may be of its action upon the urine, we must rather attribute its efficacy in pulmonary diseases to the resinous element. Pure benzoic acid, when slightly warmed, exhales an aromatic fragrance. Schreiber[1] took half an ounce of it in forty doses in the course of two days. He experienced a prolonged irritation of the throat and a sense of warmth, first in the abdomen and then over the whole body. The pulse grew more frequent, and afterwards subsided gradually. After the first day, the perspiration and expectoration were augmented, but the quantity of urine was unchanged; the head was somewhat confused, and the digestion was temporarily impaired. According to Dr. Ure, the administration of benzoic acid caused the disappearance of uric acid from the urine, which was replaced by hippuric acid. Similar statements have been made by Leroy d'Etiolles and by Debouy.[2] But Keller, on the other hand, maintains that the uric acid remains unchanged, and that the benzoic acid is converted into hippuric acid[3] at the expense, according to Garrod, of the urea, the uric acid meanwhile remaining undiminished.[4]

USES.—The principal use of benzoic acid is to diminish the tendency to the formation of *uric acid* calculus. In spite of the theoretical views above stated, experience has proved that this object may be, partially at least, secured, and the effects of the disease palliated. Upon this ground it was recommended by Golding Bird to be administered in doses of eight or ten grains in syrup, or dissolved in a weak solution of carbonate or phosphate of soda, thrice a day. Cinnamon-water forms an appropriate vehicle.[5] Dr. Ure announced, in 1844,[6] that

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[1] MITSCHERLICH, ii. 223.

[2] DIEU, iv. 911.

[3] MITSCHERLICH, loc. cit.

[4] Lancet, Nov. 1844, p. 239.

[5] The following is Dr. Bird's formula: ℞.—Sodæ carb. ʒiss; acid. benzoic. ϑij; sodæ phosph. ʒiij; aqu. fervent. fʒiv; solve et adde aquæ cinnamomi fʒviiss; tinct. hyoscyami fʒiv.—M. S.—Two tablespoonfuls three times a day.

[6] Prager Vierteljarschrift, ii. 130.

from ten to twenty grains of benzoic acid, given twice a day, in cases of *phosphatic urine*, is capable of rendering the urine acid, and thus preventing the irritation of the vesical mucous membrane, which is so distressing a symptom of that form of disease. It has also been found by Dr. G. B. Wood[1] to palliate the derangement of function and general distress which accompany phosphatic urine, speedily changing the reaction of the fluid and rendering it transparent. This effect is, however, only to be expected when the state of the urine depends upon disease in the bladder itself. It is of no advantage when phosphatic urine is produced by derangements of the digestive or the nervous system. The benzoate of ammonia has been recommended under the same circumstances by Dr. Holland. "It may be prepared extemporaneously by dissolving five or six grains of benzoic acid and as much sesquicarbonate of ammonia in an ounce of boiling water."

Dr. Delcour,[2] and also Dr. Caspar Morris, have treated *incontinence of urine*, without an altered constitution of this secretion, successfully by means of benzoic acid.[3] According to Falck, benzoic acid is a specific remedy for *jaundice*.

Benzoin was formerly employed much more than at present in chronic affections of the *bronchia*, both in substance and in vapor; but, since it acts as an irritant, care must be taken to restrict its use to cases which will not be injuriously influenced by stimulation. It enters into the compound tincture of benzoin, which is sometimes used as a *stimulant expectorant*, and also in the treatment of *chronic dysentery*.[4] Reil states that from his own experience he believes benzoic acid to be one of the best expectorants in the bronchial catarrh of old persons.[5] As a local application to *indolent* and *gangrenous sores* it is often of signal advantage. Bourdel recommends the tincture of benzoin as a remedy for *sore nipples*. The first application is painful for a few minutes, but the subsequent ones are less or not at all so, and the infant can usually nurse without difficulty and without pain to the mother.[6] A mixture of one part of tincture of benzoin and four of glycerin, after having been strained, forms the most efficient cure for *chapped hands and lips* that we have ever used. Benzoated cold cream is also an excellent application in cases of the same nature. A simple tincture (benzoin ℥ij; alcohol Oj) is also much

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[1] Trans. Phil. Coll. of Med., March 7th, 1855.

[2] Gaz. des Hôpitaux, Dec. 1844.

[3] Trans. Phil. Coll. of Med., March 7th, 1855.

[4] R. W. Ellis, Lancet, Aug. 1856, p. 221.

[5] Mat. Med. d. rein. Pflanzenstoffe, p. 68.

[6] Annuaire de Thérap., 1855, p. 89.

employed as a cosmetic, when mixed with water, to remove freckles and slight papular and other eruptions, as well as to preserve the freshness and suppleness of the skin. The simple tincture is used in the preparation of *court plaster*.

Benzine or *benzole*, a liquid obtained by distilling benzoic acid with lime, has been used to destroy *lice* in animals and to cure the *itch* in man.[1]

ADMINISTRATION.—Benzoin is seldom administered in *substance*, but it may be given in doses of from *ten to forty grains*. The dose of the *acid* is stated as the same. To promote its solution in water, four parts of phosphate of soda, or one part and a half of biborate of soda, should be added.

PIX LIQUIDA.—TAR.

DESCRIPTION.—Tar is the product, by dry distillation, of *Pinus palustris*, *P. sylvestris*, *Abies excelsa*, and other pines and firs. It is a blackish-brown, tenacious, stringy semi-solid, possessing a strong empyreumatic odor, and a nauseous, acrid, bitter, persistent, and somewhat acid taste. It is but slightly soluble in water, in which it sinks, but it readily dissolves in alcohol, ether, and oils. It is very inflammable, and in burning, emits a dark, thick smoke. "It consists of resinous matter united with acetic acid, oil of turpentine, and various volatile empyreumatic oils, and colored with charcoal." Among these oils is creasote.

Unguentum Picis Liquidæ.—TAR OINTMENT.

This ointment is prepared by stirring together equal parts of melted tar and suet.

HISTORY.—In the Hippocratic writings, tar is spoken of as a dressing for sores, and as a medicine in certain affections of the womb. Pliny[2] describes it as stimulating and healing, and as useful in catarrhs and chronic coughs, and various nervous affections when taken internally. Externally, he states that it cures papular eruptions, and the itch of dogs and cattle, heals indolent ulcers, promotes the cure of carbunculous and sloughing sores, of fissures of the anus and of the nipples, and that it is also a remedy for alopecia. Similar virtues are attributed to it by Dioscorides.[3] Other ancient writers, including Galen, repeat the same account.

For a long time this remedy would seem to have fallen into disuse among physicians. Yet it continued to be employed as a popular

[1] Bull. de Thérap., xlvii. 101, xlviii. 268, liii. 42.

[2] Hist. Nat., xxiv. 23, 24.

[3] Lib. i., cap. xxviii.

remedy for man and beast. A little more than a century ago, Bishop Berkeley published his treatise on the wonderful virtues of tar-water,[1] a work in which there is more of all things else than of its nominal theme. The learned writer would seem to have learned something of the popular uses of tar-water during his sojourn in America, but he subsequently attributed to it, as the result of his own observation, all the virtues of a panacea. He alleged it to be stomachic, cardiac, diaphoretic, diuretic, alterative, pectoral, antihysterical, &c., and to be of great use in gout, gangrene, fevers, peripneumonies, pleurisies, erysipelas, scurvy, chronic dysenteries, urinary disorders, and hypochondriasis. To impute such extravagant virtues to any remedy is absurd. In the case of the learned and acute author of the *Minute Philosopher*, it can be explained only by supposing that he craved a faith in something, however preposterous, in order to atone for his denial of what the rest of the world believed. Some eminent names may be found among those who, after Berkeley, attested the value of this remedy; but they singularly curtailed the catalogue of its virtues, and charged it with frequently producing headache and disorders of the digestive organs.

Action.—Small doses of tar are said to display a moderately excitant power, but at the same time to disagree with the stomach, while large ones produce vomiting, purging, pain in the abdomen, and a frequent pulse. A case is reported of a sailor who swallowed between a quart and a pint of "liquid tar." Constant vomiting and extreme debility ensued, with violent pain in the bowels and kidneys, and diarrhœa; but the pulse was not affected, nor was there any pain in the head. The urine was of a bright-red color, and both it and the fæces smelled strongly of tar. Within twenty-four hours the patient recovered, but continued feeble for several days. Fatal cases are reported of poisoning by tar.[2] Tar-water in small doses is said to quicken the pulse and augment the secretions of the skin and kidneys. The vapor of tar, when inhaled, augments the bronchial secretion.

Uses. *In Pulmonary Affections.*—Tar vapors were recommended in 1817, as a remedy for pulmonary consumption, by Sir A. Crichton, physician to the Emperor of Russia. The late Dr. Morton, of Philadelphia, employed this method in *tubercular consumption*, and found it a palliative of the most harassing symptoms of the disease. In *chronic catarrh*, he declared that he knew of no plan of treatment that could compare with it.[3] Whenever the bronchial secretion is excessive, it

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[1] Siris, A Chain of Philosophical Reflections and Inquiries concerning the Virtues of Tar-Water, &c., 2d ed., 1744.

[2] Taylor, On Poisons (Am. ed.), p. 425.

[3] Illustrations of Pulmonary Consumption (1834), p. 135.

diminishes this symptom as well as the cough. But as Vogt has observed, if too freely employed, it produces oppression, pain, hemorrhage, and even disposes to inflammation.[1] Hence, whenever there has been recent inflammation, either primary or intercurrent, it should be avoided, as well as in consumption when hectic fever exists. The manner of employing tar fumes is as follows: In a cup placed in a small water-bath over a common night-lamp, mix some tar with about a twenty-fourth part of its weight of carbonate of potash, in order to neutralize the pyroligneous acid which may be present, and which has an irritating action upon the lungs. The extrication of the vapors should be very slow, but after a few days should be maintained constantly, and their quantity gradually increased. Without this precaution, headache, oppression, and drowsiness are apt to be experienced. *Tar-water* has been found equally advantageous by Petrequin.[2] In twenty-three cases of pulmonary catarrh and tubercular phthisis, this medicine facilitated expectoration, soothed the cough, diminished the oppression and pain in the chest, while it did not, on the other hand, increase the thirst or derange the digestion. On the contrary, it improved the appetite and diminished existing diarrhœa, and at the same time promoted sleep.

Of other internal uses of this remedy may be mentioned pills of tar in *constipation;* and the use of tar-water by the mouth, and by injection into the bladder, in chronic *vesical catarrh.*

Diseases of the Skin.—In 1834, Duchesne-Duparc and Dauvergne used an ointment of two drachms of tar to an ounce of lard, in treating *scabies.* It relieved the itching promptly, seldom produced accidental eruptions, and cured the disease within ten days.[3] In the Berlin hospital, Fricke used it successfully in 264 cases, two-thirds of which were cured within a fortnight. But the method was not persevered in because many relapses were observed to follow its employment, and because it involved the destruction of the bed and body clothing used by the patients.[4]

In *scaly eruptions*, and particularly in psoriasis, this remedy was greatly vaunted by Emery,[5] who says: "Before I used this powerful method, I never knew, in treating a severe case of psoriasis, whether it would get well, nor when; now I can confidently declare that hardly a case of lichenoid eruption or of psoriasis resists the due application of tar ointment." In support of this statement, Emery claimed more than seven hundred successful cases. He used an ointment containing

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[1] Lehrbuch, ii. 171.
[2] Revue Méd., lxiv. 231.
[3] Bull. de Thérap., vi. 144.
[4] Strumpf, Handbuch, i. 920.
[5] Bull. de Thérap., xi. 216; xiii. 72.

one part of tar to four of lard, and applied it three times a day. The ordinary duration of the treatment was four or six weeks, but in some severe and inveterate cases it extended to two or three months. It cannot, however, be denied that the permanence of the cure by this treatment appears to be less than when arsenical preparations are employed.[1] The union of both plans appears to be indicated whenever either one singly proves ineffectual.

In some cases of *eczema* of long standing, when all secretion has ceased, and the skin has become thickened, rough, and scaly, tar ointment, or oil of tar, will act more favorably than perhaps all other applications, provided that its strength be cautiously proportioned to the sensibility of the skin. *Herpes circinatus* (ringworm) is often readily cured by tar ointment, as well as by an analogous preparation, the oil formed by condensing the smoke of burning paper. According to Trousseau, tar ointment is one of the most used and useful remedies for *prurigo*.

Tar is used by the vulgar as a dressing for *excoriations* both of man and beast. It is also a popular application to *scorbutic* and *gangrenous sores*. In *unhealthy ulcers*, says Vogt, tar ointment deserves to be preferred, for it is not easy to accomplish so much with any other dressing. It has been used with prompt success to heal mercurial ulcers of the gums and throat, both by painting them with tar itself, and by using a mouth-wash of tar water. The ancient practice of treating *fissures of the nipples* and *hæmorrhoids* with preparations of tar, has been successfully revived by Jaffé and Marcus.[2]

ADMINISTRATION.—Tar may be given mixed with milk or with beer, or else in pills. *Several drachms* may be taken daily. "*Tar-water* is prepared by stirring a pint of tar with half a gallon of water for fifteen minutes, then allowing the tar to subside, and straining the liquid." From *half a pint* to a *quart* may be taken daily in divided doses.

COPAIBA,	vid.	*Diuretics.*
SCILLA,	"	"
TEREBINTHINA,	"	*General Stimulants.*
AMMONIÆ CARBONAS,	"	"
" MURIAS,	"	*Alteratives.*
IPECACUANHA,	"	*Emetics.*
SULPHUR,	"	*Cathartics.*
ASSAFŒTIDA,	"	*Antispasmodics.*

[1] DÉVERGIE, Mal. de la Peau, p. 513.

[2] MÉRAT and DE LENS, Dict., tom. suppl. p. 697.

DIAPHORETICS.

STRICTLY speaking, *diaphoretics* are medicines which promote the insensible perspiration, and *sudorifics* those which excite sweating. These terms, therefore, only indicate different degrees of the same operation.

The discharge of fluid by evaporation, or in a liquid form, is partly a physical phenomenon, and partly dependent upon vital processes. All moist bodies, whatever, in a relatively dry medium, must give off moisture until a hygrometric equilibrium is established. The human body would soon become so dry that the continued action of its organs, that is, the prolongation of its life, would be impossible, but for the due supply of moisture contained in the food and drink, a portion of which is discharged by the kidneys, a portion by the lungs, and a still larger portion, at times, by the skin. Its discharge may be invisible, or the reverse. It is very copious when the condition of the skin, and, perhaps, the state of its fluids, favor its evacuation, and, even under ordinary circumstances, when the air is too moist to carry it away as rapidly as it is formed. But the difference between insensible and sensible perspiration is only one of degree, and is analogous to that between dew and rain, the one of which is visible and the other invisible in the atmosphere, only because the former is in a more condensed and the latter in a more rarefied condition.

It is probable that perspiration produced by debility consists of little else than water, while that of health is formed by water holding in solution a large proportion of salts,and more or less of the products of textural disorganization. It is alleged by Schultz[1] that the effete elements of the muscular system are eliminated chiefly through the skin; but, considering the close relationships of the skin and kidneys, manifested by the fact that unusual activity in the one involves diminished activity in the other emunctory, and the morbid effects which result from the suppression of the cutaneous exhalation, it may be considered certain that the skin is a principal outlet of effete matters derived from various and probably many organs, and which become causes of disease when retained in the blood. Of this fact, indeed,

[1] Allgemeine Pharmakologie, p. 233.

there is the direct evidence of the senses, when, in disease, the perspiration acquires various odors, sour or fetid, when we observe it to exhale the smell of garlic, musk, amber, assafœtida, &c., and when we see that it becomes glutinous or greasy, and that occasionally even its color is altered to yellow, blue, red, green, &c. These facts suggest a partial explanation of the circumstance that all perspirations are far from having the same influence upon the course of diseases; and that while some coincide with a marked amelioration of the symptoms, others exert no influence upon its course, or appear only to aggravate it by inducing debility.

The influence of perspiration upon the temperature of the body is one of its most important modes of action. It is by this, indeed, that the animal heat is maintained constantly at very nearly the same degree, for the more active does the generation of caloric become, the more copiously is this principle evolved from the cutaneous surface, carrying with it a large proportion of moisture. But in febrile diseases, while the temperature of the body is raised by the activity of the destructive processes going on in the œconomy, the cutaneous exhalation is diminished, according to the old expression by "a spasm of the capillary vessels of the skin," and the sensation of heat in this texture, as well as in the internal organs, becomes a source of much suffering. The subsidence of the excitement and tension is usually accompanied with more or less perspiration. The occurrence of such a discharge has generally been looked upon as the cause of the relief which is then experienced. But although the elimination of morbid matter which probably then takes place through the skin, and visibly by the urine at the same time, may tend to bring the febrile attack to a termination, it cannot be overlooked that the very occurrence of diaphoresis demonstrates that some salutary change within the economy has preceded it, and that this change, therefore, and not the perspiration itself, is the true cause of the amelioration of the symptoms. The amount of the exhalation from the skin is not proportioned to the relief which accompanies it, and, indeed, in several febrile diseases, bears to it an inverse proportion. In typhus fever, articular rheumatism, and hectic fever, for example, the discharge of liquid from the skin is frequently profuse, and yet, far from alleviating the febrile symptoms, it only renders them less tolerable. It may be suggested that in these and similar cases, the liquid which is poured out by the skin so copiously, contains none of the morbid elements which sustain the disease. This may be perhaps admitted as a general proposition; and yet we observe that in rheumatism the secretion is continuously and strongly acid, without at all alleviating the suffering

of which, in the opinion of many, this acidity is a cause. When, therefore, the symptoms of a febrile disease subside during the occurrence of diaphoresis, we may presume that the two phenomena are effects of a common cause, and that either may precede the other in the order of their appearance, or may take place independently.

It is not uninteresting to observe that the ancient physicians fully recognized the truth of the principle which we are now endeavoring to inculcate, that the mere act of sweating is not necessarily of advantage in disease. Upon this point Hippocrates expressed himself very emphatically, declaring that those sweats alone are beneficial which take place over the whole body, and are followed by an alleviation of the symptoms, a doctrine which amounts nearly to an admission that, in themselves considered, they are of little value. He even went farther, and restricted his favorable opinion of sweats to those which occur upon the critical days; but since the very determination of these days depended, in some degree, upon their being marked by the occurrence of sweats, and the simultaneous subsidence of the symptoms, it is evident that his doctrine was implicitly an admission that some perspirations are signs of a favorable change in disease, and that others are not.

It does not at all follow from these doctrines, that medicines which tend to promote perspiration ought not to be administered for the cure of disease. In so far as experience has pronounced in their favor, they should be employed, whatever view we may think proper to take of their mode of action; but a moment's reflection will render it plain that they may excite diaphoresis independently of any power which they exert directly upon the skin, by merely neutralizing, counteracting, or removing conditions which impede the powers of the system in their natural tendency to produce this effect. A consideration of the various influences which occasion diaphoresis will render plain that it is quite as often the consequence of an indirect as of a direct operation upon the skin.

If we inquire into the nature of the causes which produce or promote perspiration in health, we shall find that they are almost without exception stimulants. Heat is the most universal in its influence, and is applied in the greatest variety of forms, including the solar rays, combustion, the use of food and of spirituous or simply of hot drinks, of clothing made of imperfect conductors of caloric, and which merely prevents the loss of heat previously generated in the body, muscular exercise which hastens the development of animal heat, and friction or other modes of mechanical stimulus which act in the same manner. All of these agents may be employed as diaphoretics in diseases to

which they are applicable. Their effect is evidently to augment the quantity of blood in the vessels of the skin, either by quickening the central organ of the circulation, as in the case of alcoholic drinks, or by stimulating the skin itself, and thus attracting towards it a larger amount of blood than usual. These movements, when excited in health, generally issue in the production of diaphoresis. The skin is naturally perspirable, and the various stimuli merely augment, in a greater or less degree, its natural function, rendering visible in a liquid form the moisture which was before invisibly exhaled.

But in disease the conditions are different. The most ordinary one is fever, in which one of the most familiar phenomena is dryness of the skin. This is evidently accompanied with turgor and redness, showing that although the quantity of blood in the tissue is increased, its secreting and exhaling powers are diminished. It may not be easy to explain why this should be, or to decide whether it is owing to a mechanical distension of the capillaries which paralyzes their movements, or whether there is really a spasmodic contraction of those unstriped fibres in which the skin abounds, and which thus prevent the exit of fluids from the bloodvessels. The former of these suppositions, as an exclusive explanation, is the more probable of the two; for were it true that the contractile element of the skin was in a state of spasm merely, the tissue ought to be comparatively pale, as we see that the scrotum is when the dartos muscle is corrugated. The skin being, on the contrary, more highly colored than natural, we must in this case adopt rather the alternative supposition. It is also more in harmony with the observed effects of diaphoretic medicines. In febrile affections with a dry skin, perspiration may be produced by stimulant or by sedative diaphoretics, but not by either indifferently. The propriety of a choice between them will depend in a great measure upon the stage of the disease. While it is still in embryo, as it were, and before its material elements have acquired the fixity of a new form, they may be dispersed by the application to them of a sudden and lively force. Thus it is that at the commencement of fevers and inflammations a stimulant diaphoretic not infrequently prevents the further development of the attack, scattering their gathered elements, and eliminating them with the perspiration. But when once the vascular engorgement has exceeded that limit beyond which the vessels refuse to contract under the action of such stimulants, and possibly are thrown into a spasmodic state, it is evident that stimulant medicines must only tend to aggravate the mischief, and, so to speak, impact the blood more firmly in the capillary vessels. Sedatives of the nervous and circulatory system, upon the other hand, must tend

to promote diaphoresis—first, and possibly, by relaxing the supposed spasm of the vessels or of the skin; but secondly and chiefly, and more certainly, by lowering the action of the heart and arteries, allowing the blood to retreat from the capillaries, and consequently permitting its more fluid parts to escape as perspiration. Thus, according to the condition of the skin and of the system in general, a stimulant or a sedative may be the most appropriate agent for the production of diaphoresis. In the one case the circulation must be excited, in order to cause the bloodvessels to discharge their more liquid contents through the pores of the skin; in the other it must be depressed, in order to render the escape of fluid possible from the engorged bloodvessels. Familiar illustrations of the former have already been referred to in the various dietetic and calorific agents, including hot drinks; of which it may be further remarked, that the rapid accession of a large quantity of liquid to the bloodvessels, by absorption from the stomach, must tend to excite diaphoresis whenever the general temperature of the body does not greatly exceed its normal average, even independently of the caloric with which it is combined; but its union with heat gives it a special direction to the skin when it would otherwise tend to escape by the bowels or by the kidneys. When, on the other hand, the skin is abnormally hot and dry, it is more quickly rendered perspirable by draughts of cold than of warm liquids. This fact is familiarly illustrated during the intense heats of summer, when the skin is dry and burning, by the immediate and often profuse perspiration which a copious draught of cold water seems to force from the body; and in febrile diseases, by the effect of cold water applied by sponging or by affusion. It should, then, be borne in mind that what Alexander was the first to describe as "the sweating point"[1] is a reality, "and that the further the heat of any person is advanced above or reduced below this standard, the further is he removed from any possibility of sweating." This point is not, however, a fixed temperature; it varies with every person even in health, and still more in disease, but, in general, bears a direct proportion to the temperature of the skin.

These considerations justify and explain the division of diaphoretics, which is sometimes made, into stimulants and sedatives. The first are chiefly applicable to febrile diseases in their forming stage, and to chronic affections in which a mild but sustained operation promotes the elimination of morbid materials from the system. The second are most frequently employed at the height of febrile diseases, or at the

[1] Essays, p. 165.

commencement of those which might display a dangerous nature if treated unavailingly by stimulants. Stimulant diaphoretics comprise, besides heat and moisture, and the reaction from cold suddenly applied to the skin, alcoholic preparations, and a large number of vegetable substances containing an acrid principle, and which are generally administered in hot decoction or infusion, or in mixtures. Sedative diaphoretics include a great number of agents, belonging to different classes of the materia medica, but chiefly to that of emetics and saline purgatives. Of the former, some appear to operate by their nauseating or emetic action alone, and others, as tartar emetic, by a direct sedative influence upon the nervous system, and, through it, upon the circulation and its dependent functions. By the latter a diaphoretic action is exerted independently of any operation upon the bowels, and is indeed quite inconsistent with this occurrence. That they are absorbed into the blood is unquestionable, and that they induce diaphoresis by a sedative action upon the circulation is probable; but whether this is accomplished dynamically, or by a chemical or physical dilution of the blood, is not determined. Some of these medicines, as the salts of potassa and soda, especially those formed with vegetable acids, appear to have no stimulant influence at all, and therefore to be most appropriately used in purely sthenic diseases. But others, like the salts of ammonia, and especially the acetate in solution, are unequivocally diaphoretic, although compounded of a stimulant and a sedative. Indeed, the most efficient of all sudorifics appear to combine these two qualities. This peculiarity is very striking in Dover's powder, which is composed of opium and ipecacuanha, in the former of which a stimulant, and in the latter a sedative virtue prevails. Nor is it hardly less so in opium itself, whose stimulant properties, in certain doses of the drug, are as palpable as its sedative operation in larger ones. Yet even in the latter a distinctly stimulant influence is perceptible, followed, however, by sedation and profuse perspiration. Indeed, the more the action of this group of powerful diaphoretics is examined, the more probable does it appear that their peculiar effects are due to their producing successively, but in close succession, stimulation and sedation.

The therapeutical management of diaphoretics requires a great deal of circumspection. It may be held to be a law, to the application of which there are very few exceptions indeed, that powerful and stimulant sudorifics are useful only in the forming stage of acute febrile diseases. All of these which originate in the impression of cold upon the surface of the body, affections of the throat, lungs, and skin, especially, and even of the bowels, may generally be arrested in their

development by almost any agency which will excite a copious discharge of perspiration; by hot stimulating vegetable infusions, for example, in the case of the first-mentioned disorders, and by opium, or, still better, by Dover's powder, in these, and more particularly in the last. Nor is such an impression upon the economy much less efficient in the forming stage of miasmatic fevers, for it often prevents the further progress of the disease, especially if conjoined with the use of an emetic, and followed by a full dose of opium. It is this striking and salutary result of the treatment that has lent a powerful support to the doctrine that it becomes curative by eliminating a morbid poison derived either from the suppressed perspiration or received into the system through the lungs. A similar remark applies to many cases of uræmia, cholæmia, poisoning by venomous animals, and by mineral poisons, especially lead; although it must be admitted that, except in the third of these examples, diuretic medicines are more efficient than diaphoretics.

In certain chronic diseases, such as rheumatism, gout, skin diseases, syphilis, scrofula, &c., the energetic appliances of the water-cure are sometimes attended with remarkable success, when they have produced copious diaphoresis, and the body is, as it were, purged through the skin by the simultaneous administration of cold water.

It was an ancient practice to attempt the cure of dropsy by covering the patient with hot sand, and the same method has been employed in our own time for the relief or cure of anasarca. The unusual dryness of the skin in diabetes no doubt suggested a similar method of treating that affection, and of using opium, which, while it promotes the action of the skin, restrains that of the kidneys.

But if the utility of diaphoretic medicines is unquestionable in many chronic diseases and at the commencement of the greater number of acute affections, their application to fully-developed febrile disorders, whether idiopathic or symptomatic, is subjected to different rules. These affections, when once formed, involve a more or less radical change in the condition of the nutritive functions, which, as it has required time for development, requires it also for cure. Of all the benefits conferred upon medicine by pathological anatomy, none exceeds in value its demonstration that the greater number of diseases are associated with, and often dependent upon, physical changes, changes of bulk, consistence, composition, &c., in the affected parts, and, consequently, that any treatment which claims to effect their immediate restoration may justly be accused of false pretences. Hence it is easy to understand why the more active agents of the present class must be altogether rejected from the treatment of affec-

tions such as those referred to, in common, it may be added, with perturbative treatment of every kind. The ancients, without being aware of this reason, which to the modern pathologist is so conclusive, were none the less taught by experience the danger of using stimulant diaphoretics during the height of inflammatory diseases. Dr. Freind, indeed, declares that Hippocrates *always* mentions sweat as a prognostic only, and not as a means of cure, and that, in the genuine works of this physician, allusion is never once made to any remedy which might provoke sweat; it is added, moreover, that even in Galen's works no reference is made to any internal medicine for this purpose.[1] So Celsus speaks of using diaphoretics only when a tendency to perspire is manifest,[2] and elsewhere of forcing a sweat, but only with cold water.[3] The practice of employing alexipharmics and other stimulants as diaphoretics belonged originally to some of the Arabian school, and their successors, but the most judicious physicians of modern times, who have bequeathed to us the precious legacy of their experience rather than the creations of their genius, are almost unanimous in condemning this class of medicines in febrile affections. In this, Sydenham and Hoffmann, so widely different in many other respects, were perfectly agreed.

The only diaphoretics which are adapted to the cure of such disorders are those which either by nature or by reason of the smallness of their dose incur no risk of aggravating the symptoms they are intended to relieve. Such are the nauseants, as tartar emetic and ipecacuanha, or the mild and transient stimulants, as the ethereal preparations. If, however, an inflammatory disease assumes a typhoid type, stimulants may be resorted to, not because they excite diaphoresis, but, on the contrary, because this operation is of secondary importance when compared with direct stimulation in such cases, and because, further, in the relaxed condition of the skin which then exists, stimulant diaphoretics (diffusible and opiate) tend rather to check than to promote perspiration.

LIQUOR AMMONIÆ ACETATIS.—Solution of Acetate of Ammonia; Spirit of Mindererus.

History.—It is generally stated that a solution of acetate of ammonia was first described, in 1732, by Boerhaave, who introduced it into

[1] Nine Commentaries upon Fevers, p. 35.
[2] Book iii. ch. vi.
[3] Ibid., ch. vii.

the materia medica.[1] It was, however, first discovered by Raymond Minderer, of Augsburg, in 1621.[2]

PREPARATION AND PROPERTIES.—This solution is prepared by saturating dilute acetic acid with carbonate of ammonia. It is a colorless, transparent, and inodorous liquid, of a sweetish saline taste, and readily decomposes by keeping. It has a sp. gr. of 1.011, and is, therefore, less concentrated than the French and German preparations, the former of which has a sp. gr. of 1.036, and the latter of 1.035, and contains fifteen per cent. of the pure acetate, and also acts sensibly upon the living tissues, dissolving the cuticle and the epithelium of the gastro-intestinal mucous membrane. The solid crystallized acetate of ammonia may be obtained by evaporating the saturated solution in an air-pump over sulphuric acid. This salt readily deliquesces.

ACTION. *On Animals.*—Mitscherlich[3] injected into the stomach of a rabbit half an ounce of the solution. (*Pharm. Bor.*) It occasioned no decided symptoms. But when an ounce was used great prostration ensued, hurried breathing, frequent pulse, inability to stand up, with alternate rigidity and spasms, and death within two hours; no fæcal discharge took place; the epithelium of the stomach and small intestine was found dissolved. In another experiment, half an ounce of the solution was twice injected into the cellular tissue of the abdominal walls of a rabbit. The animal uttered loud cries and struggled, then grew feeble, and lay first upon the belly and then upon the side; spasms and tetanus followed, and death took place in an hour and ten minutes. On inspection, the wound was found to be full of bloody serum, and the bloodvessels around were distended with slightly coagulated blood. The epithelium of the upper portion of the intestine appeared to be thinned and covered with more mucus than usual. These experiments show that the preparation is far from being inoperative.

On Man.—Cullen put forth the singular opinion that this medicine is valueless. He had "never seen any benefit from it," and had "known four ounces taken at once, and soon after four ounces more without any sensible effect."[4] Many other writers make an opposite statement. Voigtel says that it acts as a general but mild and transient stimulant, with a special direction to the skin and kidneys.[5] Richter found it to be most valuable for its diaphoretic properties. He states that it renders the pulse somewhat fuller and more frequent, and augments the general activity and warmth of the skin, until sweat

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[1] PEREIRA.
[2] STRUMPF, op. cit., i. 869.
[3] Lehrbuch, ii. 294.
[4] Mat. Med., ii. 347.
[5] Arzneimittellehre, iv. 527.

breaks out, when these symptoms decline, and coolness and relaxation succeed. He adds that, when it does not act upon the skin, it augments the secretion of the lungs and the kidneys. In large and repeated doses it disturbs the digestion, and provokes diarrhœa.[1] According to Mérat and De Lens, its stimulant properties are incontestable.[2] Patin found that it produced a transitory giddiness and intoxication.[3]

The preceding conclusions were drawn from observing the action of the remedy in disease. They do not agree with the results of experiments on healthy persons. Thus, Wibmer observed no effects in his own person except some irritation of the fauces, a little warmth in the abdomen or skin, with headache and loss of appetite for several days. The negative results of Cullen and the inconsiderable effects observed by Wibmer do not, however, neutralize the statements that positive phenomena follow the use of this medicine in disease. Either may be true, or both; and both, we are persuaded, are so.

Externally, according to Mitscherlich, the solution acts as an irritant to the skin, inflaming and vesicating it. It is more active than the hydrochlorate, but less so than the carbonate of ammonia.

Uses.—It is a useful remedy in those slight cases of fever produced by the suppression of perspiration by cold; but if actual inflammation sets in, it is of little use, if not of absolute injury. Hence, it may be prescribed in mild cases of *catarrh*, *sorethroat*, and *muscular rheumatism*, or in more sthenic cases after the fever has begun to decline. In *scarlatina* and *measles* it is much esteemed by several authors of repute when the eruption develops itself slowly or imperfectly, and again after the fever has subsided, leaving the nervous system irritable and impressionable. Vaidy found it very useful in an epidemic of *pseudo-membranous broncho-pneumonia*, in which the antiphlogistic method signally failed.[4] Michel, Mazuyer, Vaidy, and others, were equally successful in the use of it in *typhoid fever*. In the adynamic forms of this disease, and in *petechial typhus*, we have frequently prescribed this medicine, and believe it to mitigate the heat of skin, to moderate the delirium, and diminish the dryness of the tongue. It is the best diaphoretic that can be used in epidemic catarrh, or *influenza*.

Few remedies are so successful as a teaspoonful or two of this solution, in *sick headache*. In *alcoholic intoxication* Mazuyer affirms that it speedily puts an end to the phenomena of drunkenness, and is not so unpleasant as liquor ammoniæ. A teaspoonful or two is sufficient;

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[1] Ausfurl. Arzneim., iv. 337.
[2] Mat. Med., i. 243.
[3] Archives Gén., xviii. 231.
[4] Annales de Thérap., v. 91.

if this is vomited, a second dose should be given within five minutes afterwards.[1] Ogston and Chevalier testify to the same purpose.[2]

Already, in 1817, Voigtel recommended this medicine in *dysmenorrhœa*, saying that it may render more powerful and active remedies unnecessary.[3] In 1828, Patin referred to a case in which Cloquet had administered it with success to relieve severe uterine colics attending menstruation; he himself obtained a like result, but observed that the catamenial discharge was at the same time diminished. He claims to have employed it with remarkable advantage in *menorrhagia*, even when depending upon organic disease of the uterus. He concludes that whenever there is a fluxionary movement towards the pelvic organs, from whatever cause, this remedy will palliate the pain, hemorrhage, &c.[4] The observations of Carrière[5] fully sustain this conclusion, although he attributes the phenomena observed to an antispasmodic rather than to a purely stimulant action. Others, again, have referred them to a sedative action upon the vascular system.[6] Such considerations are of slight importance, provided that the fact be settled of the medicine's utility in any form of dysmenorrhœa. That it is so, may be considered probable.

Various writers have recommended the spirit of mindererus in *dropsy* depending upon atony of the skin and kidneys, and in particular in the form which occurs after scarlatina and measles. Dr. Todd also has advised it in "inflammatory dropsy."

In many other diseases acetate of ammonia has been alleged to be serviceable, *e. g.*, *epilepsy*, *hydrophobia*, *whooping-cough*, *asthma*, *uterine cancer*, *chronic eruptions of the skin*, *scrofula*, *jaundice*, &c., but the evidence of its utility in these affections is very slight, if not altogether illusory.

Externally, this remedy is of great service as a discutient in *bruises*, *lacteal engorgements*, *glandular swellings*, *commencing abscesses*, *dropsy of the joints*, and even in *hydrocele*. Dr. A. T. Thompson[7] recommends it as a collyrium, with opium, in chronic *ophthalmia*, and, when diluted, as an injection in *gonorrhœa*. In *porrigo of the scalp*, he says, "I have ordered it with the best effect as a lotion."

Administration.—The dose of the officinal solution is from *half a fluidounce* to a *fluidounce and a half*, mixed with water and sweetened with sugar. But it is to be remarked that nearly all of the effects

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[1] Bull. des Sci. Méd., 1825. [2] Clarus, Arzneim., p. 787.
[3] Arzneimittel., iv. 528. [4] Mérat and De Lens, Dict. de Mat. Méd., i. 244.
[5] Annales de Méd. Psychol., vii. 204. [6] Annales de Thérapeutique, iv. 129.
[7] Dispensatory, p. 886.

which have been attributed to the solution, by the writers referred to above, were obtained from the stronger preparations of the German and French Pharmacopœias. Of the German solution, the prescribed dose is *one or two fluidrachms* every two or three hours. This medicine is often associated with spirits of nitric ether, and with tartar emetic.

POTASSÆ CITRAS.—Citrate of Potassa.

Preparation.—Under the names of *neutral mixture* and *effervescing draught*, two forms of this useful medicine are employed. The former is prepared by saturating any quantity of bicarbonate of potassa with a solution of citric acid, or lemon-juice, or by directly dissolving six drachms of the citrate of potassa in half a pint of water. The latter is often prepared extemporaneously by adding "to a fluidounce of a solution, consisting of equal parts of lemon-juice and water, half a fluidounce of a solution containing fifteen grains of carbonate of potassa, or twenty grains of the bicarbonate." When lemon-juice cannot be obtained, a solution of citric acid, of the strength just mentioned, may be used as a substitute, but it is far less palatable.

These preparations constitute the *fever draughts* which are universally employed in England and in this country for inflammatory affections, and in the hot stage of paroxysmal fevers. The effervescing draught is usually most grateful to the patient, and is particularly useful when there is much nausea and thirst, both of which symptoms it frequently allays with promptness, while it lowers the pulse and the heat of the skin, and induces perspiration, as well as promotes the secretion of the kidneys. There is no better mode of correcting undue acidity of the urine than to administer this or the other vegetable acids. When taken into the stomach the citrate is decomposed during digestion, and a carbonate is excreted by the kidneys, rendering the urine alkaline. In febrile affections the solution may be improved by the addition of sweet spirit of nitre or of tartar emetic. In all cases when it tends to disorder the bowels, a small proportion of laudanum or sulphate of morphia may be added.

Administration.—Of the *neutral mixture one or two tablespoonfuls*, somewhat diluted, may be given every two or three hours, or oftener. The dose of the effervescing mixture is *two tablespoonfuls* of the acid solution with fifteen grains of the carbonate (which is preferable), or twenty grains of the bicarbonate of potassa, repeated at the same intervals as those recommended for the neutral mixture.

SPIRITUS ÆTHERIS NITRICI.—Spirit of Nitric Ether; Sweet Spirit of Nitre.

History and Description.—This is one of the numerous compounds for which we are indebted to the former chemical school of medicine. Its discovery is generally attributed to Basil Valentine, in the fifteenth century. It is prepared by the distillation of nitric acid and alcohol.

Spirit of nitric ether is a colorless, transparent, and volatile liquid, of an aromatic, pungent, and sweetish-sour taste, and a peculiar aromatic fragrance. It has a slightly acid reaction, and a sp. gr. of 0.834. It mixes readily with water and alcohol, and is very inflammable.

Action. *On Animals.*—The vapor of this preparation is a deadly narcotic poison. Breathed by rabbits and cats it speedily brings on spasms, and death in one or two minutes, after which the blood of these animals is found liquid, watery, and of a chocolate color, the membranes of the brain and the lungs are injected, but the bronchial mucous membrane is not inflamed.[1]

On Man.—In moderate doses sweet spirit of nitre produces an increased secretion by the kidneys, if the skin is kept cool, and by the skin itself if its warmth is preserved; at the same time it acts more or less as a diffusible stimulant, but so gently as not to produce decided heat of the surface. When this part of the system is already in a febrile condition, the nitre tends to reduce its temperature, and at the same time to promote perspiration. Often, indeed, the occurrence of sensible moisture upon the skin precedes its coolness. It is to this secondary operation, rather than to the free acid contained in the preparation, that its refrigerant action must, we think, be ascribed. It is true that, as too often sold, there is a large proportion of free acid in the liquid, but it is also then that its sedative action is least distinct. It is to this acid that must be attributed certain poisonous effects observed by Kraus[2] in a boy twelve years of age who had taken a drachm of the spirit. For six hours he suffered from colic, and had copious slimy evacuations. When inhaled, its toxical effects are very decided. Hermbstadt experienced headache, throbbing of the temporal arteries, anxiety, and giddiness.[3] Other experimenters, or observers, have described a cyanotic condition, giddiness, confusion of mind, a small thready pulse, with loss of muscular power, and

[1] Mitscherlich, Handbuch, ii. 364. [2] Ibid., p. 363.
[3] Strumpf, Handbuch, i. 1014.

spasms, lasting from twelve to eighteen hours.[1] It is related that a druggist's female servant was found dead in her bed apparently poisoned by the fumes of the "spirit of nitric ether," a large bottle or jar of which was broken in her room.[2] She lay on her side, with her arms folded, the countenance and posture composed, and the whole appearance that of a person in deep sleep.

Uses.—This medicine is most frequently used in *febrile affections* with a view of allaying *nausea*, *heat of the skin*, and *arterial* or *nervous excitement*. Under these circumstances it may be associated with the neutral or the effervescing mixture, the spirit of mindererus, or a solution of tartar emetic. In idiopathic *dropsy*, and particularly in that form of it which arises from cold, or as one of the sequelæ of scarlatina, it sometimes proves sufficient to remove the effusion, but more frequently it must be associated with squill, acetate of potassa, or digitalis. In *dysury* from *cantharides*, or a too concentrated state of the urine, it generally affords relief. It is an agreeable and efficient carminative when flatulence is connected with sickness at the stomach. *Externally* it may be prescribed as a cooling evaporating lotion in *neuralgic headache*, but if long continued its acid irritates the skin. It has also been employed as an application to certain *scirrhous ulcers* of the lip supposed to be cancerous, in which case, according to Richter, its free acid is the curative agent.

Dr. Bowditch and Dr. Rickard have employed *inhalations* of the vapor of sweet spirit of nitre as a palliative of *cough* in acute and chronic inflammations of the pharynx and larynx.[3]

Administration.—It is usually directed in doses of *half a fluidrachm* to *two drachms*, in some diluent vehicle, and still larger quantities are advised in dropsy. These may be needful to obtain its diuretic operation, but in febrile affections its diaphoretic influence may be acquired by much smaller doses, such as *twenty or thirty drops* repeated every hour or two.

PULVIS IPECACUANHÆ ET OPII.—Compound Powder of Ipecacuanha; Dover's Powder.

Description and History.—The compound powder of ipecacuanha is made by triturating together one part each of opium and ipecacuanha, with eight parts of sulphate of potassa.

For this useful and admirable compound, we are indebted to Dr.

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[1] Mitscherlich, loc. cit. [2] Edinb. Med. and Surg. Journ., xxxv. 452.

[3] Boston Med. and Surg. Journ., Dec. 1858, p. 381.

Dover, who employed it as a sudorific in gout.[1] His mode of preparing it differed from the present officinal one, in that the medium for uniting the opium and ipecacuanha consisted of nitrate and of sulphate of potassa fused together. The mixture was also diluted with powdered liquorice root. He prescribed from forty to sixty or seventy grains in a glass of wine posset at bedtime, and directed that the patient should be warmly covered, and drink two or three pints of the posset while sweating. He affirms that in two or three hours the gouty pain will quite have vanished. The minimum dose mentioned by him contains nearly four grains of opium!

ACTION.—The essential virtues of this medicine depend upon the opium it contains; but the ipecacuanha would appear to render the diaphoretic effects of its associate more decided, and at the same time to diminish its narcotic operation. On the other hand, it has the disadvantage, as compared with opium, of more readily exciting nausea and vomiting. An instance is recorded in which fatal narcotism in an adult was produced by a dose of between fifteen and twenty grains of Dover's powder.[2]

USES.—This preparation is employed whenever it is desired to obtain a sudorific as well as a narcotic and anodyne effect. Hence it is most frequently prescribed in *rheumatism*, and most beneficially in the muscular forms of the disease, or in those cases affecting the joints which are originally mild, or have been partially subdued by antiphlogistic treatment. In such cases the free and repeated use of this remedy often serves to arrest the progress of the attack. In the forming stage of *other inflammations*, such as pleurisy, pneumonia, bronchitis, enteritis, dysentery, orchitis, &c., it is sometimes equally efficient in preventing the development of the disease, when given in full doses. If it fail in this, it may still do much to mitigate the severity of the symptoms. It is said to be very serviceable in *hemorrhages* from the internal organs, and particularly from the *uterus*. This statement appears to be probable as regards cases which are distinguished by a cool and contracted state of the integuments.

ADMINISTRATION.—The full dose of Dover's powder intended to produce diaphoresis is *fifteen or twenty grains;* but *ten* grains are more usually prescribed. Within an hour afterwards, hot or somewhat stimulant drinks may be given. A less degree of diaphoretic influence may be maintained by doses of from three to six grains every two or three hours.

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[1] The Ancient Physician's Legacy to his Country. (1742), 6th ed., p. 14.

[2] London Times and Gaz., Feb. 1855, p. 133.

GUAIACI LIGNUM; GUAIACI RESINA.—Guaiacum Wood; Guaiac.

Description.—The wood and the resin of *Guaiacum officinale*. This is a tree from thirty to sixty feet in height, and is a native of the Antilles, particularly of Hayti and Jamaica. The bark is medicinal as well as the parts mentioned. The wood is the well known *lignum vitæ*, and is remarkable for its density. Owing to this quality, it is employed for many mechanical purposes. Its raspings and shavings are used by the druggists. When subjected to friction, or burned, it exhales an aromatic perfume. It has a bitterish and acrid taste. It contains twenty-six per cent. of resin, and a fractional proportion of a peculiar bitter and acrid extractive matter. A volatilizable acid is also extracted from it called the *guaiacic*, which has a close affinity to the benzoic, and is, indeed, thought by some to be identical with the latter; but it differs by being soluble in water, alcohol, and ether. The resin is the concrete juice of the guaiacum tree. It is of a greenish-brown or reddish color, whenever it is exposed to the air. Internally, it is rather of a reddish-brown color, and presents a shining conchoidal fracture. After having been chewed a little while, its taste is acrid and pungent, and it emits, when thrown on coals, a strong but grateful and aromatic smell. This resin is soluble in ether, alcohol, and alkaline solutions. The last named quality has caused it to be regarded as an acid.

The following are officinal preparations of guaiac:—

Decoctum Sarsaparillæ Compositum.—*Vid.* Sarsaparilla.

Syrupus Sarsaparillæ Compositum.—*Vid.* Sarsaparilla.

Tinctura Guaiaci.—Tincture of Guaiac.

This is a filtered solution, after maceration, of half a pound of guaiac in two pints of alcohol. Dose, from one to four fluidrachms two or three times a day.

Tinctura Guaiaci Ammoniata.—Ammoniated Tincture of Guaiac.

This preparation is made by macerating four ounces of powdered guaiac in a pint and a half of aromatic spirit of ammonia and filtering the solution. Dose, one or two fluidrachms. Both tinctures may be conveniently administered in milk, mucilage of gum, barley-water, or gruel.

History.—In the first expedition to America, several Spaniards affected with syphilis were cured of it by the natives with a decoction

of guaiac.[1] In 1508, the wood was carried from Hispaniola to Spain, and became known in Europe chiefly by the treatise on its effects in syphilis by Ulric von Hutten, in 1519.[2] This soldier was himself cured by its means of constitutional syphilis, under which he had labored for nine years, and after having undergone eleven courses of mercurial treatment in vain.[3] In the same year, one Nicholas Poll published an account of the cure of three thousand cases by this medicine.[4] Nevertheless, the remedy did not sustain its original vogue, either in consequence of its acting less favorably in the cool climate of Europe, or because the due employment of it was irksome, or finally because the superior success of mercury eclipsed its reputation.

Action.—The effect produced upon the organs of taste has already been noticed, and has been ascribed to the volatile and extractive matters of the wood and resin, for, as Schwilgué remarked,[5] the pure resin produces no sensible effects upon the economy, whereas, the decoction of the wood, which contains no resin, represents all the medical virtues of the drug. Guaiac mainly influences the vascular system, promoting the cutaneous exhalation. Some experiments of M. Sandras[6] tend, in his opinion, to throw much doubt upon the sudorific qualities of this medicine, because he did not observe them unless his patients were placed in circumstances favorable to transpiration. But the objection is not valid; it might be brought with equal justice against all diaphoretics whatever. In some cases it has been observed to produce only general lassitude and dulness. In others, according to Kraus, it sometimes occasions an exanthematous eruption. When the system is impressionable, it causes vascular fulness, and a proneness to congestion and inflammation, and when used for some time it deranges the digestion. In excessive doses, it causes burning pain in the throat and stomach, vomiting, purging, palpitation of the heart, disordered circulation, congestion of the head, confusion of the mind, giddiness, fainting, &c.

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[1] Lane, Lancet, Dec. 1841, p. 303. [2] Voigtel, Arzneimittellehre, i. 117.

[3] Fracastorius thus describes the operation and results of the treatment by guaiacum:—

"Imponunt sese stratis, medicamen ut intro
Large eat, et calido sudorem e corpore ducat.
Interea vacuas pestis vanescit in auras:
Et (dictu mirum) apparet jam pustula nulla:
Jam nomæ cessere omnes, jam fortia liquit
Membra dolor, primoque redit cum flore juventa."

Syphilis, lib. iii. vers. 84.

[4] Strumpf, Handbuch, ii. 342. [5] Mat. Méd., i. 479.

[6] Bull. de Thérap., v. 371.

Uses.—If we look at the early accounts given of its successful employment in *syphilis*, the narrative of v. Hutten, for example, we observe that the patient was obliged to undergo a regimen of the strictest kind, to drink enormous quantities of a stronger and of a weaker decoction of the wood, to live upon a very sparing and simple diet, and in every manner to promote perspiration. Similar regimen was insisted upon by Boerhaave, Valsalva, and Morgagni. It cannot be wondered at, therefore, that the insignificant doses of the medicine and its unmethodical administration, which are now usual, should fail entirely of producing its appropriate effects. Still, the experience of the present time proves that the decoction of guaiacum is really of service in constitutional syphilis of long standing, which affects the bones and skin, and is complicated with the evil results of a long mercurial course, especially in persons of scrofulous, feeble, or impaired constitutions.

At one time, a tincture of guaiacum had much reputation in *gout*. It was advised by Cullen in the chronic forms of this disease. He directed from fifteen to thirty grains in an emulsion to be taken at night, so as to produce a cathartic operation. Quarin, Stoll, P. Frank, and others, recommended it under the same circumstances, but Chapman, on the contrary, thought it useful in the irregular forms of the disease, as when it threatens the stomach, &c.

Dr. Dewees first employed this remedy in idiopathic *suppression of the menses*, and placed great confidence in its efficacy.[1] But he considered depletion, purging, and low diet, essential preliminaries to its exhibition, and alleged that when thus employed, it never failed in any case proper for its use. Indeed, he held it to be "more certain than bark in an intermittent." Dr. Dewees used a tincture made according to the following formula: ℞.—Pulv. guaiac. ℥iv; sodæ and potassæ carb. ℥iss; pulv. pimentæ ℥j; alcohol dilut. Oiss. Digest for a few days, and, when wanted for use, add a drachm or two of spirits of ammonia to every four ounces of the tincture. Of this tincture, a teaspoonful was directed to be given three or four times a day in milk or wine. Although so highly and urgently lauded by its proposer, it would seem to have been successful only in his own hands. We cannot discover a single competent authority to corroborate his statements. In *dysmenorrhœa* guaiacum was likewise recommended by Dr. Dewees. He observed that it sometimes increased the severity of the pain at first, even when it ultimately proved effectual. He was led to its employment "from supposing the disease

[1] Essays on Various Subjects, &c., pp. 109 and 105.

to be a rheumatic affection," a most groundless supposition, as he indeed suspected it to be, but one which Dr. Rigby has since partially adopted. Dr. Wood mentions that he has found this medicine highly useful in painful menstruation.[1] Dr. E. D. Fenner states that in dysmenorrhœa and consequent sterility he has successfully made use of a formula recommended by Dr. Falk, of London, into which Canada balsam, oil of sassafras, and corrosive sublimate enter.[2] This combination is analogous to those formerly in vogue for the treatment of constitutional syphilis.

In the subacute and chronic forms of *rheumatism* guaiac is undoubtedly efficacious in proportion to the care which is taken to favor its diaphoretic operation. Dr. Graves says that, "whether given in the form of powder or tincture, it often proves an extremely useful remedy in cases of chronic rheumatism where no symptoms of active local inflammation or general fever exists."[3] He preferred, however, to prescribe it in conjunction with cinchona, sulphur, ginger, and cream of tartar.

Guaiac has been recommended in *tonsillitis* by Dr. Hannay, of Glasgow, Mr. Bell,[4] and Dr. Carson.[5] According to their statements it abates the pain and inflammation with singular rapidity and uniformity. The dose employed was half a drachm of the tincture every six hours.

Administration.—Of the simple *decoction* of guaiacum wood about *a pint* may be given in twenty-four hours. The compound decoction of sarsaparilla, into which it enters, is more commonly employed. The *resin* may be prescribed in powder, in doses of from *ten* to *thirty grains*. An alkaline solution forms one of the best vehicles for its administration. A soap is directed as follows in the Prussian Pharmacopœia: ℞.—Liq. kali. caust. ℥j; aq. destill. ℥ij; warm, and add pulv. guaiac. resin. ʒvj. —M. This may be reduced to a pilular consistence, or diluted with water. For immediate use the *Mistura Guaiaci* is sufficient. In rheumatic cases, and those of menstrual derangement, Dewees's tincture, or the *Tinctura Guaiaci Ammoniata*, is to be preferred. Of either, the dose is *a teaspoonful* several times a day.

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[1] U. S. Dispensatory, 10th ed., p. 1233.
[2] Am. Journ. of Med. Sci., Oct. 1858, p. 577.
[3] Clinical Medicine, p. 662.
[4] Lond. Med. Gaz., Oct. 1840, p. 202.
[5] Ibid., Nov. 1841, p. 310.

SASSAFRAS RADICIS CORTEX.—Bark of Sassafras Root.

Description.—The bark of the root of *Sassafras officinale.* This tree is indigenous to North America, and in favorable situations grows to a height of forty or fifty feet. Almost all parts of the tree are more or less aromatic, but its active principle resides principally in the bark of the root, from which an essential oil is obtained by distillation. When chewed, it has a warm aromatic taste, and diffuses a peculiar and fragrant odor.

Action and Uses.—Sassafras bark is believed to be somewhat stimulant, to quicken the pulse slightly, to promote the digestion, and increase the secretions of the skin and kidneys. It was originally employed in the treatment of constitutional *syphilis*, and has been much used in certain *chronic affections of the skin*, but there is no reason to believe that it possesses any specific virtues. It still forms an ingredient of several compound officinal decoctions, from which, however, its active properties must be in a great measure dispelled by heat during the preparation. It is much employed, in the form of simple infusion, as a domestic remedy, and also in a fermented liquor, or beer, as a popular beverage in the spring season of the year, under the idea that it "purifies the blood."

Administration.—An *infusion* may be made with half an ounce to an ounce of the bark and half a pint of hot water, and may be used *ad libitum.* Of the *essential oil* two or three drops may be given at a dose.

SERPENTARIA.—Virginia Snakeroot.

Description.—"The root of *Aristolochia serpentaria* and other species of Aristolochia." This is an herbaceous plant which grows chiefly in the Middle and Western States of the Union, in shady woods, and especially upon hill-sides. It has a perennial root, composed of numerous slender fibres arising from a short, knotty caudex. As found in the shops, the odor of the root is aromatic and agreeable, resembling that of camphor, and it has a pungent, bitter, and aromatic taste. Alcohol and water extract its virtues, which appear to depend upon a volatile oil and a resin, the former of which concretes into a substance resembling camphor. Chevallier found in it a yellowish, bitter, and acrid principle, soluble in water and in alcohol.

The officinal preparations of serpentaria are the following:—

Infusum Serpentariæ.—INFUSION OF VIRGINIA SNAKEROOT.

This infusion is prepared by macerating half an ounce of serpentaria in a pint of boiling water for two hours in a covered vessel, and straining off the liquid. Dose, one or two fluidounces.

Tinctura Serpentariæ.—TINCTURE OF VIRGINIA SNAKEROOT.

Three ounces of serpentaria are macerated in two pints of diluted alcohol for fourteen days, and then strained and filtered. Dose, one or two fluidrachms.

Tinctura Cinchonæ Composita.—*Vid.* CINCHONA.

HISTORY.—This root was used by the American aborigines as a cure for snake bites (whence its name), and by the early colonists as a tonic and stimulant. It was introduced into medicine by a London apothecary, named Johnson, in 1633.[1] Sydenham alludes to it as a remedy for intermittent fever when infused in white wine, and taken so as to produce sweating before the fit.[2]

ACTION.—Its properties have been investigated only by Jörg.[3] The powder and the infusion were employed in a large number of experiments made by his associates and himself, and from them he drew the following conclusions: Serpentaria occasions nausea, eructation, vomiting, constriction and pain of the stomach, borborygmi, colic in the small intestine, discharge of flatus, and a disposition to go to stool, but without any evacuation, or of consistent fæces only. The appetite is sometimes impaired and sometimes increased, the stomach and bowels often distended with flatus; itching about the anus, and even hæmorrhoids are occasionally produced. Hence it would appear that the medicine acts as an irritant upon the alimentary canal, producing a secretion, not of liquid, but of gas. It appears to operate upon the brain by producing a tendency of blood to this organ, as is shown by a sensation of heat in the face and of dulness or painful fulness about the head. Frequently it quickens the circulation and causes the urine to be voided at shorter intervals of time, but without increasing its amount. Sometimes it appears to stimulate the organs of generation. Jörg found that in small doses its operation lasts from eight to twelve hours, and in large doses from eighteen to twenty hours. Hence there would seem to be no need of repeating it oftener than twice in twenty-four hours. According to other authorities,[4] it is not only a stimulant, but a tonic and antiseptic, and most powerfully promotes

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[1] MÉRAT and DE LENS, i. 415; STRUMPF, i. 559.

[2] Works, Syd. Soc. ed., ii. 239.

[3] Materialien, i. 179.

[4] SUNDELIN, Heilmittellehre, ii. 135.

the perspiration. It is often compared to camphor, but its influence is more permanent.

Uses.—In *typhus*, *typhoid fever*, and the *typhoid state* of various diseases, this medicine is indicated when the pulse is small, feeble, and irregular, the skin cool, doughy, and clammy, the teeth and lips fuliginous, the eyes injected and dull, and the mind affected by delirium or insensibility. The still graver condition, marked by dark and fetid urine and fæces, by petechiæ and vibices, gangrene of the skin, &c., is often favorably influenced by serpentaria, especially if alcoholic stimulants be judiciously associated with it. Huxham and Pringle advised it strongly in low forms of fever, but they generally associated it with cinchona.[1] The compound tincture of cinchona, proposed by Huxham, and still employed under the circumstances just indicated, derives a portion of its efficacy from serpentaria. In typhoid pneumonia, or rather in epidemic typhoid fever complicated with pneumonia, Richter employed it with remarkable success.[2] Among the negroes of South Carolina it is much employed in the low stages of pneumonic inflammation to which they are said to be peculiarly liable.[3]

It has already been stated that Sydenham mentioned serpentaria as a remedy for *intermittent fever*. Dr. Chapman advises it in *remittent fever*, and particularly in that form of the disease which has been called "bilious pleurisy," and which "has all the characteristics of pneumonia, with the addition of some of the symptoms of autumnal fever." In this affection, after moderate bleeding and evacuation of the bowels, diaphoresis produced by serpentaria sometimes proved curative.

An infusion of serpentaria was recommended, in 1753, by Cadwalader Colden, of New York, in *putrid sore throat*, both as a diaphoretic in the forming stage of the attack, and as a gargle with sumach berries (*Rhus glabrum*) and alum.[4] Dieu affirms that he has arrested a violent fit of the *gout* by the use of a hot infusion of serpentaria, and, by continuing it, three times a day, for a month, prevented a return of the disease.[5] Some persons have also attributed to it *anthelmintic* properties.

Administration.—The *dose* of the *powdered root* is from *ten* to *thirty grains*. Of the *infusion* the dose is *one* or *two fluidounces* every three or four hours in low forms of fever, but less frequently in chronic

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[1] Diseases of the Army, p. 270.
[2] Ausfürliche Arzneim., iii. 51.
[3] Porcher, Trans. Am. Med. Assoc., ii. 766.
[4] Med. Obs. and Inq., i. 210.
[5] Mat. Med., iii. 560.

affections. Of the *tincture* of serpentaria the dose is *one* or *two fluidrachms*, but it is inferior to the *Compound Tincture of Peruvian Bark*, into which serpentaria enters, and of which the dose is from *one* to *four fluidrachms*.

Ammoniæ Carbonas,	vid. *Stimulants.*
Potassæ Nitras,	" *Diuretics.*
Antimonii et Potassæ Tartras,	" *Emetics.*
Ipecacuanha,	" *do.*
Sarsaparilla,	" *Alteratives.*
Mezereum,	" *Irritants.*

DIURETICS.

Diuretics (δια, through, ουρον, urine; διυρητικος, diuretic) are medicines which tend directly to increase the secretion of urine.

According to this definition, the number of medicines which in various states of the economy are adapted to promote the urinary discharge would be much more restricted than in practice is found to be necessary or convenient; for in numerous morbid conditions the deficiency of urine depends, not upon any defect in the organs appropriated to the function of secreting it, but to derangements of others which interfere more or less with the action of the kidneys. Or, to go one step further back, the secretion of urine may be duly performed, but its discharge externally may be prevented by some obstacle in the urinary passages. For example, an obstruction of the ureters may exist, such as a thickening of their coats, or possibly a spasm of their muscles, or, what is more frequent, a calculus, or inspissated mucus, or even an entozoon, may be contained in the canal. But in such cases the obstacle is usually confined to one of the two organs, and that of the opposite side of the body assuming the functions of both, effectually accomplishes the depuration of the blood.

The instances in which other organs than the uropoietic prevent the proper secretion or discharge of the urine are also numerous. Of these, some are closely analogous to the group which has just been referred to. Such are physical agencies interfering with the secretion or with the discharge of the urine, or with both at the same time. Everything which mechanically compresses the ureters will prevent

the escape of the urine from these canals. By accumulation behind the obstacle, it may gradually distend the ureter and the pelvis of the kidney, causing pressure upon the glandular structure of the organ, and ultimately its atrophy; at first, therefore, retention, and afterwards suppression, of urine occurs. Tumors of the ovaries, mesentery, and other organs of the abdomen, may produce such effects.

But all of these causes, taken together, are few in number compared with those which limit the secretion of the urine by interfering with the free circulation of the blood in the kidneys. Such freedom is essential to the proper action of every gland, and of none more than those under consideration. Owing to the extreme vascularity and the intimate connection of all the abdominal organs, whatever interferes with the due circulation of the blood in one, affects the rest, and in a greater or less degree curtails the freedom and the amount of its discharge. If the intestines are over-distended by fæces, they to some extent impede the proper action of the kidneys, partly by mechanical pressure upon them, partly by impeding the circulation of the portal blood through them, and partly, also, by preventing the absorption of the fluid contents of the bowel. Still more strikingly does congestion of the liver or spleen operate in the same manner, and, most of all, chronic induration of these organs. Obstructive valvular disease of the heart itself exerts a scarcely less marked influence upon the freedom of the secretion of urine, because this organ is connected directly, by means of large veins, with the abdominal circulatory system. Debility of the heart, arising from its atrophy or from fatty degeneration, or associated with a general want of tone in the body, produces an analogous result, for it renders the supply of blood to the kidneys comparatively imperfect. In the preceding cases the hindrance to secretion exists in the pressure of the blood itself, or in its defective supply; but it sometimes happens that a peritoneal effusion which distends the abdominal walls to their utmost limits may prevent the proper circulation of blood in the organs of the abdomen, and consequently interfere with the secretion of its glands, and especially of the kidneys, which are so placed as to be readily subjected to compression from such a cause.

Closely analogous, in their action, to these causes are all which, independently of mechanical obstruction, tend to divert the blood from the kidneys. It is a familiar fact that active exercise, which causes a copious discharge of perspiration, diminishes the quantity of urine which is secreted, and that heat produces the same immediate and remote effect; so that, as every one knows, the discharge of urine is copious in winter and scanty in summer, and, as physicians are very

well aware, diaphoretic medicines are directly antagonistic to those of the diuretic class. Profuse diarrhœa diminishes the urine in like manner; and, indeed, when the alvine evacuations are excessive and continued, a complete suppression of it may result. Of this a striking illustration is presented by malignant cholera, in which the blood is so completely drained of its liquid parts through the bowels, that it ceases to circulate in the vessels, and there is a total suppression of urine.

All febrile states of the system diminish the action of the kidneys, as they do that of every glandular structure, whether it be in consequence of the changes which the blood undergoes, and by which it becomes more dense, and consequently less adapted to enter the capillary vessels in which the function of secretion is performed, or whether it depend upon an infarction of these vessels with such viscid blood, or of the ultimate branches of the efferent ducts themselves with the débris of the destructive processes going on in them, or, finally, upon the mere tension of the bloodvessels from the excessive amount of blood contained in them, and which the suspension of the usual secretions and excretions which in health are discharged from the body must tend to augment.

In the preceding paragraphs several distinct categories have been referred to of diminished discharge of urine, and several examples of each have been mentioned, but in scarcely one of them all are diuretics the appropriate remedies, which, indeed, are almost as various as the illustrations themselves. Mechanical causes of obstruction within the urinary organs are, some of them, irremediable, and of one, a calculus in the ureter, although its removal may be favored by diluent drinks, the discharge will more certainly be promoted by opiates and antispasmodics. If defective urination results from the pressure of an accidental formation, such as an ovarian, mesenteric, or other tumor it is for the most part insusceptible of successful treatment; if from a congestion or other remediable obstruction of the liver, mercury will prove the best diuretic, or else colchicum or taraxacum may succeed; or if from a similar condition of the spleen, of miasmatic origin, quinia is the most efficient remedy; in other cases iodine may prove an active indirect diuretic; a purge may produce diuresis by removing the accumulated contents of the bowels, or the operation of tapping by relaxing the over-distended abdomen; digitalis, apart from any direct action upon the kidneys, or prussic acid, independently of such an action, may cause a free discharge of urine when it has been prevented by the irregular or violent action of the heart; general depletion is the capital remedy when the imperfect secretion is due to a high febrile action,

with tension of the whole vascular system, and even in some cases of general dropsy with fever; and local depletion from the loins is even more certain in its effects when scanty urine is owing to an inflamed or congested state of the kidneys. On the other hand, their secretion may be restored, when it is suspended by loss of fluids, if appropriate liquids can be retained in the system after their introduction into the stomach or the veins.

Here, then, are numerous means by which the discharge of urine may be increased, and under various circumstances; but they cannot strictly be called diuretics, and hence it is proper in defining this class to restrict the title to medicines, the *direct* action of which is to augment the secretion of urine. By the term urine, however, we cannot understand a liquid which is uniformly of the same composition. Even its physical qualities vary greatly in health and in disease, so that from time immemorial they have been looked upon as affording valuable indications of the nature or the progress of diseases. It is strikingly various in density, sometimes scarcely exceeding that of water, and at other times rising to a sp. gr. 1.0030 or more. Now all of its weight above that of distilled water, represented by 1.000, is due to the solid matters which it contains, and which it has derived from the waste of the tissues or of the blood itself. The action of diuretics is shown by the increase of either the watery or the solid constituents of the urine, or of both together. One group is distinguished by its power of promoting the discharge of water by the kidneys, and the other by the large proportion of effete solid matters which it causes to be eliminated; just as there are some cathartics which are called hydragogue because they evacuate little else than water from the bowels, while others are depurative, and promote the discharge of the several glandular secretions.

Diuretics of the former class, here referred to, have sometimes received the name of *stimulant, irritant, or acrid diuretics*, and have also been very appropriately called *hydragogue* diuretics, or renal hydragogues. They irritate the tissues with which they come in contact, and when absorbed have a tendency to be eliminated by the mucous membranes or their glands, but chiefly by the kidneys. Among them the principal are these: Squill, copaiba, broom, juniper, guaiacum, savin, buchu, horseradish, mustard, garlic, seneka, digitalis, colchicum, mezereon, and cantharides. Many possess virtues which entitle them to places in other classes rather than in this, but they all tend in a greater or less degree to be excreted with the urine, and in so doing to stimulate the kidneys and the mucous membrane of the urinary passages. Indeed many of them, when given in too large a dose, oc-

casion ardor urinæ, dysury, strangury, pain in the kidneys, and even fever, or propagate their irritation to the rectum, exciting tenesmus, and in the female to the uterus and vagina, occasioning hemorrhage, or the catamenial discharge, or abortion from the former organ, and leucorrhœa from the latter. These phenomena might suffice to prove that the diuretics in question are excreted with the urine, but they have also been detected in this liquid either by chemical analysis or by their sensible properties. Thus oil of turpentine and copaiba impart to it peculiar odors, and the essential oils of cubebs, mustard, mezereon, &c., have been distinguished in it.

All of the medicines included in this division, with the partial exception, perhaps, of digitalis and colchicum, may be considered as promoting diuresis by a direct stimulant action upon the kidneys themselves, whereby their normal function is quickened. That is to say, they separate from the blood a larger quantity than usual of whatever this fluid in its circulation through them has to offer, and consequently a larger proportion of water than of any other constituent, unless, indeed, they be given in such doses as not merely to stimulate, but actively to irritate, the kidneys, in which case they cause the escape of the albuminous element of the blood, and even of the coloring matter of its corpuscles. This statement of their mode of action explains their usefulness in the class of diseases to which they are chiefly applied, viz., dropsical affections.

It was once a prevalent doctrine in regard to the action of the present class of diuretics, in the cure of dropsy, that they stimulate the absorbents to remove the effused liquid contained in the several serous cavities of the body or in the cellular tissue; but it is now certain that the veins, and not the absorbents, are the principal channels through which the absorption takes place, and not by virtue of any active property residing in them, but simply because when the veins are drained of the watery portion of their contents, through the kidneys, or otherwise, a transudation of the dropsical effusion tends to occur from the serous cavity which contains it into the denser liquid within the veins. Thus through them as channels between the dropsical cavity and the free surface of the kidneys, the water is, as it were, pumped out of the system. This rationale is most applicable to dropsy produced by mechanical causes, and independent of inflammation of the serous membrane in which the effusion is contained. When the latter condition exists the membrane may be no longer in a condition to allow the passage of water through it, or at least without a greater force being applied to it than the one just mentioned. Indeed, in both of these cases the association with diuretic medicines of others which

are adapted either to produce resolution of an indurated parenchymatous organ, or to promote the absorption of the false membrane which acts as a barrier to the passage of the effusion into the blood-vessels, will expedite the cure, or may constitute an essential element of it.

In many cases the efficient cause of the dropsy is unknown or only conjectural, and then the exhibition of diuretics should be cautiously resorted to. If the more favorable condition should be present, viz., that in which there is no mechanical and insurmountable impediment to the cure, it will be best secured by means of these medicines. Or if, on the other hand, such an obstacle should exist, as in cases of valvular disease of the heart, they may still promote the evacuation of the effused serum, and thereby promote the comfort of the patient, and prolong the life it may be impossible to save.

There is, moreover, a choice to be made among diuretic medicines in the several forms of dropsy, and it frequently happens that a combination of a renal hydragogue with a depurative diuretic is much superior in efficacy to either alone. Indeed, in the simplest of all the varieties of this affection, general anasarca produced by cold, it is found that members of the former class are more efficient than those of the latter, that acetate or bitartrate of potassa will evacuate the water much more rapidly than juniper, broom, squill, &c., but not so much so as a preparation in which both are associated. If an inflammatory element underlies the dropsical effusion, it should be combated chiefly with alterative doses of mercury and with digitalis, during the continuance of the active symptoms, and afterwards with these agents in conjunction with squill. If, in ascites, the liver is the organ upon which the dropsy depends, mercury should, in like manner, be exhibited in conjunction with taraxacum, colchicum, or squill. But if the effusion is connected with a persistent albuminous state of the urine, the use of mercury is generally contraindicated, and often involves serious danger, so that the cure must be confided to digitalis, and the saline diuretics. In the more chronic cases, with an enfeebled condition of the system, diuretics of the stimulant class, such as oil of turpentine, copaiba, horseradish, and even cantharides, may be used with advantage, or the astringent diuretics uva ursi and pipsissewa may be employed. Finally, when dropsy is the effect of an organic disease of the heart in which this organ pulsates violently, the double action of digitalis as a sedative of the heart's action, and as a direct diuretic, gives it a pre-eminence over all other medicines of its class.

Diuretics of the second group which has been referred to as producing the elimination of a large proportion of effete solid matters

from the blood, have received the name of *renal depuratives.* Formerly, a great many diseases were held to depend upon an acrimony in the blood. By this term was understood certain particles, which, by their shape or their chemical action, irritated the tissues, and thus gave rise to the local phenomena of disease. However plausible this doctrine may have seemed, it has not the support of the actual observation of any such morbid agents, nor of any arguments, by the way of exclusion, which prove the necessity of their existence. The effects of miasmata and various more tangible poisons we are acquainted with, and the probable explanation of their morbific agency is that they act upon the blood catalytically, or in the manner of a ferment. As regards many diseases, it may be assumed that they arise from a retention in the blood, not of substances essentially foreign to it, but of some which have assumed a new form, rendering their presence in the system incompatible with health. In other words, they are the excrementitious matters of nutrition. As, next to the fæces, the urine of all the excretions contains the largest proportion of such substances, a diminution of the quantity of it excreted necessarily involves a greater or less deterioration of the blood, and its renewed or augmented discharge as necessarily tends to the purification of the vital fluid, provided that the proportion of solid effete matters contained in it equals or exceeds the normal quantity.

It has already been stated that if stimulant diuretics are administered to a healthy person, the urine will not be found, under their influence, to contain an increased proportion of solid matters. The experiments of Krahmer, and of Dr. Hammond,[1] prove this conclusively. But if a saline diuretic is made use of in a similar experiment, its effect is enormously to augment the solid contents of the urine, and not by the saline substance alone which was taken, but by urea, uric acid, and various organic matters. Much more is this the case in many diseases. Often, indeed, the kidneys appear to form the principal outlet for substances which are useless and may be injurious in the system. In jaundice, when the flow of bile into the duodenum is interfered with, the urine becomes charged with it, or at least with its coloring matter. In other obstructions of the portal circulation involving the liver and spleen, a large amount of purpurine is found in the urine, a substance which is said to be essentially connected with the non-elimination of the carbonized elements existing in the portal blood. Indigo has also been detected in this secretion. Certain noxious substances, also, received from without, such as mercury and

[1] Am. Journ. of Med. Sci., Jan. 1859, p. 278.

lead, may be eliminated with the urine after having remained for a long time quiescent in the economy.

The diuretic agents which thus depurate the blood are chiefly water and saline solutions. In acute febrile diseases, and in those of a more or less chronic character attended with local inflammation, there can be no doubt that whatever tends to renovate the blood, even in its aqueous portion, must aid in removing from the system as well the actually effete matters circulating in the blood as those which still maintain a feeble organic connection with the solids. As we observe, even in the external appliances of surgery, the advantage of washing away the results of disorganization of the tissues, we may plausibly infer that a constant renewal of the great solvent element of the blood in like manner hastens the separation of morbid particles of the solids, and their elimination with the urine. Thus Becquerel first remarked that even in health, and the quantity of solid food remaining the same, the amount of solid matter in the urine is somewhat increased by increasing the quantity of water used as a drink.[1] This statement has been fully confirmed by Bird, who explains by its means the efficacy of numerous springs famous for their curative virtues in chronic disorders, and which are but little, if at all, mineralized.

Those diuretics which augment the proportion of solid matters in the urine ameliorate the symptoms of many diseases which are regarded as most probably dependent upon a specific or otherwise noxious matter in the blood. It seems probable, therefore, that they decompose, destroy, and eliminate a material morbid cause circulating in the blood, or, what is quite as probable, that they promote the elimination of the effete substances which have been produced by the action of that morbid cause, and thus literally purge the capillary bloodvessels of the noxious materials with which they are loaded, and which interfere with all the processes of a healthy nutrition. It seems to be a rational opinion that every disease, and especially every febrile disease, is attended with an increase of the destructive processes proper to the economy, while the organs destined for the elimination of the resulting substances become engorged and unable efficiently to continue their function. This is evidently the case in regard to the liver in miasmatic affections, in which, while the disease is in activity, the secretion of bile is diminished; or if temporarily increased, is only so because a sudden and excessive afflux of blood towards the organ has taken place. But subsequently the secretion is diminished, and the liver becomes engorged and swollen. Even the spleen, which, in some

[1] Séméiotique des Urines, 1841, p. 140.

sense, is a gland placed upon the channel of the circulation to accomplish certain changes in the blood which passes through it, becomes, in like manner, distended, in part by mechanical pressure from behind during the cold stage of the paroxysm, but also, in some degree, it may be, by the accumulation of blood in it which is not of such a composition as adapts it to undergo the changes which occur in health, and which is not, therefore, in a condition to be carried forward through the bloodvessels of the organ. During this infarction of the two important organs referred to, the kidneys appear to assume, to some extent, the eliminating function of one, and to relieve both of their congestive distension; the proportion of solid matters contained in the urine is augmented as the evidences of local congestion decline, and the earthy, sallow, or bilious character of the complexion is exchanged for a more wholesome hue. Such, indeed, is the succession of phenomena in the cure of this disease by the powers of nature, or by means not directly addressed to modifying the state of the blood and the secretions. But they present themselves in more rapid succession when treatment is employed which is adapted speedily and frequently to renew the watery element of the blood, and at the same time to quicken its elimination by the kidneys, and also that of the effete and therefore noxious substances which it holds in solution.

As the salts of the alkalies, with vegetable acids, tend to change the reaction of the urine from acid to alkaline, these preparations, as well as solutions of the alkalies themselves, are of the utmost value in correcting the uric acid diathesis, which is the most common of urinary diseases. Benzoic acid, on the other hand, is a useful corrective of the phosphatic diathesis, and of the numerous local derangements of the urinary organs with which it is connected.

The influence of blood depuratives in malarial diseases has already been insisted upon, but it may be proper here to add that, valuable though they may be as adjuvants to the antiperiodic treatment, they are not only unsuited to supplanting it, but are, on the whole, inferior to cathartics in their action as eliminants. In rheumatism, and especially in the acute form of the disease, the relative value of the two classes of medicines is reversed; alkaline, or, preferably, saline diuretics, when freely administered, being among the most prompt of all the means that have been employed in reducing the violence of the attacks.

To obtain the due effects of diuretic medicines they must be managed with a strict reference to the rules which long experience has established, and which have been more or less explained by the conclusions of modern science. Thus all of the class of acrid diuretics require

peculiar circumspection in their use; for while by their tendency to the kidneys, and their irritant operation upon them, they act as very certain diuretics, provided that the condition of the kidneys, and of the other organs, is not inappropriate to their use, they may, by the mere excess of their natural operation, produce renal congestion or inflammation, arrest the secretion of urine, and thus defeat the very end which they were intended to accomplish. It is equally clear that they must be altogether inadmissible whenever a congested or an acutely inflamed state of the kidneys, ureters, or bladder exists, either in consequence of general causes, or owing to the irritation of calculous concretions. But such medicines cautiously managed, so as to obtain their substitutive influence, are frequently the most efficient remedies for chronic inflammatory states of the same parts, not, indeed, because they increase the urinary discharge, but because they are eliminated with the urine, and communicate to it their qualities. Juniper, copaiba, turpentine, and cantharides, are the most important agents of this description, and are of the utmost value in disorders of the mucous membrane of the urinary organs. They and their associated medicines are generally inappropriate when the urine contains sugar, or fatty matter, or blood, and should be very circumspectly employed in dropsy accompanying albuminous urine, even when the amount of the dropsical effusion renders an evacuant of the serum necessary.

Renal depuratives, and here saline diuretics are chiefly referred to, require for their due effect that they should be given in small doses and largely diluted, for otherwise they act as irritants of the bowels, and purge. This, indeed, is true of other medicines, and in a marked degree of spirits of turpentine. The tendency of salines to be discharged either by the kidneys or by the bowels, depends in some degree upon individual peculiarities. Many persons resist the purgative action of saline mineral waters altogether, and, in many, even sulphate of magnesia acts more upon the kidneys than upon the bowels. Alexander mentions that except in enormous doses, this agent always produces a diuretic effect upon the horse. Besides the direct irritant action, upon the bowels, of saline medicines when given in large doses, and in a comparatively small quantity of liquid, which renders their action purgative, this action is greatly augmented by the attraction which they exert upon the watery constituent of the blood, for as the saline solution is denser than the liquor sanguinis, the latter transudes into the intestine and forms the liquid stools which are discharged. When largely diluted, on the other hand, saline medicines are absorbed, become diuretics, and are eliminated almost altogether with the urine.

Such dilution is, then, the necessary condition of their proper diuretic operation.

In many instances the combination of medicines belonging to the class of acrid diuretics with the depurative agents, is of very superior value to the use of either of them alone. Indeed, there are few compounds intended to be diuretic which do not contain numbers of both classes; digitalis or squill is associated with acetate or nitrate of potassa, juniper with bitartrate of potassa, &c., and these are conjoined with the indirect diuretics in such cases as those referred to at the beginning of this article. Such combinations must be varied from time to time in chronic cases of disease requiring the use of diuretics, for it is the case with these as with all other medicines, that they lose their proper effect by habitual use.

The greater number of diuretic substances may be divided into the following groups:—

DIETETIC.—Water, the great diuretic and lithontriptic agent, sugar, whey, buttermilk.

Fruits, containing acidulous or saline elements, as apples, pears, grapes, and their fermented juices, wine, perry, and cider, and also small beer; watermelons, and especially their seeds.

Vegetables, containing a saccharine or a peculiar principle, as carrots, parsnips, celery, and asparagus.

MEDICINAL.—*Emollient*, as poppy and hemp seeds, and almonds.

Acidulous, as carbonic, citric, tartaric, boracic, and benzoic acids, and many of their salts.

Alkaline, as the carbonates and bicarbonates of potassa and soda, and alkaline mineral waters; liquor potassæ.

Volatile oils and *ethers*, in wines, or separated; the volatile principles of dill, fennel, parsley, mustard, scurvy-grass, horseradish, copaiva, cubebs, buchu, onions, garlic, &c. Oil of turpentine, juniper, cajeput, and tar.

Acrid substances, such as cantharides, savine, squill, seneka, digitalis, mezereon, and broom.

Astringents, as uva ursi and pipsissewa.

From this catalogue, imperfect as it is, it will be seen that the number of agents which tend directly to increase the urinary secretion is very great, and that very many and indeed the majority of them belong to other classes even more appropriately than to this, but although the honor of a classification may revolt at this possession of multifarious qualities by the same medicine, we cannot blame Nature because she has chosen to endow certain of her productions so richly.

POTASSÆ CARBONAS.—Carbonate of Potassa.

POTASSÆ BICARBONAS.—Bicarbonate of Potassa; Sal Æratus.

Description.—The preparation and properties of carbonate of potassa have already been described. Bicarbonate of potassa is prepared by passing through carbonate of potassa in solution a stream of carbonic acid gas, and evaporating the liquid. It forms colorless, transparent, octohedral crystals of a saline and caustic taste. It is soluble in four times its weight of cold water.

Action.—Like pure potassa, carbonates of this alkali act as local irritants, but less energetically than it. The poisonous operation of the carbonate has been described in another place. (See *Irritants.*) The bicarbonate is much milder in its action, and hence is to be preferred for internal administration. It increases the quantity of the urine and renders it alkaline.

Uses.—The most valuable application of this medicine is to prevent the formation of *lithic acid* deposits in the urine. For this purpose it should be taken several times a day in doses of twenty or thirty grains, dissolved in half a pint or more of water. The bicarbonate, as before intimated, is the more eligible preparation, as well on account of its milder taste, as because it may be rendered quite acceptable to the stomach, by adding to each dose enough lemon-juice or citric acid to cause effervescence. Even when stone actually exists in the bladder, the use of this solution tends greatly to blunt the sensibility of the coats of the organ, and probably to moderate the inflammation which the presence of a foreign body must ultimately produce, and which may issue in complete disorganization. By such a palliative operation the salt diminishes, also, the irritability of the bladder which prompts to frequent and painful attempts to void the urine. The tendency to calculous affections may also be diminished by neutralizing acidity developed in the stomach and bowels in feeble states of the digestion. Thus, a scruple of the carbonate or bicarbonate of potassa with four or five grains of nitre, as recommended by Dr. Prout, may be taken about four or five hours after a meal.

Theoretical notions of its action, according to which it was classed along with mercury, led to the employment of potassa and its carbonates in *pseudo-membranous* affections, *glandular enlargements*, &c. But experience has not fulfilled the anticipations of the physiologico-

chemical school. In vain it was used in puerperal peritonitis, in croup, in pneumonia and other inflammatory affections, by physicians of skill and reputation. It is never relied upon now in such diseases; nor indeed was it by those who at first urged its value most earnestly, for they conjoined mercury with it in every instance.

In certain forms of *jaundice*, not easy of recognition, however, but such as are supposed to depend upon inspissated bile, these preparations are sometimes useful, perhaps, by their catalytic action upon the blood. Under the circumstances mentioned, however, the carbonates of potassa would appear to promote the excretion of the biliary fluid. The cases in which they are most evidently beneficial, are those in which jaundice occurs in persons of intemperate habits, before the degeneration of the liver has gone so far as to produce ascites. Under these circumstances, they may be given in some bitter infusion such as that of wormwood.

In Scotland, carbonate of potassa has from time immemorial, been used in conjunction with cochineal, as a remedy for *whooping-cough*. Dr. Wachtl, of Vienna, found its effects instantaneous and constant.[1] It has also been commended by Gregory, Armstrong, and others, but is not often employed at the present time.

Carbonate of potassa has formed one of the ordinary medicines in the treatment of *skin diseases* for a long time past. Internally, it appears to be most adapted to cases in which the digestive and urinary organs are at the same time deranged, and a superabundance of acid is formed in the system. Externally, it is applied in lotions, baths, ointments, &c., for the relief of the chronic forms of scaly, pustular, and other species of eruption.

ADMINISTRATION.—The dose of the carbonate of potassa is from *ten to thirty grains*, and of the bicarbonate *double this quantity*. For external use, a lotion composed of *two drachms* of the carbonate in *a pint of water* may be employed, or an ointment containing from *ten grains to a drachm* of this salt in *an ounce* of lard.

POTASSÆ NITRAS.—NITRATE OF POTASSA.

DESCRIPTION.—Nitre is a natural and also an artificial product. It abounds in the soil and fissures of calcareous rocks, in various parts of the East Indies and of Spain, in the Mammoth Cave of Kentucky, and other caves in the soil of which large quantities of animal remains

[1] GIBB, On Whooping-Cough, pp. 312, 320.

exist. The oxygen of the atmosphere is supposed to unite with the nitrogen of the ammonia which these substances contain, generating nitric acid, which combines with the alkaline and earthy bases present in the soil. Nitre is also contained in certain plants, *e. g.* tobacco, the sunflower, hemlock, &c., from the ashes of which it may be obtained by lixiviation. Of the artificial sources of this salt, the principal consists in bringing alkaline or earthy bases, including potash, into contact with decaying nitrogenized matters. A gradual reaction is produced by the presence of moisture and atmospheric air, at a temperature of about 60° F., which results in the generation of nitric acid and potassa in combination. Various expedients are employed in different countries to effect this object, but the most common is to allow urine to remain for a long time in contact with vegetable matters, by which means the nitrogen of the liquid unites with the alkaline bases contained in the vegetable remains. Nitre is also produced artificially in decomposing nitrate of soda by means of caustic potash.

Nitrate of potash usually occurs in long, striated, and semi-transparent crystals. Its taste is sharp, and somewhat bitter, and it gives a sensation of coolness to the tongue. "It dissolves in four or five times its weight of cold, and in about two-fifths of its weight of boiling water," and generates cold during its solution. It has the property of preserving meat from putrefaction, and of giving it a bright red color.

HISTORY.—The history of nitre is very obscure. The terms *natron* and *nitrum* are applied, by Greek and Roman writers, to soda and its carbonates, and yet nitre must, as an abundant and widely diffused natural product, have been known at all historical periods. Allston, after examining the question of its origin, concludes by saying, "When, how, and by whom it was invented I cannot find." According to Richter,[1] it was first employed as a medicine by Geber, in the eighth century. But this great alchemist was not a physician.

ACTION. *On Animals.*—Orfila made various experiments upon dogs with nitre, in which he introduced a solution containing from two to twelve drachms of it dissolved in four ounces of water into the stomach, and then tied the œsophagus. The animals made attempts to vomit, seemed unsteady and giddy, uttered cries of pain, had spasms of the extremities, dilatation of the pupils, and feebleness of pulse, followed by general insensibility and death. The stomach was found injected, its veins were distended, and in some points blood was extravasated

[1] Ausfürlich. Arzneim., iv. 237.

beneath the mucous membrane.[1] When introduced into a wound, the part became inflamed and sometimes even gangrenous, but no general symptoms of poisoning were manifested. A solution of the salt injected into a vein is generally fatal after having produced convulsions.

On Man.—The effects of nitre upon the human economy vary greatly with the dose and the degree of its dilution. Opinions have differed very much respecting its essential operation, and to this day they may be regarded as undetermined. In the last century, Alston[2] described it as resolvent, antiseptic, antiphlogistic, diuretic, purgative, and antaphrodisiac; and Boerhaave expressed similar opinions. This philosopher noticed its power when mixed with freshly-drawn blood to prevent its coagulation and to brighten its color. Alexander[3] observed that it acted upon the skin, or upon the kidneys, according as the patient took warm or cold drinks. In Löffler's account of a series of experiments performed upon themselves by five young men, all in good health, a drachm of the salt, it is said, was taken the first day, and the dose gradually increased until between three and five ounces in all were taken. The symptoms observed were these: general weakness and indisposition to exert either body or mind, low spirits, facility to be fatigued, disposition to sleep, and a slow and weak pulse. The pulse gradually became less frequent, until towards the end of the experiments it was several times reduced to twenty beats in the minute; nor did it recover its normal frequency for seven or eight days after the discontinuance of the medicine. The appetite and digestion were unaffected, and the bowels were only purged occasionally. There appeared to be some degree of diuresis.[4] In Jörg's experiments[5] the quantity of urine was so uniformly augmented as to cause this effect to be regarded by him as the principal one. He found that soon after the medicine was taken, undissolved or in strong solution, that it produced a sense of dryness in the fauces, thirst, craving appetite, and heat in the stomach like that of inflammation, with eructations, and sometimes, if the dose was large, vomiting, flatulence, colic, and diarrhœa, with tenesmus, or, on the other hand, constipation, either with perspiration or an increased flow of urine. Jörg hence concludes that nitre cannot, any more than arsenic, be called an antiphlogistic; that it is an irritant; and that its continued use must impair the digestion. The latter statement is certainly true, but it does not disprove the "cooling" or sedative action of the

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[1] Toxicologie, i. 352.

[2] Materia Medica, i. 179.

[3] Experimental Essays, p. 117.

[4] Schmidt's Jahrbuch, 1848, and Edinb. Month. Journ. and Retrospect, April, 1849, p. 91.

[5] Materialien, p. 48.

remedy upon the system generally when taken in a due state of solution, nor does it contravene the assertion that nitre diminishes the plasticity of the blood, and may even induce a scorbutic state of the system.[1] This change in the blood was more precisely defined by Löffler, who found, in his experiments, that the proportion of the solid constituents of the blood was reduced by nitre, as well as the firmness and elasticity of its clot. The same condition was observed by Dr. Basham.[2]

Martin-Solon, in his observations on the use of nitre in rheumatism, states that in many cases it brought on diarrhœa, which, however, ceased spontaneously, or else was readily controlled. Sometimes, indeed, constipation was produced, even when very large doses, such as two ounces, were taken. No durable derangement of the digestion was observed to ensue.[3] The same immunity is also asserted by Devilliers and by Mérat and De Lens.[4] The diuretic properties of the salt are, according to Martin-Solon, very slightly, if at all, marked. The quantity of urine was increased in proportion to the liquid taken, but the specific gravity of this secretion was not lowered, because the nitre itself passed off by the kidneys, and could be recovered from the urine by evaporation. Dr. Basham, in his observations, found that the specific gravity of the urine was raised to between 1030 and 1040. Dr. Bennett, who witnessed the extensive use of the medicine by M. Gendrin, states that the renary secretion is decidedly augmented. But where several quarts of fluid are used during the day, it must clearly be difficult to attribute its due share, if any, to the increased activity of the kidneys.

When large, but not poisonous, doses of nitre are taken, the symptoms seem to indicate derangement of the nervous system chiefly. Jörg enumerates among them giddiness, headache, and confusion of ideas. Dr. Cargill, in an interesting paper upon the subject, says, that general debility of the limbs, especially of the lower extremities, is complained of, so that patients believe that they are seized with general paralysis. The speech is also affected, and there is general trembling, the memory is sometimes affected, and there is also giddiness with painful rushing noises in the ears.[5]

When the dose is poisonous the symptoms are various. The stomach is generally the seat of burning pain, sometimes preceded by a sense of extreme coldness in the epigastrium. Then vomiting suc-

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[1] Comp. M. Solon, loc. inf. cit., Vogt, ib., and Richter, iv. p. 239.

[2] Lancet, Nov. 25th, 1848.

[3] Bull. de Thérap., xxv. 250.

[4] Dict. de Mat. Méd., v. 479.

[5] Lond. Med. Gaz., Oct. 1851.

ceeds, with violent colics, purging, coldness of the extremities, a feeble and thready pulse; convulsive movements of the face; trembling of the hands and limbs; insensibility, blindness, deafness, &c. Alston mentions a person who was several times attacked with paralysis of the upper extremities from using this salt. In a case reported by Husemann, in which from one and a half to two ounces of saltpetre was swallowed, there was vomiting of blood, and bloody stools. The patient recovered; but on the fourth day even oatmeal gruel excited pain in the stomach.[1] Dr. Davies has published a case in which a female, after taking an ounce of this substance, presented the very symptoms which have just been described, but in a more aggravated degree: "She lay quite unable to move for about a week, and then a dreadful diarrhœa took place, with awful griping and bloody stools." Yet this patient recovered.[2] Sometimes few or none of these symptoms present themselves even in fatal cases. Such an one is reported by Dr. Snowden[3] of a man who took, by mistake for Epsom salts, three ounces and a half of nitre at one dose. His bowels were opened three times within as many hours; he complained of slight pain in the epigastrium, and drank a good deal of water. About five hours after having taken the saltpetre, he suddenly fell out of his chair and expired. No dissection of the body was made, but the lips remained of a life-like pink color on the third day after death. In this case the sudden death may perhaps be attributed to the erosion of a large bloodvessel of the stomach. In the absence of violent nervous symptoms it may be compared with one or two earlier cases. Such an one is recorded by Butter[4] of a pregnant female, who, after taking an ounce of nitre, vomited blood, but had no other active symptoms with the exception of choreic spasms which lasted for several days. No doubt a large proportion of the poison was vomited. Another case is reported by Vanoye,[5] in which a female, sick with typhus fever, took an ounce and a half of nitre by mistake. She vomited bile and a large quantity of blood, but afterwards recovered.

In fatal cases, after death the contents of the stomach sometimes consist in part of blood; the gastric mucous membrane is of a dark red color, sometimes corroded; its veins are distended, and blood is effused within and beneath it. The upper portions of the small intestine are more or less in the same condition.

USES. *In Rheumatism.*—Nitre was employed for the cure of this

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[1] REIL's Journ. f. Pharm., ii. 178.
[2] Lancet, Nov. 1857, p. 484.
[3] Phil. Med. Exam., Ap. 1855, p. 244.
[4] Ed. Med. and Surg. Journ., xiv. 34.
[5] Month. Retros. of Med Sci., Ap. 1849, p. 92.

disease towards the close of the last century in England, by Brocklesby, Macbride, and Whytt. The first named physician gave ten or more drachms of it in twenty-four hours dissolved in four or five quarts of barley-water. Copious sweating and great improvement or recovery ensued, it is said, within three or four days. In later times this practice was revived in France by Gendrin and Martin-Solon, to the latter of whom we owe the fullest details of its results.[1] He was of opinion that the method was not only devoid of risk, but possessed decided advantages. As a medium dose he prescribed one ounce to be taken in the course of the day, but sometimes double that dose, dissolved in a large quantity of weak lemonade or some slightly aromatic infusion, sweetened, and administered every hour. It produced no sensible phenomena other than that in the course of two or three days it caused the pain in the joints to subside, while none were invaded anew, and the attack was cured by the tenth day. Dr. Basham imitated this plan exactly, and reports analogous results.[2] Dr. B. used the solution upon *spongio-piline* as a *local application* to the affected joints, as Alexander had originally done, and found it to relieve the inflammatory symptoms. Probably pure water applied in the same manner would have had nearly the same effect. The testimony of Dr. Rowland is equally favorable[3] to the internal administration of nitre.

Other physicians, it must be confessed, have arrived at different conclusions. Monneret, in particular, could observe no influence produced by the medicine upon the course of the disease, and he speaks in strong terms of the extreme repugnance of the patients to its use.[4] Dr. Fuller, also, who watched its administration to the extent of about an ounce daily in seventeen cases of acute rheumatism, and to a less extent in several others, did not observe that it exerted any decided control over the course or character of the symptoms.[5]

In *chronic rheumatism* this remedy was employed by Dr. Cargill, who reports that in three-fifths of one hundred cases the average duration of the cure was thirteen and three-quarter days. He prescribed two scruples three times a day, but in some cases increased the dose to as many drachms, and administered it always in at least half a pint of *warm* barley-water, without which it produced griping, pallor of the face, cold perspiration and a feeble pulse.[6]

There seems then to be no doubt of the efficacy of nitre in acute

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[1] Bull. de Thérap., xxv. 250.
[2] Lancet, Nov. 25, 1848.
[3] Ibid., Feb. 1854, p. 149.
[4] Compendium de Méd. Pratique, vii. 393.
[5] On Rheumatism, &c. (Am. ed.), p. 93.
[6] Lond. Med. Gaz., Oct. 1851.

rheumatism, provided that it be given in doses of at least half an ounce daily dissolved in a large quantity of liquid. On the other hand it must be admitted that the degree of its success hitherto has not led to its general adoption as an anti-rheumatic medicine.

In other *inflammatory* diseases nitre has been to some extent employed. Alexander states that he ordered it in the quantity of two scruples every hour and a half, and found it often to procure a remission of the symptoms, and either sweating or diuresis. Vogt likewise recommended it in *pneumonia* and other affections in which the blood is covered with a buffy coat.[1] A popular remedy for *sore-throat* (catarrhal pharyngitis) is to allow a small piece of nitre slowly to dissolve in the mouth; but, except in the most superficial forms, it is more injurious than useful. It has been recommended in passive *hemorrhages* depending upon purpura, scurvy, &c.[2] Eberle says that it is beneficial in cases of *dropsy* resulting from suppressed perspiration after an eruptive disease.[3]

In *spasmodic asthma* the fumes of paper impregnated with nitre have been found to render the breathing freer and less stridulous.[4] In some cases their continued use renders the disease quite tolerable, or perfectly cures it. They may be employed by diffusion through the air of the patient's bedroom, or inhaled from a cigarette, or from paper impregnated with nitre, burned under a funnel, from the mouth of which the patient inspires.[5] Dr. Hyde Salter, who has reported some striking examples of its success, calls attention to the importance of using paper which is not so thin as to absorb too little of the nitrous solution, nor so thick as to take up too much of it, nor made of woollen or other fibres which give off acrid fumes in burning.[6] It is also of the utmost importance that the remedy should be resorted to at the very commencement of the paroxysm, and before there is superadded to the nervous element congestion of the bronchial tubes. The utility of nitrate of potassa in spasmodic asthma, taken in connection with the efficacy of tobacco, antimony, and ipecacuanha in the same affection, proves that its mode of action is essentially sedative, and corresponds with the effects of the medicine in large and poisonous doses.

From the well-known efficacy of orange and lemon-juice, as well as of potatoes and other fresh vegetables, in the prevention and cure of *scurvy*, it has been inferred that they owe this property to the potash contained in them, and, consequently, that the nitrate of potash would

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[1] Pharmakodynamik, i. 392.
[2] Braithwaite's Retrospect (Am. ed.), xix. 37.
[3] Therapeutics, p. 461.
[4] Lancet, April 5, 1845, p. 383.
[5] Challery, Abeille Méd., xiii. 259.
[6] Lancet, Aug. 1858, p. 223.

be found an antidote to scorbutic symptoms. But, like so many other scientific anticipations in therapeutics, this one has received no confirmation when brought to the test of experience. On the contrary, the comparative trials which were instituted on board of the English convict ships[1] led to the conclusion that nitre is destitute of the antiscorbutic qualities that have been assigned to it, while its nauseous, mawkish taste, and injurious effects on the system generally, rendered it worse than useless. It is true that, as early as 1794, Mr. Patterson advised a solution of nitre in vinegar as preferable to lemon-juice in scurvy; and in 1829 Mr. Cameron found this same solution, or that of nitre in lemon-juice, to be a very effectual cure; but results obtained from such mixtures are far from being a measure, or even an indication, of the value of nitre itself as an antiscorbutic.

ADMINISTRATION.—Nitre may be given in doses of from *ten grains to half a drachm or more*, in the form of powder or in solution. The latter is the preferable mode, and the quantity of liquid employed should be large. When an overdose of nitre has been taken, the only efficient antidote is water, or some bland liquid, by means of which whatever portion of the salt remains undissolved may be rejected, and what remains may be diluted so much as to render it innocuous. The gastric inflammation is to be combated by cold drinks, leeches to the epigastrium, &c.

POTASSÆ ACETAS.—ACETATE OF POTASSA.

DESCRIPTION.—Acetate of potassa exists in the juices of many plants. It is prepared artificially by the action of acetic acid upon carbonate of potassa, or by the double decomposition of acetate of lead and sulphate of potassa.

This salt is white, foliated, and has an unctuous feel, and a warm, pungent, and saline taste. It attracts moisture with great rapidity, and is converted by it into a liquid of oily appearance. Hence it should be carefully excluded from the air in well-stopped bottles. It is dissolved in about half its weight of water, and twice its weight of alcohol. Nearly all of the acids decompose it.

HISTORY.—According to Richter,[2] this preparation was known to the ancients, and is mentioned by Pliny. However this may be, Raymond Lulli was the first to describe it accurately, and Sennertus rendered its use general.

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[1] BRYSON, Med. Times and Gaz., March, 1850, p. 213.

[2] Ausfürl. Arzneim., iv. 328.

ACTION.—According to Wibmer, Richter, and other German authors, it acts upon the blood as a solvent and diluent, as a depurative upon the glands and mucous membrane, especially of the abdomen, augments the secretion of bile, urine, and sweat, and does not readily disorder the digestion. In doses of from half an ounce to an ounce it is a mild laxative. It undergoes decomposition in the system, and is discharged with the urine as carbonate of potassa, rendering this liquid alkaline. Like other diuretics of the saline and alkaline classes, it augments *not only the watery, but also the solid*, elements of the urine to the extent, as Golding Bird has shown, of even one hundred and ninety grains of extractive in the twenty-four hours.[1] It is this power of depurating the system which constitutes the great value of alkaline diuretics, and which the older writers, as well as some of the German authors nearer the present day, have in view when they speak of its relieving the infarcted viscera, and attenuating the secretions of the abdominal organs inspissated by constitutional cachexiæ which involve the assimilative functions chiefly. Hence it was classed by them among the resolvents.

USES.—The older writers describe it as a *depurative* in *chronic congestions of the liver and spleen*, with imperfect secretion of bile, and in *hæmorrhoidal* and *uterine infarctions*, accompanied with nervous and hypochondriacal symptoms, such as follow long-continued attacks of malarial fever; in that depravity of the digestive organs, and of the whole economy, which is often the consequence of a *scrofulous diathesis*, and with which abdominal dropsy is apt to be associated; in cases of *chronic jaundice* depending either upon local or general causes not mechanical; in *lithiasis*, in *gout*, in *furuncles*, *carbuncles*, and various *cutaneous affections* depending upon the gouty diathesis. These effects, which, according to the physiological mode of viewing disease and its treatment, had for a long time been overlooked or made light of, have been demonstrated anew and explained by Becquerel and by Bird. The latter physician has especially called attention to them. "*Jaundice*," he remarks,[2] "connected with a large, sluggish, congested liver, has certainly better yielded to setting up a complementary function on the parts of the kidneys by a diuretic alterant than by goading the liver with remedies whose influence it refused to obey; and in more than one instance a strumously enlarged cervical gland has yielded to the persistent use of an analogous remedy, even after resisting the iodide of potassium." This author shows, further, how the depurative

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[1] On Urinary Deposits (2d Am. ed.), p. 356; and EASTON, Month. Journ. of Med. Sci., May, 1850, p. 422.

[2] Op. cit., p. 359.

action of the remedy corrects the *malarious cachexia*, and renders the previously ineffectual preparations of bark or arsenic sufficient for the cure of periodical fever. Even in recent *tertian ague* he found that when the paroxysms were well marked it diminished their intensity.

Of the use of acetate of potassa in *acute rheumatism*, Dr. Bird says: "I have seen the cure to be more rapid, and the immediate relief to the patient more marked by the use of the acetate of potass in quantities of half an ounce, administered, largely diluted, in divided doses, in twenty-four hours, than by any other treatment. In three days, I have repeatedly found the exquisite pain of the joints nearly absent." He was also impressed with a belief that it lessens the chance of cardiac complications, if given so as to render the urine alkaline. He used no other treatment than this salt, except, perhaps, a full dose of Dover's powder, when the pains were at the first severe; and the affected joints were always wrapped in cotton wadding. In this and in the other affections distinguished by an excess of uric acid, it acts in the same manner as the analogous compounds with vegetable acids; that is to say, they are decomposed, the acid absorbs oxygen, and is converted into carbonic acid and water, while the former unites with the base, and, on being secreted with the urine, neutralizes its free acid, or even renders the liquid alkaline.

Alluding to the cachectic states accompanied by *glandular engorgements* and *furunculous eruptions*, and those deranged conditions usually styled *bilious*, Dr. Bird assures us that the advantage gained by the use of this remedy is remarkable. Thus it is that in all points he confirms the conclusions of the earlier physicians above referred to, but which have been too long allowed to remain without practical extension, even where they were not discredited.

In several forms of *dropsy*, acetate of potass is a valuable diuretic. So distinct is its operation on the kidneys, that it formerly was known as *sal diureticus*. Alibert found it very serviceable in *hydrothorax*. Voigtel states that it is peculiarly efficient in *jaundice* and *dropsy* depending upon "torpor of the liver." Other writers prefer it to be given associated with squill or digitalis. In cases of idiopathic and scarlatinous anasarca we have used it with almost uniform success, even when prescribed alone. If it fail to act, or if it do so imperfectly, the addition of the articles just mentioned will nearly always provoke abundant diuresis. It may also be given in the infusion of parsley, broom, dandelion, &c.

In several forms of skin disease, particularly *psoriasis* and *eczema*, this medicine has been very successfully employed by Dr. Easton, of

Glasgow. Several of the cases reported by him had resisted other methods of treatment.[1]

As a *diaphoretic*, the acetate of potassa has long been celebrated in the form of the *potio Riverii*. This is made by saturating with vinegar two drachms of carbonate of potassa, and adding six ounces of sweetened water. A tablespoonful every two hours is the proper dose. Like the neutral and effervescing draughts, and the spirit of mindererus, it acts as a gentle sedative, promoting the secretions of the skin, kidneys, and bowels, and is of much use in febrile affections.

ADMINISTRATION.—This salt should always be administered in a large quantity of liquid for all purposes except that of producing diaphoresis. In febrile affections, as a sedative, its dose is *ten grains*. In rheumatism, *half a drachm* may be given every four hours. As an alterative, it may be prescribed in the same or still larger doses. As a laxative, the dose is *three or four drachms*.

SODÆ ACETAS.—ACETATE OF SODA.

HISTORY AND PROPERTIES.—This salt appears to have been first discovered in 1767, by Meyer, of Osnabruck, by directly combining distilled vinegar and carbonate of soda.[2] It is a white, striated, or octohedral crystalline salt, with a sharp, saltish, but not unpleasant taste. It dissolves in three parts of water, and in twenty-four of alcohol. It does not, like the acetate of potassa, deliquesce on exposure to the atmosphere, but effloresces slowly.

ACTION AND USES.—Acetate of soda resembles the acetate of potassa in its action, but is milder. It is also less apt to derange the digestion, while it is even more powerful as a diuretic. It can be employed for all the purposes to which that salt is applied, and, unlike it, can be administered, if desirable, in pill or powder. But this can seldom be required. The *dose* is from a *scruple* to *two drachms*.

AMMONIÆ PHOSPHAS.—PHOSPHATE OF AMMONIA.

DESCRIPTION AND USES.—The neutral tribasic phosphate of ammonia was introduced into medicine in 1846, by Dr. T. H. Buckler, of Baltimore. It comes in white rhombic crystals, and is obtained by saturating a solution of phosphoric acid with ammonia.

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[1] Month. Journ. of Med., May, 1850.

[2] SACHS u. DULK, Handwörterbuch, II., ii. 744.

Dr. Buckler was led to employ this medicine in *gout* and *rheumatism*, by reflecting that the lithic acid, which is so abundantly discharged on the subsidence of a gouty or rheumatic fit, must have been combined in the system with bases, and probably with soda and lime, the materials of gouty concretions, and that probably also phosphate of ammonia would lead to the formation of two soluble salts, the phosphate of soda and the lithate of ammonia, which would be readily eliminated.[1] M. Bouchardat, in a note upon this subject, says that although in practice the apprehension may prove to be unfounded, still that one might fear lest the salt should give rise to the formation of an insoluble ammoniaco-magnesian phosphate, and thus increase the risk of calculous disease.[2]

In a number of cases occurring under his own observation, and that of Drs. Power and Frick, Dr. Buckler found that lithic acid disappeared from the urine rapidly under the use of this salt. Hence he proposed it as a means of preventing the precipitation of lithic acid from the urine and the generation of *calculus*, and even for procuring the solution of calculi already formed. Its power of keeping lithic acid in solution in the urine has been confirmed by Dr. Golding Bird, who considers it to be equal if not superior to borax and phosphate of soda for this purpose. He also found it of service in the more recent effusions into the joints in the subacute forms of rheumatic gout.[3] He did not, however, attribute to it any influence upon the tophaceous deposits already formed in the joints, &c. The remedy has since been tried by many physicians, and some favorable results of its operation have been published. Dr. Edwards, in England, used it with "great success in almost every variety of gout and rheumatism, both prior to the development of the inflammatory stage and after its partial subsidence." He adopted the explanations of its action suggested by Dr. Buckler, but without naming the source of his first knowledge of the subject.[4] Dr. Mattei, of Bastia, also published several cases intended to show the efficacy of the medicine in gout and rheumatism.

This remedy was fairly tried in acute and subacute rheumatic cases by Dr. Pepper, at the Pennsylvania Hospital, and patients recovered under its use sometimes when other plans of treatment had failed.[5] In some instances it nauseated and purged, and Dr. Wells informs us that

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[1] Am. Journ. of Med. Sci., Jan. 1846, p. 108.

[2] Annuaire de Thérap., 1848, p. 98.

[3] On Urinary Deposits (2d Am. ed.), p. 148.

[4] Provin. Med. Journ., Nov. 1847, and Am. Journ. of Med. Sci., Jan. 1848, p. 239, and ibid., Oct. 1850, p. 496.

[5] Am. Journ. of Med. Sci., Jan. 1849, p. 49.

he has heard of very unpleasant symptoms following its use.[1] While, therefore, the phosphate of ammonia must undoubtedly be admitted among the available therapeutical solvents of lithic acid, it does not appear to possess qualities much, if at all, superior to those of the alkaline carbonates of the vegetable salts. Experience has not, however, pronounced definitively upon its value.

ADMINISTRATION.—Phosphate of ammonia may be given in doses of from *ten to twenty grains*, three times a day, dissolved in water.

ARMORACIA.—HORSERADISH.

DESCRIPTION.—"The fresh root of *Cochlearia armoracia*." Horseradish is a native of Europe, where, as in other civilized countries, it has long been cultivated for the sake of its root, which is used as a condiment. It grows in rich and rank soils. The root is long, white, and cylindrical. The stem is about two feet high; its lower leaves are dark-green, and lance-shaped; the upper are smaller, and without footstalks. The flowers are white, and in terminal clusters.

Horseradish has a pungent odor, and its exhalations readily make the eyes water. Its taste is warm, acrid, and slightly sweet. It imparts its properties to water, vinegar, and alcohol. They depend upon a volatile oil which is readily dissipated by heat or exposure to the air.

The only officinal preparation of horseradish is the following:—

Infusum Armoraciæ.—INFUSION OF HORSERADISH.

It is made by infusing an ounce, each, of fresh horseradish root and bruised mustard seed in a pint of boiling water, and macerating them for two hours. Dose, a wineglassful three or four times a day. The Compound Spirit of Horseradish (*Lond.*) is prepared by distilling proof spirit upon horseradish, orange-peel, and nutmeg. Dose, from one to four fluidrachms.

ACTION.—The volatile oil just referred to has, at first, a sweetish but afterwards a very acrid taste. When applied to the skin it acts as a rubefacient. Horseradish in considerable quantities produces a sense of warmth in the stomach, and assists the digestion of animal food. In excessive doses it creates a burning heat at the epigastrium, followed by nausea and vomiting. It augments the secretion of urine, and perhaps that of the perspiration also. Tiedemann injected an ounce of its juice into the crural vein of a dog, and immediately afterwards detected its characteristic odor upon the animal's breath.[2]

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[1] On Gout, p. 218.

[2] MITSCHERLICH, Lehrbuch, ii. 559.

USES.—Horseradish has been more celebrated for its *antiscorbutic* virtues than for any other property. Linnæus calls it a divine remedy in what he terms scorbutic affections of the chest. Bergius says that he has known a teaspoonful of the scraped root taken every morning fasting for a month, without being masticated, and followed by a draught of tea prepared from juniper tops, to act very beneficially in scorbutic diseases.[1] Cullen remarks that it has the reputation of being most effectual in scurvy when eaten fresh as a salad, or in the form of a conserve of the expressed juice.[2] Cochlearia officinalis, or scurvy grass, an allied species, is, as its name implies, considered to be eminently antiscorbutic.

In recent times, this medicine has not been much employed as a diuretic, but formerly it had some vogue as a remedy for *dropsy*. According to Murray, it acts favorably in atonic forms of the disease. Sydenham included it with several other diuretic plants in his prescriptions for dropsy following intermittent fever. Huss employed it successfully in *albuminous nephritis*, and Rayer in *anasarca*.[3]

When the digestive powers are feeble and the *appetite fails* in chronic diseases, or from mere exhaustion of the system, it may be used with great advantage as a condiment.

As an *external* application, it is useful when a rapid and decided counter-irritant is required. Murray recommends it mixed with mustard and flour as a revulsive to the soles of the feet in *soporose affections*. As a masticatory in *toothache*, it sometimes affords relief by exciting a flow of saliva, as well as by its counter-irritant action. The infusion has been employed as a gargle in relaxed states of the *pharynx* and *larynx*. A mixture of the juice with vinegar is recommended by Voigtel for removing *freckles* and *tan*.[4]

ADMINISTRATION.—Horseradish-root, grated or scraped, may be given in doses of *half a teaspoonful* to *two* or *three teaspoonfuls*. The compound infusion, which contains mustard-seed, is an excellent stimulant diuretic. The dose is *two fluidounces* three or four times a day. It may be rendered more active by the addition of compound spirit of horseradish, of which the dose is from *one* to *four fluidrachms*.

SCOPARIUS.—BROOM.

DESCRIPTION.—The fresh tops of *Cytisus scoparius*. This shrub, which is a native of Europe, derives its name from the bushy stalks

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[1] Mat. Med., ii. 559.
[2] Mat. Med., ii. 164.
[3] DUBOIS, Mat. Méd. Indigéne, p. 132.
[4] Arzneimittellehre, iii. 54.

(σκοπος) of which it is composed, and which are used for the same purposes as the tops of broomcorn. It abounds in all parts of Europe, where it is used as fuel, but in this country is only cultivated in gardens on account of the sweetness of its flowers, of which the bees are very fond.

Broom tops contain a large proportion of carbonate of potassa. They have a bitter, nauseous taste and a peculiar odor, which depend chiefly upon a volatile base, which is a powerful narcotic resembling conia and nicotine in its action. For this supposed principle the name of *spartein* has been proposed by Dr. Stenhouse, and that of *scoparin* for another which is represented to be diuretic in the dose of five or six grains. But Schroff, after the administration of even a larger dose, observed no diuretic effects, but only colic and borborygmi. The decoction of broom occasionally excites considerable irritation in the kidneys and urinary passages.

USES.—Broom has long been employed in Europe as a popular remedy, especially for *dropsy*. In Floyer's *Touchstone of Medicines* (1687), it is said to be "good in the scurvy, jaundice, and dropsy," and in Culpepper's *Herbal*, of the same period, the powder of the seeds is described as purgative, emetic, and diuretic, as a cure in dropsy, gout, sciatica and jaundice, and also as a diaphoretic in ague. Prepared with oil, it is recommended as a cosmetic. Cullen, after learning its popular reputation, employed it in dropsy, ordering half an ounce of the fresh tops to be boiled in a pint of water down to one-half of that quantity, and giving two tablespoonfuls of the decoction every hour until it operated by stool, or the whole was taken. It seldom failed, he says, to operate both by stool and urine, and by repeating the dose every day or every second day, some dropsies were cured.[1] Mead speaks of curing an *ascites* by this preparation,[2] and also of the usefulness of the ashes of broom in the same disease. The latter were employed by Sydenham, and are also said to have been used extensively and with success in the treatment of *anasarca* following an epidemic catarrh which prevailed in Sweden in 1757. Itard relates that about 1788 the French government published as a specific for dropsy a prescription which consisted of powdered seeds of broom, and this author states that he employed it with success in two cases, and once with "almost miraculous" effects.[3] The diuretic properties of the ashes have been attested by many writers. The ashes are very abundant, and contain twenty-nine per cent. of carbonate of potash, to

[1] Mat. Med., ii. 534.
[2] Med. Works, p. 390.
[3] Dict. des Sci. Méd., xxii. 407.

which, no doubt, their virtues are principally, if not entirely, owing. Dr. Darwall[1] states that the decoction will, in many instances, remove the effusion when other remedies fail. He remarks, however, that it should be made of the green tops, and drunk for a considerable time in large quantities. Dr. Pearson[2] recommended a tincture of the seeds as preferable to the tops. He considered it superior to other diuretics from its improving the appetite and invigorating the whole system, and was most successful with it in ascites and general dropsy. To these evidences of the efficiency of broom as a diuretic, we may add the statement of Pereira that, according to his experience, and he had frequently employed it, it is more certain than any other diuretic in dropsies. Indeed, he says, "I cannot call to mind a single case in which it failed to act on the kidneys."

ADMINISTRATION.—The *decoction* of broom (*Dub.*) is prepared by boiling half an ounce of the tops in half a pint of water in a covered vessel for ten minutes. This quantity may be taken during the day. The *compound decoction* (*Lond.*) is prepared by boiling broom tops, dandelion, and juniper-berries, of each half an ounce, in a pint and a half of water to a pint. *One* or *two fluidounces* may be given at a dose.

SCILLA.—SQUILL.

DESCRIPTION.—Squill is the bulbous root of *Scilla maritima*, a perennial plant which grows on the coast of the Mediterranean Sea. The bulb is pear-shaped, as large as or even larger than a man's fist, and is composed of successive imbricated layers somewhat like the onion, whence it is sometimes called *sea-onion*.

In its fresh state squill abounds in a thick, acrid juice, which acts as an irritant upon the skin, but as this property depends upon a volatile principle, it is in a great measure lost by drying. The more important medicinal operations of the drug are due to *scillitin*. According to Landerer, this is an exceedingly acrid and bitter crystalline substance of an alkaline reaction and vaporizable by heat. Marais describes it as amorphous and uncrystallizable, attracting moisture strongly, soluble in alcohol and ether, but not in water, and intensely bitter.[3] As found in the shops, squill consists of fragments of thin transverse slices of the bulb, which are somewhat contorted. They

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[1] Cyclopæd. of Pract. Med., art. Ascites, i. 166.

[2] Brit. and For. Med. Rev., i. 533.

[3] Annuaire de Thérap., 1857, p. 96.

are generally of a pale reddish-buff color, or else nearly white. They are brittle when dry, but usually are rather tough. They have also a faint smell, and an acrid, bitter, and nauseous taste.

The officinal preparations of squill are the following:—

Acetum Scillæ.—VINEGAR OF SQUILL.

In making this preparation, four ounces of bruised squill are treated with two pints of diluted acetic acid or distilled vinegar. Dose, thirty minims gradually increased to two fluidrachms, and administered in some aromatic liquid.

Pilulæ Scillæ Compositæ.—COMPOUND PILLS OF SQUILL.

These pills are composed of squill, ginger, ammoniac, soap, and syrup. Each pill contains half a grain of squill, and one grain of ammoniac. Dose, as an expectorant, in chronic bronchitis, one pill three or four times a day.

Syrupus Scillæ Compositus.—COMPOUND SYRUP OF SQUILL. HIVE SYRUP.

This medicine is prepared by percolation, by first making a solution of the active properties of squill and seneka, in alcohol and water, converting it into a syrup, and dissolving in it tartrate of antimony and potassa. One grain of the last named ingredient is contained in every ounce of the syrup. It is a sedative emetic, with an especial tendency to promote the secretion of the bronchial mucous membrane. Dose, from five drops to a fluidrachm, repeated at intervals of ten or fifteen minutes, when it is intended to produce vomiting. Its sedative effects on children are sometimes alarming.

Tinctura Scillæ.—TINCTURE OF SQUILL.

This tincture may be made by percolation with four ounces of squill to two pints of diluted alcohol. Dose, from ten to twenty minims, as a diuretic. It is particularly adapted for application by friction to the skin in cases of dropsy.

HISTORY.—Squill is mentioned, and its virtues are described by many ancient writers. Besides Hippocrates, who alludes to it, we find that Pythagoras wrote a complete treatise concerning this plant.[1] Pliny fully describes the mode of preparing a *vinegar of squill* which, according to him, clears the vision, and is good for abdominal pains, but in an overdose destroys life. He also speaks of this preparation and of the *honey of squills*, as useful in dropsies, for enlargement of the spleen, and for some forms of indigestion. According to him, squill will cure scrofulous and other affections of the skin when ap-

[1] PLINY, Hist. Nat., xix. 30.

plied in a cataplasm; &c.[1] Dioscorides attributes to it similar qualities, and further extols vinegar of squills for its virtues in healing spongy and ulcerated gums, as a gargle in ulcerated sore throat, and as a stimulant in debility of the digestive organs.[2] The Arabian writers rehearse this catalogue of its virtues, but do not materially augment it.

Action. *On Animals.*—Squill acts poisonously upon various animals. The camel is said to reject it among the plants on which he browses. It is fatal to mice, rabbits, cats, dogs, swine, fowls, &c. In most of these animals it appears to occasion pain with vomiting, great distress, and purging, loss of muscular power, or convulsions.[3] Some experimenters state that it produces inflammation of the stomach, but their opinion seems to be rather an inference from the symptoms, than the result of inspection, for others have met with but few or no traces of phlogosis, and attribute the phenomena produced, to the operation of the drug upon the nervous system. The convulsions just alluded to, are no doubt produced by the absorption of the active principle of the drug, since they are observed when it is introduced into the cellular tissue of a limb. Emmert and Hoering, who introduced squill into the peritoneal cavity of animals, found that the characteristic symptoms followed.[4] Chiarenti rubbed a solution of squill into the skin of a dog with the effect of producing copious diuresis.[5] The experiments of M. Chateau furnished similar results to those now described, but he found that he was able to produce them with doses of one or two drachms of the medicine, while other observers had employed as many ounces.[6] The following summary includes all of the important toxical effects of squill as observed in dogs. The animals grow dull; then slaver and seem to be nauseated, vomiting follows, and liquid stools which are voided in small portions, and, as it were, drop by drop. If the dose is large, trembling succeeds, and paralysis first of the posterior and then of the anterior limbs. The animals then seem to regain their steadiness, but suddenly, and without intermediate symptoms, convulsions take place, or rather a single convulsive paroxysm, which is followed by complete relaxation; the animals fall upon the side, make a few movements like those of deglutition, stretch themselves spasmodically and die.

If the dose of squill is small, these phenomena do not follow one another so rapidly; but they always take place in the same order;

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[1] Pliny, Hist. Nat., xx. 34, 35.
[2] Liv. ii. ch. 167.
[3] Wibmer, Wirkung, &c., v. 20.
[4] Strumpf, Handbuch, ii. 129.
[5] Mérat and De Lens, vi. 259.
[6] Arch. Gén. de Méd., 5ème sér., iii. 53.

that is to say, there is vomiting, then purging, dulness, stupor, intermittent paralysis, convulsions, and finally death in the course of twelve or fifteen hours. The animal temperature invariably falls during the progress of these symptoms.

In M. Chateau's experiments, the ganglia of the sympathetic nerve were found injected, and sometimes the cerebellum and the spinal marrow were completely softened.

The experiments performed on dogs and rabbits with *scillitin*, by M. Marais, presented results identical with these, but when the poison was introduced into the cellular tissue instead of into the stomach, the gastro-intestinal symptoms were less decided. Four grains of this substance destroyed a strong dog of medium size within twenty-four hours.[1]

On Man.—The juice of the fresh plant applied to the skin acts as a rubefacient. From the internal use of squill fatal poisoning has sometimes resulted. A case of this sort is recorded by Lange. Quarin even asserts that twelve grains of it may prove fatal. Pregnant women who have used it to produce abortion, have perished in consequence. Plenk saw convulsions produced by it in a child. A case is related in which a drachm of the powder was taken to relieve a fit of asthma, but it produced violent and painful vomiting, great prostration, itching and an eruption of the skin, injected face, great heat of the trunk and head, and coldness of the extremities. The result was not, however, fatal.

In general, the effects of an overdose of squill may be thus described. When very excessive, there is violent emeto-catharsis, severe colic, dysury or bloody urine, rapid breathing, and general convulsions. In somewhat smaller doses, vomiting and diminished secretion of urine are still the prominent symptoms, and the pulse is found to be less frequent than natural. In small or medicinal doses, squill, in the great majority of cases, exerts a diuretic action, and most frequently at the same time operates on the bowels. But its purgative action is never prominent except at the expense of its action on the kidneys. The characteristic effects seem to be most certainly produced by the powder, or by the wine of squill. The syrup and the oxymel appear to influence the pulmonary secretion more particularly. When used for some time, squill disorders the stomach, destroys the appetite, and impairs the digestive powers.

Squill produces its characteristic effects by absorption through the skin. Brera used it thus successfully in dropsy, as also did Lambert,

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[1] Annuaire de Thérap., 1857, p. 98.

Lentin, Bally, and Hosse. Krause found that the fresh root reduced to a pulp and applied to the skin, produced decided diuresis. Dr. Gerhard[1] applied the powder to the denuded cutis in a case of ascites and in one of anasarca. Copious diuresis occurred in both, and the patients recovered.

Uses. *As an Expectorant.*—Squill is useful in cases of bronchial inflammation of a mild form, when the sputa are tenacious and scanty, and the lungs are free from acute inflammation. Thus it will be found serviceable in chronic bronchitis complicating emphysema, and in all forms of chronic and subacute catarrh. Under these circumstances, it is most usually combined with senega. It is also much employed as an ingredient in the compound syrup of squill, which is so popular a remedy in spasmodic croup; but it may be questioned whether the benefits derived from this combination are not chiefly due to the tartar emetic which it contains. In the decline of spasmodic and even of membranous croup, squill may be of service in promoting secretion from the laryngeal mucous membrane.

As a diuretic, few medicines excel the one under notice, and hence it is in universal use for all the forms of *dropsy*. Even when the effusion is owing to some organic and incurable lesion, it may, nevertheless, be often temporarily evacuated by squill. It is generally prescribed in the passive forms of the disease, or in cases which have passed the acute stage, and ought never to be used so long as the strength and frequency of the pulse and the heat of skin denote inflammatory action, nor when morbid sensibility of the kidneys or of the urinary passages betrays disease in them. Sometimes it produces a rapid evacuation of the water by vomiting and purging; this is particularly the case when it is associated with tartar emetic, or with saline cathartics. As a general rule, it is given in combination with digitalis and blue mass (of each, one grain three or four times a day). In order to lessen its injurious action upon the stomach, it may be conjoined with aromatic tinctures, or with the aromatic spirit of ammonia. When the stomach is intolerant of the medicine, it may be administered endermically, either by frictions with its tincture and that of digitalis, or the powdered squill may be sprinkled upon the denuded cutis. This latter method is, however, apt to produce a good deal of pain. In the hydrocele of young subjects, says Mr. Waring,[2] a radical cure has occasionally been effected by the local external application of acetum scillæ. It causes desquamation and subsequent

[1] N. Am. Med. and Surg. Journ., x. 157.

[2] Manual of Therapeutics, p. 454.

absorption of the fluid. It cannot, however, be depended upon even in young subjects; in adults, it almost always fails.

A salve made with powdered squill was anciently used as a remedy for warts, and some modern writers vouch for its efficacy.

ADMINISTRATION.—The *dose* of squill in substance is from *one to three grains* three times a day, and may be gradually increased to *ten or twelve grains*. As a general rule, if it disturbs the stomach or bowels it should be given in smaller quantities, and not combined with opium, which counteracts its influence.

The *syrup* and the *oxymel* are most appropriate as expectorants, in the dose of *one or two fluidrachms*. The *wine* is most suitable for external application. It is not officinal in this country, but the *tincture*, which is so, may be used for similar purposes. Its *dose* as an expectorant or diuretic is from *ten to twenty minims*.

CAROTA.—CARROT SEED (AND ROOT).

DESCRIPTION.—The fruit of *Daucus carota* (*U. S.*); the root of the same (*Ed.*). This is a plant of the natural order of Umbelliferæ. It grows wild, and is very common both in Europe and in this country, along fences and in neglected fields; the cultivated carrot is a familiar garden vegetable. The root is spindle-shaped, the stalk is divided into erect branches which terminate in compound umbels formed of small, white flowers. The seeds have an aromatic odor, and a warm, pungent, and bitterish taste which is due to the volatile oil which they contain. The root of the wild carrot is white; that of the cultivated of a reddish-yellow color. The former has a strong smell and acrid taste, due to the presence of a volatile oil, the flavor of the latter is rather sweetish and mucilaginous.

HISTORY.—Dioscorides describes the wild carrot under the name of σταφυλίνος ἀγριος.[1] He states that the seeds promote the menstrual flux and produce abortion, and that they are used as a diuretic in urinary disorders and in dropsy. He also mentions that the garden and the wild carrot have similar properties, but that they belong to the latter in a higher degree. This writer, and also Galen, say that the bruised leaves cleanse foul ulcers, and both ascribe aphrodisiac properties to the seeds. Rhazes gives a similar account,[2] and adds that carrots are heating and flatulent unless cooked. He calls them diuretic, laxative, and stomachic.

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[1] Lib. ii. cap. 52.

[2] EBN BAITHAR.

Uses.—Eberle and other writers state that the seeds are efficient as a diuretic remedy, and much in vogue among the country people, to relieve strangury from blisters and other causes, and also suppression of the urine. "They hardly ever fail," says Eberle, "to produce copious diuresis." The volatile oil which they contain renders them rather grateful to the stomach, and hence peculiarly applicable in asthenic forms of dropsy connected with dyspepsia.

Externally the bruised carrot-root has been long employed, as in ancient times, on account of its stimulating or cleansing influence upon *foul ulcers*. It was in 1768 that Gibson, in England, employed it for a cancerous sore of the penis, which it greatly amended, neutralizing the smell, and causing a complete separation of the dead parts, and a partial cicatrization of the sore. In other simple gangrenous sores it had the same effect, and promoted the cure.[1] About the same time, Sultzer in Germany, and Bridault and others in France, employed it successfully under like circumstances.[2] Many other writers might be mentioned, including Hufeland, Boyer, and Ricord, to vouch for its admirable qualities in the cases alluded to.[3] We have long been in the habit of prescribing it for all descriptions of *indolent and ill-conditioned sores*, and most successfully for such as have been mentioned, and for those which discharge a thin sanious pus. The juice, used as a wash, is also said to afford great relief to itching in various *cutaneous affections*.

Administration.—The powdered *seeds* may be given in doses of *half a drachm* to *a drachm*. An *infusion* may also be made by adding half an ounce or an ounce of them to a pint of water, which may be taken during the day. The root may also be used in simple infusion, but it is more generally employed as an ingredient of broths, which it renders more digestible, and, at the same time, diuretic.

PETROSELINUM.—Parsley.

Description.—The herb, root, and seeds of *Petroselinum sativum*. In the U. S. Pharmacopœia the root only is officinal. Parsley is a native of Southern Europe and Asia Minor, but is now everywhere cultivated in civilized countries, for culinary purposes. It is a biennial plant, with a white spindle-shaped root, and a jointed stem about two feet high, bearing small white flowers arranged in umbels. The

[1] Med. Obs. and Inq., iv. 178, 191, 359.
[2] Dict. de Méd., iii. 658.
[3] Dubois, Plantes Usuelles, p. 22.

radical leaves are smooth, lobulated, and notched. The seeds are small, ovate, flat on one side, and marked with longitudinal ridges.

HISTORY.—Parsley is described by the ancient medical writers, and Galen says the plant, and especially its seeds, are stimulant, diuretic, emmenagogue, and carminative. To these qualities Dioscorides adds a discutient influence upon bruises and tumors; he also states that it cures the stings of insects, and some forms of internal poisoning. Similar virtues were attributed to it by the Arabians, who also regarded it as depurative, lithontriptic, capable of arresting or drying up the secretion of milk, as promotive of digestion, &c.

ACTION.—Parsley has a strong, and to most persons an unpleasant, smell. The seeds are more aromatic than other parts of the plant, and the root has a disagreeable and sweetish taste. The active properties appear to depend upon an essential oil, which has been named *apiol*, and which is obtained only from the seeds. It has their peculiar odor, and is extremely pungent and acrid in taste. The action of the seeds resembles that of fennel, anise, or coriander seeds, and is chiefly carminative. The essential oil is poisonous in large doses. According to Mitscherlich,[1] a half ounce of the oil, introduced into a rabbit's stomach, produced laborious breathing, and the expired air smelled strongly of it. The pulse became frequent, the animal soon grew feeble and unable to stand, and its pupils were contracted. Insensibility, muscular twitches, coldness, and death in five hours succeeded. No lesion of the tissues existed. In doses of from seven to fifteen grains it is represented as occasioning an excitement like that produced by coffee, with warmth at the pit of the stomach, and a general sense of comfort. Thirty, and from that to sixty, grains of this substance produced a state of intoxication, with scintillations before the eyes, deafness, buzzing in the ears, staggering movements, and violent headache.[2]

USES.—In modern as in ancient times parsley has been used as a *carminative*, *discutient*, and *diuretic*. The root is said to be more actively *diuretic* than the rest of the plant. Eberle states that, given in decoction, it seldom fails to produce a very considerable increase of urine, and that he has employed it to relieve *strangury* from cantharides or turpentine, and the painful micturition depending upon nephritic affections.[3] Chapman makes the same statement.[4] The oil, and also the juice, have been used with good effect in *gonorrhœa*. Tournefort mentions that in Provence the juice is much employed to

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[1] STRUMPF, Handbuch, i. 618.
[2] JORET and HOMOLLE, loc. inf. cit.
[3] Therapeutics, p. 530.
[4] Therapeutics, i. 272.

cure *periodical* fevers; and several others, of whom one of the most recent is Peraire, assert that its powers in such affections cannot be questioned.[1] Still more recently the proximate principle, or the essential oil, has been vaunted as a powerful antiperiodic. The symptoms produced by it, as described above, are thought to be closely analogous to those of quinia, and accounts have been published of its curative virtues in *intermittent fever* and intermittent *neuralgia*, by Joret, Homolle, Dubail, and others, and also in *painful and scanty menstruation*.[2] The oil is sometimes used in an ointment to destroy vermin.

ADMINISTRATION.—The powdered seeds may be given in doses of *ten or fifteen* grains. The root should be employed in the recent state, and generally in strong infusion.

TARAXACUM.—DANDELION.

DESCRIPTION.—The root of *Leontodon taraxacum*, a native plant of Europe, but naturalized in almost every part of the United States. The root is fusiform, brown externally and white within, and abounds in a milky juice. The leaves are radical, and serrated or toothed, whence the plant has derived its name of dandelion (dent-de-lion, lion's tooth). The flowers are of a golden-yellow color, composed of imbricated florets, and supported on a fistulous scape. They are succeeded by a hairy radiated pappus, or downy head.

The root should be gathered in the summer or autumn and used while fresh, as its juice is then the strongest. The medicinal virtues of the plant appear to depend upon a crystallizable principle called *taraxacin*.

The following are officinal preparations of taraxacum:—

Infusum Taraxaci.—INFUSION OF DANDELION.

Two ounces of bruised dandelion in a pint of boiling water, are macerated in a covered vessel for two hours, and strained. Dose, a wineglassful two or three times a day.

A *decoction* may be prepared by adding four ounces of bruised dandelion to a pint and a half of water, boiling to a pint and straining. Dose, the same as the infusion.

Extractum Taraxaci.—EXTRACT OF DANDELION.

This extract is the inspissated juice of dandelion prepared in vacuo. It is supplanted by the *fluid extract*, of which the dose is a fluidrachm.

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[1] DUBOIS, Mat. Méd. Indig., p. 166.

[2] Compare JORET and HOMOLLE, Annuaire de Thérap., 1855, p. 180; ibid., 1856, p. 142; Bull. de Thérap., xlviii. 232; Brit. and For. Med.-Chir. Rev., Jan. 1857, p. 258.

HISTORY.—As this plant is very abundant in all parts of Europe it must have been known to ancient physicians, but the name under which it may have been described is uncertain.[1] By Mesue (A. D. 855), and other writers of the Arabian school, it was reputed to be a very efficacious deobstruent and purifier of the blood, and it is for these qualities that it has ever since been employed as a domestic medicine. Towards the close of the last century it enjoyed a professional vogue in consequence of the eulogies lavished upon it by Zimmermann, Van Swieten, Stoll, Hufeland, and Pemberton, as a remedy in chronic affections of the liver and bowels especially, and also in renal calculus, some diseases of the skin, intermittent fever, &c. The general recognition of its diuretic qualities is shown by its popular names of *lectiminga*, *pisse-en-lit*, &c.

ACTION.—The popular notion of dandelion is that it purifies the blood. Hence its young leaves are very generally eaten as a salad, and the unexpanded buds are sometimes pickled. According to Richter, it is of all bitter vegetables the most deobstruent, and as it tends to lessen the crasis of the blood, becomes appropriate when abdominal affections are connected with a febrile movement.[2] The continued use of it is said to enfeeble the digestion and occasion flatulence and diarrhœa, but such effects may very possibly depend upon the decoction or infusion having fermented, which it is extremely apt to do. The general belief, however, is that it is laxative and diuretic. Of the former operation there is more doubt suggested by some cases of Dr. Smyth,[3] in which it appeared rather to confine the bowels.

USES.—The deobstruent virtues of dandelion have been alluded to. Pemberton particularly recommended it[4] in "incipient scirrhus of the *liver* and also in several *chronic derangements of the stomach*." Of its utility in the latter case Dr. Chapman was persuaded. This writer also refers to an observation of Rush, that *liver-grown* cattle are speedily relieved by grazing in fields where dandelion abounds. It is indeed favorably spoken of by many authors in affections which are more or less dependent upon hepatic disease, such as hypochondriasis, jaundice, melæna, hæmorrhoids, amenorrhœa, and ascites, particularly when a febrile or irritative condition of the system is present. Dr. Watson, it is true,[5] says, in regard to its use in liver complaints, "It is very doubtful in my mind whether it ever does much good." We

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[1] STRUMPF, Handbuch, i. 212.
[2] Ausfürlich. Arzneim., i. 343.
[3] Lancet, Nov. 1845, p. 506.
[4] Dis. of Abdom. Viscera, 4th ed., p. 42.
[5] Lectures on Practice (1st Am. ed.), p. 750.

may unite in this doubt as far as regards diseases of an organic nature, but it seems impossible to refuse credit to the recorded evidence of its utility in cases of *dyspepsia* distinguished by obstinate constipation and a scanty or suspended secretion of bile, particularly when these depend upon sedentary habits or mental distress. It was under somewhat analogous circumstances that Wilson Philip strongly advocated its use. In acute dyspepsia, when the symptoms are mild, Dr. Todd advised it to be given in combination with nitrate of potassa and some bitter or aromatic infusion.[1]

In *chronic pulmonary affections*, included under the term phthisis by earlier writers, it has been very strongly recommended, and more recently Hufeland included it among the few and only resources to be depended upon in tubercular consumption.[2] Even Sir James Clark wrote: "That a course of taraxacum steadily pursued for several weeks during the spring or summer will often produce a very beneficial effect."[3] Indeed, when we consider the close relations of the lungs and liver as regards function, and the fatty degeneration which the latter undergoes in phthisis, we cannot but suspect that a substantial foundation exists for the opinions referred to.

ADMINISTRATION.—Dandelion may be given in decoction in the dose of a *wineglassful* two or three times a day. The dose of the infusion is the same. Both are exceedingly apt to ferment.

The *extract* is often rendered worthless by age. In its recent state the dose is from a *scruple* to a *drachm*, given in some aromatic water.

The *fluid extract*, or preserved juice of dandelion, is an excellent preparation. Its dose is *one* or *more fluidrachms*.

BUCHU.

DESCRIPTION.—The leaves of *Barosma crenata* and other species of Barosma, so called on account of its strong odor (βαρυς, οσμη). This plant, which is a native of the Cape of Good Hope, is a small shrub with brownish branches. The leaves are opposite, ovate, or obovate, and more rarely lanceolate, serrated upon the edges, and on the under surface covered with small glandular points. When dried, and as found in commerce, their surface is smooth and greenish, but the under surface is paler.

The leaves of buchu have a peculiar, strong, and aromatic smell, a

[1] Cyclop. of Pract. Med., ii. 653.
[2] Médecine Prat. trad. de Jourdan, p. 345.
[3] Cyclop. of Pract. Med., iv. 335.

bitterish and warm taste resembling that of mint, and, when swallowed, excite a sense of heat in the stomach which diffuses itself over the body. Buchu augments the appetite, promotes digestion, quickens the pulse, favors the secretion of the skin, but still more that of the kidneys, causing a sediment in the urine and giving it an aromatic smell. Large doses produce vomiting and purging. These properties may be attributed to a volatile oil which the leaves contain in the proportion of seven per cent., and which has a strong odor and a very acrid taste, and also to a resinous matter which has been called *diosmin*. Buchu yields its virtues to water and to alcohol.

Infusum Buchu.—Infusion of Buchu.

An ounce of buchu is macerated in a pint of boiling water for two hours in a covered vessel and strained. Dose, one or two fluidounces.

History.—This medicine is derived from the Hottentots, who employ the bruised leaves as an application to recent wounds, and prepare with them an ointment which they use to anoint their bodies. They also use a vinous tincture which they procure by distillation, and consider a sovereign remedy for all chronic disorders of the stomach and bladder.[1] From them the Dutch settlers at the Cape learned the virtues of the plant, and carried a knowledge of them to Holland, whence they first became known to the rest of Europe. In 1821, Dr. Reece published an account of it in England. It was generally employed then as now for dyspepsia, and renal or vesical affections attended with unhealthy muco-purulent secretions.

Uses.—It is chiefly in *chronic affections of the genito-urinary mucous membrane*, accompanied with altered secretion, that buchu is employed, and these it frequently cures completely if they are independent of textural alterations. Thus it is often successful in putting a stop to the undue secretion of the mucous follicles of the urethra, the vesiculæ seminales, or of the prostate, produced by excessive venery or by a habit of self-pollution. But its benefits are still more decided in those cases of catarrh of the bladder which have supervened upon gonorrhœa, or upon the improper use of irritating injections. This affection, which often extends to the ureters, and may involve, even to disorganization, the kidneys themselves, producing great pain, muco-purulent discharge, incontinence or retention of urine, &c., is very successfully combated by the infusion or the tincture of buchu.[2] Clarus relates a case of gleet of three years' standing which was cured in a month by the infusion of buchu;[3] and Sir B. Brodie states that he

[1] Sigmond, Lectures, Lancet, 1837–8, ii. 828.

[2] McDowel, Med.-Chir. Rev., vi. 485.

[3] Arzneimittel., p. 358.

has seen it productive of the most beneficial effects in urinary disorders depending upon disease of the kidneys.

The tonic properties of the medicine make it an appropriate remedy in cases of urinary disease connected with *atonic dyspepsia*. It tends to prevent mal-assimilation of the food and the consequent generation of sedimentary deposits in the urine, while its diuretic property holds the latter in solution, and favors their discharge. *Incontinence of urine*, depending upon irritability of the neck of the bladder, is sometimes relieved by it. Some forms of *dropsy*, and particularly idiopathic anasarca, have been cured by its means. *Rheumatism* and rheumatic *gout*, and chronic *skin diseases*, are also said to have been benefited by this remedy, which has also been used with apparent advantage in *dysmenorrhœa*, *leucorrhœa*, *amenorrhœa*, *uterine hemorrhage* after delivery, and in some cases of *suppressed menstruation*.

ADMINISTRATION.—Buchu is seldom given in substance, but the dose of its powder may be stated at *twenty or thirty grains*. The *infusion* is its ordinary form, and is directed in doses of from one to two ounces. Of the *tincture* (*Dub.*), which is less eligible in urinary affections, the dose is one or two drachms. A *fluid extract* is prepared from this medicine, and may be prescribed in doses of a fluidrachm. A useful infusion is that made with uva ursi, as follows: ℞.—Buchu, uvæ ursi, āā ʒj—ʒiv; hot water, Oj. Digest for half an hour in a covered vessel, and strain. Dose, *half a fluidounce to two fluidounces* every two or three hours.

UVA URSI.

DESCRIPTION.—Arctostaphylos uva ursi, or *bearberry*, is an evergreen, creeping shrub, which grows in open barren places, and in woods, and on mountains, in nearly every part of Europe, but most abundantly in northern latitudes. In America it is found throughout Canada, and as far southward as New Jersey. The leaves, which are the officinal portion of the plant, are obovate, thick, coriaceous, smooth, shining, of a deep-green color above, and on their under surface paler, and covered with a network of veins. The fruit is a red glossy berry, containing an insipid pulp and five seeds.

The taste of the leaves is at first styptic, but afterwards pleasantly bitter and somewhat sweetish, exciting a copious flow of saliva. The bark of the stem is even more astringent than the leaves, but the woody fibre is insipid. The odor of the dried leaves has been compared to that of hay, and also to that of liquorice. The astringency of the

plant is chiefly due to the presence of gallic and tannic acids, which attack iron or its salts added to an infusion of the leaves. A volatile oil, bitter extractive, a crystallizable principle called *ursin*, possessed of diuretic properties, and another called *arbutin*, have been obtained from this plant.

Decoctum Uvæ Ursi.—Decoction of Uva Ursi.

This decoction is made with an ounce of uva ursi boiled in twenty fluidounces of water down to a pint, and strained. Dose, one or two fluidounces three or four times a day.

History.—It is uncertain whether this plant was known to the ancients. In modern practice it would seem to have been first employed by Spanish and Italian physicians, who used it in calculous complaints about 1730–40. Its more general adoption dates from the writings of De Haen in 1756, and of Murray in 1764.

Action.—Uva ursi appears to promote the appetite and confine the bowels when given in small doses; in large quantities it has caused vomiting and purging. It does not display a very evident diuretic operation in a healthy state of the system, but in calculous disorders the urine appears to augment under its influence. Its astringent principle passes off with this secretion, giving it a dark color.

Uses. *Diseases of the Urinary Organs.*—Murray recommended uva ursi in various cases of disease of these parts attended with mucous, bloody, or purulent discharge, with painful micturition, or partial paralysis of the bladder.[1] He held that it caused the expulsion of calculi by augmenting the urine, and that it contributed to blunt the sensibility of the mucous coat of the bladder to the irritation of its contents, to cure chronic catarrhs of the urinary passages, and at the same time to diminish the pain and the frequency of urination. De Haen says: "Persons who suffer from prolonged, obstinate, and copious suppuration of the urinary organs, without venereal taint and without evident signs of stone, are cured, and that permanently, by uva ursi alone." Even in calculous cases, he remarks, "the symptoms are often so completely palliated that pain in passing the urine or in retaining it is no longer experienced. In other cases of apparent cure the relapses have been cured by the same means, and that repeatedly. In other instances again the unfavorable condition of the patient prevented any improvement."[2] According to Dr. Prout, it greatly palliates the symptoms, and Sir B. Brodie employed it with marked advantage in irritable states of the bladder, particularly when dependent upon dis-

[1] Apparat. Med., ii. 76.

[2] Bull. de Thérap., xlvii. 507.

ease of the kidneys.[1] Clarus saw excellent results from its use in these affections.[2] Ferriar[3] gave it in a considerable number of nephritic cases, and always with manifest advantage. His method was to prescribe a saline purge twice a week, and on each of the intermediate days to administer five grains of powdered uva ursi, with half a grain of opium, three or four times a day. He never found larger doses necessary, and in twelve out of sixteen cases obtained permanent relief from pain. Eberle[4] alludes to a case of renal calculus in which this medicine, as prescribed by Ferriar, appeared gradually to remove all symptoms of the disease. Barton testified to its usefulness during the nephritic paroxysm in his own person. Indeed, nearly all in whose hands the remedy has been successful are very emphatic in its commendation, while they insist upon its long-continued use as essential to accomplish a cure, and do not advise a resort to it when there is active inflammation of the urinary organs.

In some cases of *dropsy* uva ursi has proved a useful medicine. Such were probably of an atonic character, and maintained by feebleness of the digestion as well as a general laxity of fibre.

This medicine was very early proposed as a remedy for *consumption*, but Murray states that experience had proved nothing in favor of its presumed efficacy in "purulent phthisis," by which term we must understand *chronic bronchitis*. Dr. Bourne, of Oxford, wrote a work,[5] to prove its value in "pulmonary consumption," but describes his cases as being of "apparently true pulmonary consumption," so that we may reasonably doubt their having been tuberculous. They seem to show that the medicine decidedly moderated the purulent secretion of the bronchia, and diminished hectic symptoms in the same proportion. He prescribed it in powder, and in doses of five grains or more three times a day.

It is asserted by Dr. Harris, of Fayette, Ala., like ergot, to possess the property of causing contractions in the gravid uterus,[6] and the statement has been repeated by Beauvais in France.

ADMINISTRATION.—The dose of *powdered* uva ursi is generally stated to be from *a scruple* to *a drachm*, and the remark is often made that it soon excites extreme disgust. The reader will have observed that the doses which proved so successful in the hands of De Haen and of Ferriar were much smaller, and did not exceed *five grains*. The *decoction*,

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[1] WARING, Manual of Thérap., p. 526.
[2] Arzneimittel., p. 282.
[3] Medical Histories (Am. ed.), p. 56.
[4] Therapeutics, p. 564.
[5] Cases of Pulmonary Consumption, &c., treated with Uva Ursi. 1805.
[6] Charleston Journ., ix. 117.

which is officinal, is more generally employed, in the dose of *a wine-glassful* three or four times a day. The *extract* may be given in doses of from *five to fifteen grains* two or three times a day.

CHIMAPHILA.—Pipsissewa.

Description.—Chimaphila umbellata, pipsissewa, or wintergreen, is found in the northern countries of Europe and Asia, but more abundantly in the United States. It is a humble shrub of not more than from three to six inches in height, with lanceolate, serrated, dark-green, and coriaceous leaves in irregular whorls, and bearing white flowers tinged with red. The root is long, creeping, and yellowish. All parts of the plant are medicinal, but the leaves only are officinal. When fresh they exhale a fragrant odor, which they lose on drying. Their taste is bitterish, astringent, and sweetish, and the roots and stems haye, in addition, a marked pungency.

History.—This plant was long in use among the aborigines of this country, and through them it became a popular domestic remedy. It was noticed by Schoepf, who described it as astringent and tonic; but the first detailed account of its properties is contained in the inaugural dissertation of Dr. Mitchell at the University of Pennsylvania in 1803. Less attention, however, was attracted by this essay than by a paper of Dr. Somerville, referred to below, and which was published in 1814. From the latter date the medicine has been extensively employed, and its virtues are now generally recognized.

Action.—The bruised leaves sometimes produce redness, and even vesication, when applied to the skin, as Dr. B. S. Barton first observed. Internally, the plant is diuretic, tonic, and astringent. According to Somerville,[1] its diuretic virtues are indicated by the name *l'herbe à pisser*, which the French Canadians gave to it. This writer, who observed them himself very unequivocally in several cases, says "it generally increases the secretion of urine, and retains its influence on the kidneys for some time; it occasionally acts as a tonic, and in all cases is free from those offensive, and even deleterious, qualities which frequently interdict the application of some of the most powerful diuretics." Like uva ursi, it imparts a dark color to the urine, particularly when given in decoction or infusion. This effect is due to the tannin it contains. In other respects, too, it so closely resembles uva

[1] Med.-Chir. Trans., v. 347.

ursi, that the one medicine may be substituted for the other; but wintergreen is the more acceptable to the stomach.

USES.—Dr. Somerville found chimaphila very useful as a diuretic evacuant in several cases of *dropsy* which appear to have depended upon organic and incurable lesions, and he refers to similar cases which were treated by Satterley and Marcet. Dr. Chapman regarded it as distinguished for the activity and certainty of its diuretic operation, while it acted upon the stomach as a tonic.[1] Direct experience, and the inferences allowable from the physiological action of the medicine, seem to point to cases of atonic and cachectic dropsy as the most suitable for its employment. But there is very little evidence to be found of its possessing curative powers of a high order.

Chimaphila was used by the aborigines and early settlers of America as a remedy for *rheumatism* and for *nephritic disorders*. The former applied the bruised leaves to the affected joints, while they administered a hot decoction of the plant, so as to excite profuse perspiration. They were also in the habit of using it for all disorders in which the secretion of urine was diminished. Dr. Ives says:[2] "It will be granted by all who are familiar with its operation, that as a diuretic it has unquestionable merit, and that, like *uva ursi*, it will frequently mitigate symptoms of gravel, and strangury proceeding from other causes. I have given it, alternately with uva ursi, in *hæmaturia*, the effect of severe and long-continued gonorrhœal inflammation, with the most obvious benefit."

According to Chapman, its reputation for usefulness in *scrofula* is such as to have gained for it the provincial title of the "king's cure." This writer states that it is best suited to open scrofulous *ulcers*, for which the decoction may be used internally, and also externally as a wash. It is sometimes employed as a domestic remedy for the same disease. Dr. Ives states that in some instances it has appeared to be of service in chronic *cutaneous eruptions*. It has also been used successfully in the treatment of *intermittent fever*, of *chronic diarrhœa*, *leucorrhœa*, and *gleet*.

ADMINISTRATION.—The best form of this medicine is the officinal *decoction*, of which *a pint* may be given in the twenty-four hours. A fermented decoction is also used as a diet drink. The watery *extract* is sometimes prescribed in doses of *twenty* or *thirty grains* three times a day. A *syrup* of chimaphila has also been prepared by Prof. Procter, of Philadelphia, and a *fluid extract* by many druggists.

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[1] Therapeutics, i. 299.

[2] PARIS's Pharmacologia (3d Am. ed.), ii. 283.

JUNIPERUS.—JUNIPER.

DESCRIPTION.—Juniper is the fruit of *Juniperus communis*. This shrub is a native of Europe, but has been naturalized in America. It is an evergreen, and where it grows in rocky soils and hilly situations is of low stature, but in warmer and more genial localities reaches twelve or fifteen feet in height. The branches are close, the leaves narrow, sharp, channelled, and of a deep-green color. The fruit (*galbulus*) is a fleshy berry, of the size of a small pea, of a dark-purplish color, covered with a greenish bloom, and containing three angular seeds. Their taste is sweetish, bitter, and aromatic. The whole plant diffuses a strong but agreeable odor, which it derives from its essential oil, and which has led to its being used to fumigate ill-smelling places. This oil is most abundant in the berries when they are upon the point of ripening. Later than this, it is converted more or less completely into a resin. The tops may be used for the same purposes as the berries.

Infusum Juniperi.—INFUSION OF JUNIPER. *Dub.*

To an ounce of bruised juniper berries half a pint of boiling water is added, infused for an hour in a covered vessel, and strained. Dose, two or three fluidounces.

Spiritus Juniperi Compositus.—COMPOUND SPIRIT OF JUNIPER.

This preparation is made by dissolving oil of juniper a fluidrachm and a half, and oil of caraway and oil of fennel each ten minims, in a gallon of diluted alcohol. Dose, from two to four fluidrachms. It is an appropriate addition to the infusion of juniper, and that of other stimulant diuretics.

HISTORY.—It is probable that this medicine was known to ancient physicians, but the name under which it was described by them is now only a matter of conjecture.

ACTION. *On Animals.*—Some experiments by Semon upon rabbits, with oil of juniper, gave the following results:[1] An ounce destroyed a vigorous rabbit in about twenty hours, and the odor of the animal's secretions proved that the oil had been absorbed. The symptoms produced resembled those from oil of turpentine. The heart beat quicker and harder, and then gradually more feebly; the breathing grew more rapid and labored; there was diuresis and diarrhœa, and finally death by exhaustion. The bowels and kidneys exhibited a congested state, but no inflammation.

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[1] MITSCHERLICH, Lehrbuch, ii. 266.

On Man.—Juniper berries are stomachic and carminative, in virtue, probably, of their volatile oil and resin, and are found to stimulate the appetite and digestion. In large doses, they are said to quicken the circulation, and at the same time to augment the cutaneous transpiration and the urine, to the latter of which they give, like turpentine, an odor of violets. According to Alexander, the oil of juniper is a very active diuretic.[1] Their specific operation upon the kidneys is so decided that the continued employment of the powdered berries has occasioned bloody urine.[2] They are also reputed to possess emmenagogue properties. Oil of juniper applied to the skin, and allowed to evaporate, produces a slight and transient redness, but no vesication; but it is apt to blister if prevented from evaporating.

Uses.—Juniper berries augment the urine, and act as a healthful stimulant in chronic affections of the *bladder*, and particularly when the tone of this organ is impaired, inducing retention of urine. In chronic *vesical catarrh*, and in *gonorrhœa* and *gleet*, they have been used with success. Their advantages are particularly apparent when the *urine* as well as the cutaneous transpiration are *diminished by cold*, or by inactive or *sluggish habits* of life. Under these circumstances. according to Richter,[3] they prevent the development of cutaneous eruptions, and of abdominal derangements which may eventuate in organic disease. Their diuretic and healing qualities become very useful in cases where *sabulous matter* and small calculi are passed with difficulty, or create by their presence a mucous or purulent secretion from the urinary passages.

Several writers have extolled them in *dropsy*. Richter praised them especially in *scarlatinous* dropsy; and Van Swieten says[4] that he often found a strong infusion of these berries to suffice for the cure of *ascites* or *anasarca*, when the disease was not quite inveterate. But, he adds that it should be made with a large quantity of the berries, as the body easily bears this remedy. The late Dr. Otto was in the habit of using the following prescription with success, and we can testify to its efficacy: Take half an ounce of bruised juniper berries, half an ounce of cream of tartar, and a pint of boiling water. Make an infusion which is to be taken at intervals during the twenty-four hours. The acetate of potash may be substituted for the bitartrate in one-half the dose. Other diuretic mixtures and infusions of which juniper forms an active ingredient, are given in the formularies. In *scurvy*, the infusion is reputed to be serviceable, and it is much used by the people as a "purifier of the blood."

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[1] Experimental Essays, p. 151.

[2] Piso, in Murray, App. Med., i. 49.

[3] Ausfürlich. Arzneim., ii. 108.

[4] Commentaries, § 1243.

As an *external* application to *painful swellings*, and for *local pains* generally, poultices containing bruised juniper berries are much used in Europe. *Fumigations* made by throwing the berries or shavings of the wood upon hot coals are also employed to assuage pain and promote perspiration in *rheumatism*.

ADMINISTRATION.—The *infusion* (*Dub.*) prepared as already directed may be taken in the course of twenty-four hours. Other diuretics can be added to it if necessary, such as the salines referred to above, or parsley, buchu, horseradish, &c., or the berries may be introduced into a hot decoction of chimaphila, broom, &c. The *oil of juniper* is more stimulant than the infusion, and may be associated with various diuretic medicines in the atonic forms of dropsy. It is often used in the form of Holland gin, to which it imparts its peculiar flavor and diuretic qualities. The dose is from *five* to *fifteen* or *more drops*. The *compound spirit of juniper* is used for the same purposes as the oil, in doses from *two* to *four fluidrachms*.

Oleum Empyreumaticum Juniperi.—OIL OF CADE. HUILE DE CADE.

This is an empyreumatic oil, obtained by the dry distillation of juniper wood (*Juniperus oxycedrus*). It is a brownish, syrupy fluid, with a strong odor of tar, and a disagreeable, acrid, and burning taste. It does not irritate the sound skin, but its application to ulcerated surfaces is painful and irritating. It is manufactured in the South of France, where it is much used by farmers in treating the skin diseases of their cattle. It was introduced into medical practice by M. Serres (d'Alais), and fully tested by Dévergie, in various diseases of the skin.[1] It would appear that the purity of the preparation is essential to its successful use, and, at the same time, that it is seldom to be found pure. The diseases in which it has been mainly curative are *chronic eczema* and *psoriasis*, after the complete disappearance of the acute symptoms, and in *lupus*, for which it may be used as an adjuvant to internal means. Dr. Chapin employed this oil with striking advantage in *sycosis*, *eczema*, *impetigo*, and *ichthyosis*. The following formula is that which he considered the best: ℞.—Oil of cade ʒij; glycerin ʒv; solution of subacetate of lead ʒj.—M. S.—To be rubbed over the affected part every night. When the disease affects a large surface, a mixture of one part of oil of cade to seven or eight parts of cod-liver oil, or lard oil, may be substituted for the glycerin compound.[2]

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[1] Bull. de Thérap., xxxvi. 104, and xxxiv. 49; DÉVERGIE, Maladies de la Peau, p. 111, and p. 255.

[2] Boston Med. and Surg. Journ., April, 1859, p. 215.

The oil is sometimes applied pure, and in that case the slightest possible film is laid upon the affected part, but not oftener than once in from two to four or five days. This mode of application is the best, but, if an ointment is preferred, it may be made as above described, or according to Dr. Wilson's formula: ℞.—Oil of cade ℥j; suet ℥vj; lard ℥ij. Melt with a gentle heat to make an ointment.

COPAIBA.

Description.—Copaiba is a resinous exudation obtained from various species of Copaifera, which grow in South America and the West Indies. The C. officinalis is described as a lofty and elegant tree with a dense canopy of foliage. The leaflets are in pairs of from two to ten, and are more or less elliptical in shape. The flowers are whitish and in terminal branched spikes. The fruit is an oval pod containing a single seed.

The juice, which is exceedingly abundant, is obtained by means of incisions made in the stems of the tree. It is a clear transparent liquid, of an amber color, and of about the consistence of olive oil. Its odor is aromatic, and at first rather pleasant; the taste is hot, bitter, and nauseous. It is insoluble in water, but dissolves entirely in ether, alcohol, oils, and strong alkaline solutions. It forms with alkalies, a kind of soap which is insoluble in water. With one-sixteenth of its weight of magnesia, it forms a solid mass which has been used to form pills. Its constituents are chiefly a volatile oil, and a resin which yields copaivic acid. Copaiba contains one-half or even more of its weight of essential oil. It is of a light greenish hue, or, if perfectly fresh, is colorless, and is soluble in alcohol.

The officinal preparations of copaiba are these:—

Oleum Copaibæ.—Oil of Copaiba.

This oil is procured by the distillation of copaiba and water. Dose, ten or fifteen drops.

Pilulæ Copaibæ.—Pills of Copaiba.

Two ounces of copaiba are mixed with a drachm of magnesia, and set aside to harden. It ultimately becomes quite brittle.

History.—The earliest account of copaiba is that which was furnished by Piso, in 1648. This writer says that it cures leucorrhœa, diarrhœa, and gonorrhœa, and he refers to injections of it in the last named disease. Marcgrave, who wrote at the same period, speaks of its virtues in dysentery, and other intestinal fluxes. Morton (1720) included it among the balsamic medicines proper in consumption.

From his time to that of Hunter, this medicine seems to have been more used for the treatment of bronchial affections than of gonorrhœa, but at the present day it is universally prescribed for the latter disease, and is regarded in the light of a specific for its cure. Even Hunter was far from appreciating its value, for while admitting that it lessens the disposition of the parts to form matter, he asserts that "not having at the same time the power of lessening the inflammation, it can be of little service."[1]

Action.—The operation of copaiba, according to Ricord, who has most completely investigated the subject, takes place upon the stomach, the bowels, the urinary apparatus, and the skin, and in some rare cases upon the nervous centres.[2] Upon the stomach it shows its action, by gradually destroying the appetite, exciting eructations with the characteristic smell and taste of the drug, or else nausea, retching, and even vomiting, with gastric distress. When it disagrees with the stomach, it is apt at the same time to purge. Upon the urinary organs its influence is more uniform and more evident. It somewhat augments the quantity of this secretion and imparts to it a deeper color, a bitter taste, and a peculiar smell, which is somewhat fragrant. On standing, its surface is apt to be covered with an iridescent pellicle, and it becomes turbid from the presence of resinous matter, which may be distinguished from albumen by its not readily subsiding, as well as by its not answering to the tests for the latter substance. When the dose has been unduly large, it excites some heat and tenesmus in urinating, as well as a frequent desire to pass water, and even hæmaturia, and, at the same time, a feverish excitement of the whole system, fulness and frequency of the pulse, headache, and thirst.

Copaiba is evidently absorbed into the general circulation. This is clearly proved by the characteristic odor which it gives to the breath, by its modification of the urine, by its action upon the skin, and by its influence upon bronchial inflammations. It is, however, asserted by Ricord, that when it produces cutaneous eruptions its operation on the urinary passages is very slight. These eruptions were first noticed in 1814, by Montégre, who described certain red spots as appearing upon the skin whenever the urethral discharge was suspended. Delpech noticed a miliary eruption connected with gastric disturbance.[3] Armstrong also observed itching and an eruption of the skin produced by copaiba.[4] In 1828, Dr. Hewson, of Philadelphia,

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[1] Works, Amer. edit., ii. 80.

[2] A Treatise on the Venereal Disease, by John Hunter, &c., Am. ed., 1853.

[3] Bayle, Bibl. de Thérap., i. 355.

[4] On Fevers, Am. ed., p. 474.

published a notice of several such cases. In two of them the eruption resembled urticaria, and in two others it had the characters of roseola.[1] Mr. Judd has also described "a puniceous mottled eruption," and one of maculæ, and Desruelles observed urticaria proceeding from this cause. These eruptions are most apt to occur when the medicine disagrees upon the stomach, and they indicate that it is no longer acting favorably upon the disease. Indeed, Ricord states that it is not uncommon to see patients in whom the running, after having been dried up, reappears along with the cutaneous eruption.

As regards the action of copaiba upon the nervous system, it may be stated that Ricord has met with cases in which too large a dose, or the untimely administration of the medicine, has occasioned alarming symptoms. In one temporary hemiplegia was produced, which ceased upon the occurrence of a rubeolar eruption; and in another an attack of convulsions was terminated in like manner.

Oil of copaiba acts very much as copaiba itself, but less powerfully. According to Mitscherlich, it is poisonous to rabbits in doses of an ounce or more. The symptoms produced by it are hurried breathing, and palpitation of the heart, restlessness, frequent micturition, loose alvine discharges, which at last become mucous and bloody, and at last death by asthenia. The gastro-intestinal mucous membrane after death does not exhibit inflammation, but only a partial destruction of the epithelium. Upon the human skin this oil acts very feebly as an irritant.

Uses. *Gonorrhœa.*—As already noticed, the use of copaiba in gonorrhœa dates from the introduction of the medicine into Europe, and seems to have been borrowed from the natives of South America. But it was first brought into more general use in the last century by Hunter and by Swediaur. The method of these physicians was not calculated to abridge very much the duration of the disease, for they employed the remedy very seldom before the natural period of its decline. In this, too, Cullen agreed with them,[2] and the greater number of English practitioners of the present day adopt the same temporizing method. It undoubtedly succeeds, but only by a tedious cure. A different method is generally to be preferred whenever the inflammatory symptoms are not severe. In 1804 a patient of Ribes, of Paris, took by mistake an ounce of copaiba at a single dose. He was purged, suffered colic, and loss of appetite, but the gonorrhœa he labored under was cured. In 1812 Ansiaux adopted the plan of giving

[1] N. Amer. Med. and Surg. Journ., v. 72.

[2] Mat. Med., ii. 192.

Chopart's mixture[1] from the very beginning of the attack, and found that it often produced a speedy cure.[2] In English medicine the first trace of the new method is contained in the writings of Armstrong (1818), who states that he adopted it on the suggestion of Dr. Dawson who had followed it for several years. Armstrong employed the remedy in the very first stage of virulent gonorrhœa, and he concluded from his own experience that it would not fail once in twenty times completely to arrest the progress of disease, provided it be given in sufficient doses, and continued for several days after the cessation of the discharge. Subsequently, Delpech[3] (1822) directed, that after reducing the inflammation, if necessary, by local and general depletion, a drachm of copaiba should be given night and morning, increasing the dose gradually to twice this quantity three times a day, and adding opium to it if it purged. Ricord adopts the same plan, and carries the dose, when necessary and it can be tolerated, even to an ounce in the twenty-four hours. Clarus, in Germany, pursues a somewhat more cautious method. In the beginning of the attack he prescribes a weak emulsion (ʒj to ℥vj), gradually increases the proportion of copaiba to ʒiij, and then gives it pure in doses from twenty to forty drops three times a day.[4] Objections have been brought against the large doses recommended above. They are said to have produced great inconvenience by causing an irritable and even an inflammatory condition of the bladder. Something of this we have witnessed as well as pain in the region of the kidneys, but are disposed to regard it as unusual, and as not forming a valid objection to a plan which, when successful, so remarkably abridges the disease for which it is given. It is important, if possible, to commence the treatment in the very forming stage of the attack, for then it can generally be arrested; next, it should not be employed in cases of an inflammatory type without previous antiphlogistic measures; and, again, the medicine should be continued, and gradually diminished in quantity, for several days after the running has ceased.

The results here stated throw light upon the mode in which copaiva produces a cure. Its mode of action seems to be that of substitution. It excites in the diseased mucous membrane, over which it passes, mixed with urine, an action which is inconsistent with the original morbid process. Cullen long ago said of the cure of gleets, "I am

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[1] ℞.—Mint-water, alcohol, copaiba, syrup, āā ℥ij; spirit of nitric ether ℥j; orange-flower water ʒij.—M. S.—Two tablespoonfuls in the morning, one at noon, and one at night; and continue for twelve days.

[2] Dict. de Méd. en 60 vols., vi. 240.

[3] Bib. de Thérap., i. 371.

[4] Arzneimittellehre, p. 758.

persuaded that turpentine, or what is much the same, the balsam copaivæ, operates only by inducing some degree of inflammation upon the urethra,"[1] and Mr. Headland, in the most recent work on the action of medicines,[2] remarks, that it cures by stimulating the glands, and increasing the healthy function to displace the morbid one. It is only in this manner that the effects of the remedy can be explained. Otherwise we must regard it as a specific, which is unnecessary, or, like Giacomini, as a sedative, which is absurd.

It is because the active principles of copaiba are excreted with the urine that we are enabled with comparatively so much ease to cure gonorrhœa. This has been proved by a conclusive experiment. Three cases of the disease occurring in persons affected with hypospadias, came under the care of M. Ricord. The purulent secretion flowed from the urethra, in the portion anterior to the accidental opening, as well as from that behind it. But the administration of copaiba cured the latter, without relieving the former, until the medicated urine was made to pass through the whole length of the urethra, when the discharge in the anterior portion likewise ceased. This interesting experiment explains why it is that in females vaginal gonorrhœa is so much more difficult to cure than urethral; for in the latter the copaiba does not come directly in contact with the diseased parts. Some experiments have been tried to cure the disease by injecting emulsions of copaiba into the urethra, as Piso did two hundred years ago; but they have usually failed, because, probably, the urine remains unmodified, and irritates the inflamed part in its discharge. Marchal made use of injections of the pure balsam, of an emulsion containing it, and of bougies smeared with it. His success does not appear to have been very great.[3] Mr. Dallas, of Odessa, used several times a day injections of the following emulsion: ℞.—Copaiba ʒv; yolk of egg No. i; extract of opium gr. j; water ℥vij; and is stated to have employed it, without any other remedy, with complete success.[4]

The disgust which patients are apt to acquire for copaiba led Velpeau to try its administration by the *rectum*. He used it in doses of two drachms at first, which were gradually increased to six drachms, made into an emulsion with a small proportion of laudanum added, taking care that the bulk of each dose should not be sufficient to induce its expulsion, or to cause burning by its contact with the anus.

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[1] Mat. Med., ii. 182.

[2] On the action of Medicines, p. 255.

[3] Ranking's Abstract (Am. ed.), xv. 166.

[4] Brit. and For. Med.-Chir. Rev., July, 1856, p. 265.

The treatment was successful in nearly all of the cases, but neither so speedily nor so often as the ordinary one.[1] Ricord admits the occasional efficacy of this method, but affirms that the medicine is ten times more certain to cure when given by the mouth. Ratier used, instead of injections, the copaiba capsules introduced into the rectum beyond the sphincter, after well anointing the part.

Vesical Catarrh.—Numerous authors, including Hoffmann, Bretonneau, Barbier, Delpech, and Dr. La Roche, have found copaiba very serviceable in the treatment of this affection. According to Dr. La Roche,[2] moderate doses are the most successful, because they agree better with the stomach, and can be continued for a longer time. He also advised that the medicine should be occasionally suspended, in order to allow the stomach an opportunity of recruiting, and to prevent the risk of too constant an irritation of the affected parts. Other physicians (Souchier, Dévergie, Pidoux) employed injections of copaiba into the bladder in these cases, even to the extent of two ounces, with a like quantity of barley-water, and, as it would seem, successfully.[3]

Some writers have thought that copaiba, when given freely, disposes to *hernia humoralis;* but Ribes asserts, on the contrary, that nothing so soon reduces engorgement of the testicle, and that its use renders quite unnecessary all local applications, and even a suspensory bandage. Delpech made a similar observation. Although these results, and some general considerations that might be adduced, seem to favor the method, it does not appear to have been much employed, perhaps because it seemed more hazardous than it really is. Armstrong[4] found copaiba very beneficial in some cases of simple *leucorrhœa*, that is, of leucorrhœa uncomplicated with disease of the uterus or its appendages. Mitscherlich expresses a similar opinion, and Dr. La Roche furnishes several cases which sustain this favorable judgment. Dr. Churchill,[5] on the other hand, states that it did not succeed in the cases in which he tried it. In ulcerated *hæmorrhoids* it has been recommended by Cullen and Bell.

Next to its virtues in the cure of gonorrhœa, the power of copaiba over certain *bronchial affections* is the most remarkable. This, in fact, was one of the virtues earliest assigned to it, and several writers recommended it in consumptions, including in that term the diseases now referred to. Fothergill was one of the first (1769) to point out its injurious effects in consumptions attended with *bloody and purulent*

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[1] Bibl. de Thérap., i. 383.

[2] Am. Journ. of Med. Sci., iv. 13.

[3] Trousseau and Pidoux, Thérap., ii. 619.

[4] Practical Illustrations, &c. (Am. ed.), p. 558.

[5] Diseases of Females (Am. ed.), p. 32.

expectoration,[1] meaning thereby cases of pulmonary tubercles. Other writers of the same, or the immediately subsequent period, among whom Hoffmann, Valcarengh, and Monroe, may be mentioned, speak highly of its benefits in chronic pulmonary affections. In 1809, Hallé pointed out the curative properties of copaiba in chronic bronchitis, which he well distinguished from tubercular consumption.[2] In 1818, Armstrong[3] held it to exert a specific influence over chronic inflammation of the mucous membrane of the trachea and bronchia. He gave large doses, such as from thirty to eighty drops three times a day. This writer also alludes to, and commends, a favorite remedy of Morgagni in chronic complaints of the lungs, and which consisted of copaiba combined with sulphur. In 1827, Dr. La Roche, of Philadelphia,[4] in an essay which is valuable for its practical observations, demonstrates clearly the great advantages of this medicine in chronic bronchial inflammations. More recently it appears to have been much prized for the same purpose by Bellinghiere and Bertini, of Turin.[5] To these evidences we are enabled to add some personal experience of its value, which we believe to be equalled by that of no other medicine in chronic bronchitis unattended with fever. In cases attended with hectic, the copaiba, although far from always aggravating the symptoms, is still less generally beneficial, until the fever has been reduced somewhat by other means.

In protracted and obstinate *dysenteries*, copaiba was proposed by Armstrong as a means of healing the intestinal ulcers.[6] He remarks that it was formerly used for this purpose, and that we have been perhaps too hasty in discarding it. Dr. La Roche has likewise recommended it in the declining stage of acute dysentery when the stools are mucous rather than bloody.[7] Dr. Hatheway, of Illinois, speaks of it as a specific in dysentery, and is disposed to regard it as such at all stages of the disease.[8] Mr. Robarts has reported it to be very effectual in *chronic gastro-enteritis*, when given in doses of from seven to ten minims three times a day, made into an emulsion.[9]

Copaiba has been used with oil of amber and oil of turpentine to cure *nocturnal pollutions* depending upon debility of the sexual organs; also in chronic *irritability of the bladder* depending upon anterior gonorrhœa and excessive venery. Labat (1740) recommended it as

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[1] Works, ii. 122.
[2] Œuvres de Tissot, i. 462.
[3] Practical Illustrations, &c., sup. cit.
[4] N. Amer. Med. and Surg. Journ., iii. 34.
[5] Am. Journ. of Med. Sci., xlv. 192.
[6] Op. cit., p. 556.
[7] Am. Journ. of Med. Sci., xxiii. 258.
[8] New York Journ. of Med., Dec. 1853, p. 56.
[9] Lancet, ii. 1839–40, i. 569.

having proved an efficient remedy for *intermittent fever* during an epidemic of this disease at Nantes. M. Hardy found the internal use of large doses of copaiba advantageous in some cases of *psoriasis*.[1]

As a *local* application, copaiba was formerly used as a dressing for wounds and sores, whence its popular name of *balsam*. In recent times, Sachs has recommended it strongly as an application to the *sore nipples* of nursing women. He assures us that if used before there is an absolute loss of substance, but only increased tenderness and commencing abrasion or fissure, it will arrest the evil. He directs it to be applied upon fine linen compresses, which, if they adhere, can be removed by moistening them with the balsam; and also that the nipples should be washed with warm milk before the child is allowed to nurse.[2] Dr. Ruschenberger advises it as an application to *chilblains*, for which, like other terebinthinate stimulants, it is an excellent remedy.

ADMINISTRATION.—Copaiba may be given pure floated upon the surface of water, on which a few drops of tincture of gentian are then poured; or enclosed in gelatinous capsules; or solidified by magnesia; or in emulsion prepared with mucilage or yelk of egg and some aromatic water, to which a few drops of laudanum may be added if the bowels are relaxed. The dose will vary, according to circumstances, from *ten drops* to nearly *an ounce* in twenty-four hours; but the latter quantity should be reached gradually, and given only where the medicine is thoroughly tolerated.

The *oil* of copaiba may be used for the same purposes as copaiba itself, and may be given in doses of from *twenty drops* to *one* or *two drachms*. It may be taken on a lump of sugar or in emulsion.

CUBEBA.—CUBEBS.

DESCRIPTION.—Cubebs are the dried unripe fruit of *Piper cubeba*, a climbing perennial plant which grows wild in Java and the Indian Archipelago. They are of about the size of a small pea, of a blackish-brown color, rough, and furnished with a small footstalk. The shell is woody, and contains a hard, round seed, which is white within and oleaginous. They have an aromatic odor and a warm, peppery, and camphoraceous taste. Cubebs contain about ten per cent. of an essential oil, besides cubebin, resin, &c. The oil is transparent and color-

[1] Bull. de Thérap., lii. 268. [2] Handworterbuch, &c., I. Abth., II. Theil, S. 303.

less; it has a specific gravity of 0.929, the characteristic odor of the berries, and a hot, aromatic taste. Cubebin, when pure, is without smell or taste, and is soluble in alcohol and oils. It is closely analogous to, if not identical with, piperin.

The officinal preparations of cubebs are the following:—

Extractum Cubebæ Fluidum.—Fluid Extract of Cubebs.

This extract, which is an *oleo-resin*, is obtained by treating powdered cubebs with ether in a percolator, and distilling and evaporating the ether used in the process. Dose, from five to thirty minims.

Oleum Cubebæ.—Oil of Cubebs.

This oil is obtained from ground or powdered cubebs by distilling them with water. Dose, from ten to fifteen drops.

Tinctura Cubebæ.—Tincture of Cubebs.

This tincture is prepared with four ounces of bruised cubebs and two pints of diluted alcohol, by maceration, expression, and filtration. It is seldom used, but its dose is stated at half a fluidrachm as a carminative, and at two or three in gleet.

History.—The Greeks and Romans do not appear to have been acquainted with this medicine. Pereira, it is true, is inclined to the opposite opinion, because the ancients made use of the word μιρτίδανον, which the modern Greeks apply to cubebs. But it is more probable that they used the word generically, much as the word *piper*, and even *pepper*, is now employed; thus, we say piper longum, piper caudatum, red pepper, black pepper, &c. Several Arabian writers describe it as possessing diuretic virtues, and as fitted to cleanse the kidneys and bladder of sand and gravel.[1] Matthiolus[2] discusses the question of the identity of this medicine with the *capsicum* of Galen, and concludes it to be different. He describes its virtues as being chiefly stimulant. For these qualities it was used in Europe during the middle ages, and afterwards in the treatment of leucorrhœa, sterility, and impotence.[3] Acosta, who has a very interesting account of cubebs, says that the Oriental physicians use them to comfort the stomach, to resolve the enlarged and oppressed spleen, to expel flatulence, and to stimulate the womb; but that the principal object for which they employ them, and that in large quantities, is to promote the venereal appetite.[4] Alston, and the authorities he quotes, give no other account of the medicine than this.[5] In the East Indies it has long been employed as

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[1] Ebn Baithar, Heil- und Nahrungsmittel, i. 344.

[2] Commentaries, liv. i. chap. x.

[3] Strumpf, Handbuch, i. 696.

[4] Delle Droghe Medicinali, &c., 1585.

[5] Materia Medica, ii. 281.

a popular cure for gonorrhœa.[1] From thence it was introduced into Europe, in 1818, by two English surgeons, Mr. Adams and Mr. Crawford.[2] Pereira states, however, that cubebs were in use in England more than five hundred years ago, for in 1305 Edward I. granted to the corporation of London the power of levying a toll of one farthing a pound on this article in its passage over London bridge. But it was employed only as a condiment.

Action.—Crawford, in his original description of cubebs, referred to above, says that it occasions, but not always, a slight purging (in which, we may remark, that a sense of warmth is felt about the rectum), imparts to the urine its peculiar odor, and augments its quantity. Now and then it causes flushing of the face and a burning heat in the palms of the hands and the soles of the feet. Its continued use does not appear, like that of copaiba, to derange the digestive function and destroy the appetite. Crane noticed that it sometimes appeared to increase the venereal excitement and a sense of heat about the rectum and perineum.[3] More recently, Clarus assures us that when given in the inflammatory stage of gonorrhœa it may occasion violent inflammation of the neck of the bladder.[4] Crane further remarked that it occasionally produces mental irritation and anxiety, and, if the dose is too large, nausea and vomiting. These effects resemble those observed by Pul in experiments upon himself. He found that doses of a drachm only caused some thirst and heat in the throat, two drachms slight feverishness, and three drachms nausea, eructation, heat at the epigastrium, headache, malaise, and an ephemeral fever.[5] A singular view of the medicine's operation is taken by M. Dieu,[6] who alleges that its action is sedative, and is curative because it is sedative. In support of this notion he cites several cases of gonorrhœa, cured by cubebs, in which, during the progress of the cure, the pulse fell from 70 to between 40 and 50. But he neglects altogether the influence of rest, low diet, and the subsidence of pain and inflammation, which suggest themselves as the more probable causes of the alleged phenomena.

An eruption resembling urticaria is sometimes produced by this medicine, as it is by copaiba. Several cases of the sort—and the first, it is believed, on record—were reported by Mr. Crane in 1832.[7] A case was observed by Dr. Cazentre, of Valparaiso, of death attributed

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[1] Ainslie, Mat. Indica, i. 98.

[2] Edinb. Med. and Surg. Journ., xiv. 32, xv. 61.

[3] Ibid., xxi. 302.

[4] Speciell. Arzneim., p. 728.

[5] Mitscherlich, Lehrbuch, ii. 240.

[6] Mat. Méd., iii. 336.

[7] Lond. Med. and Phys. Journ. (N. S.), xii. 195.

to cubebs.[1] The symptoms were congestion of the face, dilated pupils, insensibility, a slow, feeble, and irregular pulse, and rattling respiration, and the lesions consisted of vascular engorgement of all the great viscera, and of the right side of the heart. Such effects naturally suggested a doubt as to the character of the powder taken; and subsequently, on being analyzed by Mr. Procter, of Philadelphia, it was found to contain thirty per cent. of opium.

The action of oil of cubebs upon *rabbits* has been studied by Gödecke.[2] He found that in the dose of an ounce it acted poisonously upon these animals, and produced symptoms like those of the essential oils generally, and especially like that of copaiba, but more strongly characterized. It penetrates the urinary organs and the peritoneum, provokes diuresis, quickens the pulse, excites diarrhœa, produces vascular injection of the gastric mucous membrane and of the kidneys, and renders the urine albuminous.

Uses. *Gonorrhœa.*—The earlier observations in regard to the use of cubebs in this disease have been confirmed by subsequent experience. Crawford (1821) found that it cured the great majority of cases within three weeks, and was most successful in the mildest and most recent cases.[3] This was also the result of Mr. Jeffrey's practice. He exhibited cubebs in all the stages and under all the circumstances of the complaint, without any bad results.[4] Delpech confirmed these statements,[5] and also Velpeau, who administered the medicine by the rectum.[6] Sir Astley Cooper, who was one of the first to employ cubebs in the acute as well as in the chronic forms of the disease, spoke highly of its effects, and remarked that when the inflammation is just beginning, the medicine often succeeds in removing it in a very short time.[7] Ricord regards cubebs as hardly inferior to copaiba in the treatment of gonorrhœa. But he prescribes it in doses which would scarcely be tolerated for many days. Thus, he directs from *four* to *fifteen* drachms to be taken in the twenty-four hours.[8] Pereira is equally an advocate of a liberal use of the medicine, and directs as large doses as the stomach will bear, to be given in the early stages of the disease, considering it to be fully proved that it is more efficient then than at a later period. He does not even look upon active inflammation of the urethra as contraindicating its use, although he admits that it may occasionally aggravate the symptoms, as we have shown it may do by a reference

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[1] Am. Journ. of Med. Sci., April, 1833, p. 304.
[2] Clarus, op. cit., p. 727.
[3] Med.-Chir. Trans., xii. 99.
[4] Med.-Chir. Review, ii. 271.
[5] Archives Gén., iii. 601.
[6] Ibid., xiii. 47, 53.
[7] Lancet, May, 1824, p. 201.
[8] Bumstead's edit. of Hunter, p. 118.

to Clarus. But cases of the sort are not numerous enough to warrant our withholding such doses of the medicine as alone are curative. The remarks of MM. Trousseau and Pidoux upon this subject are just. They say the intensity of the inflammation, the painful swelling of the penis, the abundance and virulence of the discharge, and the fever which sometimes attends, are less formidable in reality than in appearance, and often accompany a discharge which is more easily curable than some which are very obstinate in spite of their apparent mildness. It is not, however, easy to determine how far, if at all, antiphlogistic measures should precede the use of cubebs. Undoubtedly they must sometimes be resorted to, not merely on account of the symptoms just referred to, but also on account of an undue and excessive development of those symptoms.[1] On the whole, it would appear that the inflammatory element, so far from being a contraindication to the use of the remedy, is in reality a motive for its employment. As in the case of copaiba, it acts by substitution, and destroys the morbid inflammation by its therapeutical inflammation or stimulation. This is what Crane suggested long ago (1824), when he considered that the efficacy of cubebs might arise from "a counter-irritation incompatible with the inflammatory excitement arising from the disease."

Of *leucorrhœa* several cases were reported by Dr. Orr, cured in a short time by cubebs, in the dose of a drachm and a half three times a day.[2] Dr. Traill, also,[3] and Dr. Crane,[4] gave it with equal advantage. Velpeau reports the cure of several in which *enemata* of cubebs were thrown into the bowels.[5]

In *chronic cystitis* Brodie recommends small doses—fifteen or twenty grains—to be given three times a day. He found that they palliated the symptoms.[6]

Cubebs may also be employed in chronic and atonic *pulmonary catarrh*. Indeed, owing to their stimulant action upon the stomach, they may become more serviceable than copaiba in cases of the disease attended with feeble digestion.

In *chronic rheumatism* they have also been found occasionally beneficial.

ADMINISTRATION.—Cubebs are generally administered in *powder*, in the dose of from *ten grains* to *half an ounce* or *more* three times a day. In gonorrhœa the average dose may be stated at *two drachms*. It should be gradually diminished after the running has ceased. The *oil*

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[1] Thérapeutique, ii. 459, &c.
[2] Edinb. Med. and Surg. Journ., xviii. 318.
[3] Ibid., xvii. 312.
[4] Ibid., xxi. 304.
[5] Archives Gén., xiii. 54.
[6] Lond. Med. Gaz., i. 300.

may be given in doses of from *ten* to *fifteen drops*, gradually increased to *a fluidrachm*. It may be administered upon sugar, in emulsion, or enclosed in gelatin capsules.

A *fluid extract* is prepared, of which the dose is the same as that of the oil.

A *tincture* is also officinal, which may be given in doses of *half a fluidrachm* to *two fluidrachms*. It is of use chiefly in gleets, and as a stimulant carminative.

COLCHICI RADIX.—Colchicum Root.

COLCHICI SEMEN.—Colchicum Seed.

Description.—*Colchicum autumnale* is a biennial plant of the Natural Order *Colchicaceæ*, and is also known by the name of *autumn crocus* and *meadow saffron*. It is a native of the temperate parts of Europe, and is somewhat cultivated in this country. It may be propagated from the seeds, by a single mature *cormus*, or, as Dr. Christison has shown, by several immature cormi. The cormus, or solid bulb, is about the size of a small apricot when mature, which is in the month of June, is of firm texture, amylaceous, and extremely bitter. Soon after reaching maturity it gives off at its lower part a small bulb, which by the month of September has shot up into a flower-stalk some six or eight inches high, and bears a lilac or purple flower. After several weeks this offshoot dies down, and nothing more is seen above ground until the following February, when the leaf-stalk appears, terminating in three or four leaves, which shelter the capsules. These reach maturity in the course of the following summer, at which time the cormus has acquired its full medicinal power.[1] It has an external brown coat, and an inner one of a reddish-yellow color. A transverse section of it is somewhat kidney-shaped, and its substance is white and fleshy. When fresh, a milky juice exudes from it, and it exhales a rank smell. Its taste, like that of the seeds, is somewhat acrid and bitter. The seeds are rough, almost spherical, of a dark-brown color, and about the size of millet seeds. They have an extremely bitter and acrid taste. The active principle of colchicum is called *colchicia*. It is crystallizable, has the chemical relations of an alkaloid, has a bitter taste, and is soluble in water and vinegar, but more completely in alcohol and ether. The preparations of the seeds are

[1] Maclagan, Month. Journ. of Med. Sci., Dec. 1851, p. 501.

thought to be of more uniform strength than those of the cormus, and are therefore in general to be preferred. They contain a larger proportion of colchicia. A neutral crystalline principle, differing from this, has been announced to exist in colchicum by M. Oberlin. It is intensely bitter.[1]

The following are officinal preparations of colchicum:—

Acetum Colchici.—Vinegar of Colchicum.

This preparation is made by macerating two ounces of bruised colchicum root for seven days in two pints of diluted acetic acid, or else by percolation. Dose, from thirty drops to two fluidrachms.

Extractum Colchici Aceticum.—Acetic Extract of Colchicum.

This extract is best prepared by percolation. A pound of coarsely powdered colchicum root is exhausted by means of four fluidounces of acetic acid diluted with water, and the resulting liquid is evaporated to a proper consistence. Dose, one or two grains, and gradually increased.

Tinctura Colchici Seminis.—Tincture of Colchicum Seed.

This tincture is prepared with four ounces of bruised colchicum seed and enough alcohol to produce two pints by percolation. Dose, from half a fluidrachm to two fluidrachms.

Vinum Colchici Radicis.—Wine of Colchicum Root.

A pound of bruised colchicum root is macerated for a fortnight in a sufficient quantity of sherry wine, and then two pints of the liquor are obtained by percolation. Dose, from ten minims to a fluidrachm, repeated several times a day.

Vinum Colchici Seminis.—Wine of Colchicum Seed.

This wine may be prepared by macerating four ounces of bruised colchicum seed in two pints of sherry wine for fourteen days, expressing the residuum, and filtering the liquor. Dose, half a fluidrachm to a fluidrachm three or four times a day.

History.—Dioscorides describes this plant under the names of colchicum, ephemerum, and wild bulb, and states that it abounds in Messenium and in the isle of Colchos. Its poisonous effects, he says, resemble those produced by mushrooms, and he proposes milk as the best antidote for them.[2] Galen alludes to its poisonous qualities. Paul of Ægina, who flourished in the next century, speaks of hermodactylus (which Mr. Adams, in common with Bergius, Tournefort, Geoffroy, Pr. Alpinus, and Paris, regards as identical with colchicum), and of its use in gouty complaints, remarking at the same time, what

[1] Brit. and For. Med.-Chir. Rev., July, 1857, p. 237.

[2] Mat. Med., iv. 79.

some modern writers have insisted upon, that it is injurious to the stomach, producing nausea and anorexia, and ought to be used only in the case of those who are pressed by urgent business; for that it removes rheumatism [gout?] speedily, and after two days at most, so that they are enabled to resume their accustomed employment.[1] Alexander of Tralles, who wrote in the fifth century, refers, in his treatise upon gout, to hermodactylus as a medicine which produces watery stools, followed by such relief that the patient is presently able to walk. Yet he adds, like his predecessors, that it increases the liability to attacks of the disease. Of the Arabian physicians, Elgâfaki describes the plant and the peculiarities of its growth and flowering. Hobaisch, Mosih, and Avicenna refer to its power of alleviating rheumatic and gouty pains, and to the advantages of associating it with cathartic medicines. The last-named author recommends poultices of the root in painful affections of the joints. Others attribute to it aphrodisiac virtues.[2]

Like so many other valuable remedies, colchicum appears to have fallen into disuse until 1718, when it was proclaimed by Wedel to be a prophylactic against the plague; but in this respect it obtained no permanent credit. Once more, in 1763, Störck brought it forward as a remedy for dropsy, gout, and chronic catarrh, but especially for the first-named disease, and his views found numerous supporters. But colchicum does not seem to have been generally accepted as an anti-arthritic remedy until the period between 1814 and 1820, when the publications of Want, Home, Haden, Williams, Copland, and others, demonstrated its efficacy and established it in the confidence of physicians. Mr. Want, especially,[3] was struck with the close resemblance which the symptoms produced by a celebrated gout nostrum, the *eau médicinale*, bore to those which the ancient writers ascribed to hermodactylus and colchicum, and also with the fact that colchicum entered into the composition of Turner's powder, the Vienna decoction, and other specifics for gout. He accordingly administered it with success, and showed, contrary to the opinion of Sutton and others, that its curative effects do not necessarily depend upon its cathartic properties. Mr. Haden[4] endeavored to prove that the remedy might be used as a substitute for bleeding, for which purpose he furnishes imperfect histories of febrile attacks from which recovery took place

[1] Paulus Ægineta, ed. Adams, i. 660. [2] Ebn Baithar, ed. Sontheimer, ii. 65.
[3] Med. and Phys. Journ. (1815), xxxii. 77, 312, &c.
[4] Practical Observations on the Colchicum Autumnale. 1820.

while colchicum was being used; a statement which would have been equally true of many other medicines, and also of no medicines at all.

ACTION. *On Animals.*—In estimating the activity of colchicum, the variable strength of its preparations must be kept in view. This often depends upon the cormus having been gathered at a season when it is nearly inert. As before remarked, it is most active in July and August; the seeds are of more uniform strength, and the flowers and leaves are feebler. The plant is poisonous to most herbivorous animals, and is generally avoided by them when grazing. But it is sometimes eaten among their fodder, and then it may produce bloody flux, and death, with inflammation of the bowels.[1] Haden mentions its purging a horse violently. Given to dogs by Störck, it caused vomiting, trembling of the limbs, convulsive movements of the belly, howling, diuresis, bloody stools, prolapse of the bowels, and death. From the peculiar severity of the symptoms caused by colchicum in dogs, the French call it *mort au chien.* Braun describes as follows the effects produced in six cows that had eaten of the colchicum plant. There was loss of appetite and thirst; chewing of the cud was suspended; diarrhœa of a thin, whitish liquid took place; the anus gaped; there was a frequent and feeble pulse; running of the eyes and nose; dulness of the senses; distension of the belly, and scanty urine; the hair stood erect and rough; and there was tenderness on pressure over the maw. One of the cows and a calf died; the lining membrane of the intestine was found injected and red, and the blood dark and liquid.[2] The action of colchicum upon certain animals is very feeble. As much as six and a half drachms of the wine of the seeds was given by Lewins to a *rabbit* in the course of four days, with very little effect beyond acting upon the kidneys. On *frogs* its influence is equally slight. Some experiments upon them show a singular insusceptibility to the action of the medicine. It caused, indeed, a disposition to vomit, weakness, some convulsive movements, and tetanic rigidity; but the animals recovered from doses which are fatal to large dogs.

Forty drops of the wine of the seeds were given to a *cock*, without evident effect. On the next day eighty drops produced dulness and loss of appetite; one hundred and twenty drops caused vomiting of mucus, and copious watery dejections, with extreme debility and depression; the next day one hundred and eighty drops reproduced these symptoms, and destroyed the animal within twenty-four hours. Its intestine was filled with half digested food, and showed spots of vas-

[1] MURRAY, Apparat. Medic., v. 198. [2] FRANK, Mag. für Arzneim., iii. 143.

cular injection. Lewins[1] gave seventy minims of the wine of the seeds to a middling sized *dog*. No distinct symptoms were observed within six hours, but at the end of sixteen hours it was found that the animal had vomited and been purged, and that the egesta contained blood. He lay prostrate and motionless, refused food, and his eyes were glazed and sunken; he died without any reaction. The intestines were found to be everywhere injected, the jejunum and ileum were intensely red, and the whole bowel was lined with bloody serum and thin mucus.

Sir Everard Home injected one hundred and sixty drops of the vinous infusion of colchicum into the *jugular vein* of a *dog*. The immediate effects were loss of muscular power, slow breathing, and a feeble pulse; but reaction took place, and the pulse and respiration became frequent. The animal trembled violently for an hour and a half; made ineffectual efforts to vomit, and fell into a languid state; vomiting of bloody mucus and diarrhœa followed, the languor continued, and in five hours death took place. The whole mucous membrane of the intestine was "inflamed." The same experiment was performed by Scudamore, and with like results.[2] According to the experiments of Andral and Magendie, the preparations of colchicum, when injected into the veins, act upon the intestinal canal, and excite vomiting and purging.

Colchicin produces the same effects as the plant from which it is derived. One-tenth of a grain of this substance given to a kitten, eight weeks old, took away its appetite, brought on vomiting, purging, and debility, and death in twelve hours. The stomach and small intestines were "inflamed and congested." According to Albers, who performed experiments with this substance upon toads, colchicin acts specifically upon the skin, destroying its sensibility, produces paralysis of the voluntary muscles, without previously exciting spasms, and does not affect the movements of the heart.[3]

The results of these experiments are simple; the poison evidently acts with greatest energy upon the nervous and the digestive systems; causing, through the one, depression, faintness, and trembling, and through the other, a real cholera-morbus. Diuresis is most marked when the emeto-cathartic effects are slightest (as in rabbits); no narcotic effect is observed, and the material lesion found is intense hyperæmia of the intestinal canal. These phenomena, as will be seen, are very nearly the same as are produced by colchicum in man.

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[1] Edinb. Med. and Surg. Journ., lvi.

[2] Maclagan, loc. cit.

[3] Prager Vurteljahr., lx. anal. p. 8.

On Man.—Störck relates that after swallowing one grain of the root of colchicum, he experienced flushes of heat, colic, pain in the urinary passages and micturition, tenesmus, mucous stools, headache, hiccup, disturbed pulse, anorexia, thirst, and other marked symptoms which are so unlikely to have been produced by the trifling dose of colchicum mentioned, that the whole description has been taxed with being an invention. Still it is very certain that such precisely are the symptoms occasioned by large doses of the drug, and occasionally by very small ones. The following description comprises the most usual and important of these effects.

The *nervous system* is seldom disturbed by medicinal doses of colchicum. In a large series of cases reported by Monneret,[1] although the digestive functions were much deranged, those of the nervous system were unimpaired. Kuhn, however, observed headache and vertigo among the effects of the medicine.[2] Sir Everard Home seems to have been the first to notice the property of colchicum to diminish the frequency of the pulse (1816). Dr. A. T. Thomson also drew attention to this phenomenon, which is unquestionably one of the physiological effects of the medicine. In this country it was early noticed by Dr. J. Y. Clark.[3] It ceases as soon as the poisonous action begins. Dr. Maclagan took twenty minims of tincture of colchicum on two different days, between the hours of six and eight in the evening, and found that by midnight his pulse had fallen to about 65.

When applied to the *skin*, the fresh cormus is said to cause redness and prickling with diminished sensibility. The powder, if inhaled, excites sneezing and coughing. Upon the *tongue* it produces an acrid, bitter, and astringent taste, with irritation of the fauces, and salivation. Sachs found that chewing the bulb occasioned irritation, pain, and tension, followed by insensibility and rigidity of the tongue. Dr. R. J. Buckner reports a case in which copious *ptyalism* was attributed to colchicum given in doses sufficient to produce vertigo and a burning heat in the fauces and stomach.[4] Dr. Aldridge refers to three cases in which profuse ptyalism resulted from the use of half a drachm of tincture of the seeds three times a day during some time.[5]

The action upon the *digestive* organs is more uniform and distinct. When small doses of colchicum have been used for several days in succession, or a pretty large dose has been taken at once, some heat is felt at the epigastrium, with eructations, and perhaps nausea. If con-

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[1] Loc. inf. cit.
[2] Archives Gén., xvii. 393.
[3] Philad. Med. Recorder (1818), i. 369.
[4] N. Am. Med. and Surg. Journ., x. 205.
[5] Dub. Hosp. Gaz., Oct. 1845.

tinued, the appetite fails, the tongue becomes coated, there is some colic, with borborygmi and diarrhœa. Still larger doses develop vomiting and purging. Monneret,[1] who gave from one to four drachms of the tincture to rheumatic patients in the course of twenty-four hours, found that its most uniform effects were nausea, vomiting, borborygmi, colic, and diarrhœa. The vomited matters were usually bilious, the tormina and tenesmus were sometimes severe and incessant, with heat and smarting of the anus, and dysenteric stools. That is to say, the dejections, after being colored with bile, became serous, and contained white specks, yellowish and bloody mucus, a solid reddish substance (fibrin?) and some blood. In fact they had the chief characters of dysenteric stools. It was also found that effects of this sort were more common when the intervals between the doses were short. It is singular that in spite of these severe symptoms and the nature of the discharges, which seem to indicate intestinal inflammation, there was still no tenderness of the abdomen under pressure, and the evacuations ceased soon after the suspension of the medicine. It may be that colchicum tends rather to produce an exaggerated activity of the vascular and secretory elements of the bowel, than to operate as a direct and local irritant. In this connection, it should be borne in mind that the action upon the bowels is manifested even when the medicine is introduced by the veins.

The first notice of the influence of colchicum upon the *urine* was that of Chelius, in 1828,[2] who found that during its use the proportion of uric acid in this secretion was nearly doubled. Dr. Christison afterwards found a similar increase in the proportion of *urea* and of *urate of ammonia*, raising the specific gravity of the liquid to 1.034. These results might be attributed to the diseases which the patients under observation were affected with, were it not that they were also obtained by Dr. Maclagan, when no such disturbing element existed. It must be confessed, however, that they are not uniform, since both Graves and Gairdner found the urates to diminish under the use of the medicine. Perhaps these opposite results may be reconciled by those of Böcker,[3] who concluded from some experiments performed by himself, that colchicum acts but little on the urinary secretion, and that when its solid elements decline under the use of the medicine, it is because those of the intestinal evacuations are increased. This result accords with those of Krahmer and Bird,[4] but disagrees with the results of Dr. Hammond's experiments upon a healthy per-

[1] Archives Gén., Mars, 1844.
[2] Ibid., xviii. 111.
[3] Beiträge zur Heilkunde, ii. 216.
[4] Bird, On Urinary Deposits, 2d Am. ed., p. 354.

son, in whom colchicum produced an increased elimination of solid matter, both organic and inorganic.[1]

According to Kuhn, if a person is placed in a condition to favor it, *diaphoresis* will very generally be produced by colchicum so long as it does not act upon the bowels. Dr. Netta attributed to the medicine an action upon the *uterus* like that of ergot, but the single case on which he bases his opinion is quite insufficient to support it.[2] The same remark will apply to a case attributed to Dr. Clutterbuck.

Dr. Laycock observed that when tincture of colchicum is rubbed into the skin of the abdomen, the characteristic signs of its operation are produced, such as tenesmus, mucous stools, depressed pulse, &c.[3]

The following is a summary of the effects of *colchicia* on the healthy system, as recorded by Schroff. Soon after the one-hundredth of a grain of this substance was taken it produced eructations, nausea, and salivation. Within two hours, the pulse fell eleven pulsations. Eight hours afterwards, two one-hundredths of a grain were taken in a wafer. At the end of six hours, the experimenter being in bed and asleep, was awaked with a desire to go to stool, and, on rising, vomited for two minutes, and had a soft and copious stool, with violent griping. These symptoms returned some hours afterwards, and the stools were mucous, and of a greenish-yellow color. They did not immediately recur, but there was complete anorexia for several days, during which the stools were thin, flocculent, and albuminous, and accompanied with griping, and tenderness of the abdomen, with thirst, fever, accelerated pulse, cerebral distress, agitation, and want of sleep. The urine was thick, and gave a copious white deposit.[4]

In *posionous doses*, colchicum gives rise to symptoms of a very violent description, which are apt to terminate in death. The following is a summary of results from an analysis of ten cases which are reported in sufficient detail for our present purpose.[5] The forms of the medi-

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[1] Am. Journ. of Med. Sci., Jan. 1859, p. 278.

[2] Am. Journ. of Med. Sci., Oct. 1844, p. 463. [3] Lond. Med. Gaz., xxiv. 388.

[4] Compare Brit. and For. Med.-Chir. Rev., Jan. 1858, p. 249; and Prager Vierteljahrschrift, liii., Anal., p. 5.

[5] Compare Henderson, Lond. Med. Gaz., xxiv. 762; Leroy des Barres, Bull. de Thérap., xxxiv. 498; Feriday, Lond. Med. Gaz., x. 161; Neubrandt, Maclagan, Mém. cit.; Dillon, ibid.; Schilling, Frank's Mag. für Arzneim., ii. 139; Santlus, ibid. ii. 393; Ollivier, ibid., iii. 138; Andrea, ibid., i. 42; Bleifuss, Strumpf's Handbuch, ii. 485.

Other cases may be alluded to which were not at hand when those above were analyzed. See an article by Casper, relative to four fatal cases of colchicum poisoning (*Vierteljahrschrift für Gerichtliche und Offentliche Medicin*, vii. Bd. 1, Heft.), in which he demonstrates the mode of obtaining *colchicin* from the contents of the stomach in cases of poisoning by colchicum, and concludes that *less than half a grain* of this

cine were various, including the tincture, the seeds, the infusion of the root, and the leaves. The quantity of the alcoholic preparation always exceeded an ounce, and was generally between one and two ounces. The patients were all adults except two, who were boys of four and six years old. *Pain* in the abdomen is described in about half the cases, but not as very severe in more than two; its character was usually griping. It was generally one of the first symptoms to appear, and occurred at various intervals from half an hour to an hour after the poison had been taken. Sometimes it was spasmodic, and accompanied with cramps of the abdominal muscles. The epigastrium is said to have been slightly tender upon pressure in one case, and in two is expressly stated to have been indolent; in the rest, this symptom is not mentioned, and must, therefore, be supposed to have been slight. *Vomiting* was a prominent symptom in every case; it occurred among the earliest symptoms, and was the most persistent of them all; the fluids thrown up consisted of bile and mucus, sometimes tinged with blood; in one case, a substance like coffee grounds was rejected. *Retching* alternated with actual vomiting. In only two cases is the *thirst* said to have been great. *Diarrhœa* occurred in every case; the stools were generally frequent, liquid, greenish, black, and fetid, or containing shreds and flakes as of coagulated mucus; tenesmus occurred in one or two cases, and in one, at least, the discharges became involuntary. The other symptoms furnished by the digestive organs were subordinate and not uniform. Thirst was by no means urgent except in one case, in which there was burning of the mouth and difficulty of swallowing. In another case, the taste was normal, and the tongue blue and cold. The quantity of *urine* was generally unaffected. In only two cases diuresis is mentioned, and in two suppression of urine.

Among symptoms affecting the *nervous* system, "*numbness of the hands and feet*, with prickling as if they were asleep, painful flexure of the joints, pain in the shoulder and hip-joints, and in all the bones, with difficulty of moving the head and tongue," are mentioned in one case only which is reported by Dr. Henderson, of Edinburgh. The most prominent symptoms in this division are *spasms* affecting the

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principle is sufficient to destroy life. M. Roux has published an account of the death of five persons in the infirmary of the prison of Toulon, who died from the effects of about *two ounces* of the wine of colchicum seeds administered to each of them by mistake. (*Union Méd.*, and *Prager Vierteljahrschrift*, xlviii., *Anal.*, p. 3.) A case in which one ounce of the wine of the seeds was taken in the course of twenty-four hours, without a fatal result, is reported by Dr. Kennard. (*Am. Journ. of Med. Sci.*, Jan. 1857, p. 69.)

voluntary muscles of the legs and arms, the abdomen, the chest, and, in one case, of the neck, throat, and fingers also. Occasionally, towards the close, there was subsultus, or floccitation. In one case in which two ounces of the seeds had been taken, the large size of the dose appears to have produced general loss of muscular power. (*Feriday.*) In another case, that of a child four years old, and where also the dose was relatively excessive, there was no decided spasm, but only muscular pains, and the little patient lay with half shut eyes, breathing hurriedly, protruding the tongue with difficulty, and evidently dying from sheer exhaustion. Muscular pains accompanied the cramps and continued in the intervals between them in several instances. Once there was pain in the knee, and once in the spine. In a single case, that of a boy six years old (*Schilling*) there were exceptional phenomena depending probably upon some cerebral lesion from which the patient died at the end of forty-eight days; but no *post-mortem* examination was made. The symptoms alluded to were chiefly these: trembling; extreme sensibility; pains in both forearms; dilated pupils; convulsions, opisthotonos, and rolling of the head, deafness; swelling of the elbow and knee-joint of the left side; hemiplegia of the right, and convulsions of the left side, &c. In all, or nearly all of the cases, the *mind was clear* throughout the illness; there was no tendency to sleep except from exhaustion, no illusions, nor any perversion of the senses. The usual mode of *death* was by exhaustion; but once it came in a convulsive attack.

The *surface of the body* was uniformly in a state resembling that of collapse, with pinched and sunken features, purplish lips and cheeks, pale and shrunken and moist integuments, often livid, particularly in dependent parts, dilated pupils, cloudiness of the cornea, and a *small, thready, feeble*, and *frequent pulse*. Death probably resulted from paralysis of the heart.

After death, the *lesions* found in seven out of the eight cases which proved fatal, were very uniformly the same. The skin is generally described as purple, livid, violet or greenish upon the back and sides, and there would seem to have been a tendency to rapid decomposition of the body. The lungs and brain were gorged with dark, imperfectly coagulated, and pitchy blood, and so were the veins of the trunk. The gastro-intestinal mucous membrane is generally described as inflamed, but, on closer inquiry, it seems rather to have been intensely congested in the stomach and small intestine, and in some situations to have lost its normal consistence. In perhaps one-fourth of the cases, its color was normal. Not infrequently, ecchymoses were found in the submucous cellular tissue, and in several cases the vas-

cular congestion extended to the peritoneal coat. In one case only, there was no congestion at all.

The *duration* of the fatal symptoms seems not to have exceeded forty-eight hours in any case where the result depended directly upon the poison. The shortest period which it required to prove fatal was twenty-four hours.

In man, as in the lower animals, we may learn from the preceding statements and analysis, that colchicum expends its force upon the digestive organs and upon the nervous system, while at the same time it probably favors the elimination of solid effete matters from the economy by the bowels, the kidneys, and to some extent also by the skin.

USES. *In Gout.*—In this country colchicum was early used as a remedy for gout by Dr. Dorsey, who found the joints "were relieved by it as by the wand of a magician."[1] He believed that it promoted sleep, and observed that it purged away dark fetid matter. In England Dr. Barlow (1822) strongly advocated its use, but insisted upon premising depletion and purgation with calomel and antimony. He directed two drachms of the tincture of the seeds at night, and, if necessary, a repetition of the dose the next morning, so as to purge briskly. If this effect was not produced, a similar dose was prescribed the following night, after which the medicine was continued in smaller quantities and given in a saline mixture. Thus employed, he found that it purged, allayed the pain, and lowered the pulse. But he regarded its sedative more than its cathartic operation.[2] Sir H. Halford also gave it in conjunction with saline laxatives when the bowels were not already open; but he does not appear to have considered its purgative operation essential to its curative effects, for he states that it often cures the disease without any manifest increase of the secretions, though it sometimes acts as a diuretic and sometimes as a diaphoretic. Nor does he subscribe to the notion that the medicine is of little value because its effects are temporary, for, as he remarks, none other does even as much; and he denies that it renders the disease more apt to return, as ancient authors declared and some modern ones maintain.[3] Dr. Holland also dissents from this opinion, maintaining that, on the contrary, it may with due care be made a preventive as well as a curative agent.[4] There is no doubt that the certainty with which colchicum relieves the gouty paroxysm has led to a neglect of other medicines, of such as should be used at the same time with it to act upon all the

[1] Am. Med. Recorder, i. 376.
[2] Cyclopædia of Pract. Medicine, ii. 371.
[3] Essays and Orations, p. 101.
[4] Notes and Reflections (1st Am. ed.), p. 89.

secretions, and especially upon those of the liver and bowels, and also of remedies which should be employed after the attack to confirm the strength and subdue the tendency of the digestive organs to mal-assimilation of the food.

In regard to the value of its sensible operation, purgative or other, in gout, the views of several eminent authorities may here be alluded to. Dr. Christison, for example, does not regard its cathartic operation as either important or desirable except as an indication that the limit of the proper dose has been reached, and as a security that it is really acting upon the system.[1] Dr. Gairdner adopts a similar view, remarking that "colchicum never more effectually relieves the patient than when it acts silently and peacefully, without producing any evacuation whatever, or in any way disturbing the patient's comfort and ease." Mr. Wells, also, insists that the remedy is most efficient when it produces the least sensible effects upon the functions.[2] Dr. Todd says that if employed in such doses as will produce only its chemical changes, it will, in strong constitutions, most favorably modify the gouty paroxysm, and certainly shorten its duration. If, on the other hand, it produce any of its irritant effects, it is likely to do more harm than good. He lays down the following rules for the employment of the remedy, which it is believed embody the soundest precepts upon the subject.

"1. The use of colchicum is most applicable to the sthenic form of gout which occurs in robust constitutions, and in the prime of life; but it is almost inadmissible in persons advanced in years, who have had several attacks, and in whom the malady would seem too deeply rooted to be influenced by the temporary administration of the remedy.

"2. Colchicum should never be given at the onset of a paroxysm, nor until the bowels have been duly acted upon by mild purgatives.

"3. The first doses of the medicine should be very small; they may be gradually increased.

"4. Colchicum should be always administered at first uncombined with any other medicine, until the practitioner has satisfied himself that it does not disagree with his patient.

"5. It should not be administered so as to excite nausea, vomiting, or purging. These effects should be regarded as indicative of the unfavorable operation of the medicine.

"6. Colchicum may be regarded as acting favorably when, under its use, the urine is increased in quantity, a more abundant bile is dis-

[1] Dispensatory (Am. ed.), p. 403.

[2] Pract. Observ. on Gout and its Complications (1854), p. 223.

charged; when the fæces, though solid, are surrounded by mucus, and the skin secretes freely.

"7. The effects should be carefully watched; as, like digitalis and other medicines, it is apt to accumulate in the system."[1]

It will thus be perceived that there is a very general conviction of the inutility, if not danger, of allowing colchicum to produce its emeto-cathartic operation in the treatment of gout. We have met with but one notable exception to this statement, that of Dr. Wigan, of Brighton, who, it must be added, has reference more particularly to "rheumatic gout." In this affection he pronounces colchicum to be "the most easily managed, the most universally applicable, the safest, and the most certain specific" in the Pharmacopœia. He employs the powdered cormus in doses of eight grains every hour in some mild and agreeable fluid, until active vomiting, profuse purging, or abundant perspiration takes place. These effects are postponed as long as possible by giving the patient an occasional sip of some aromatic and stimulant drink, and generally until six or seven doses have been taken. His condition then resembles sea-sickness, and like it, is very distressing, but when it has been endured for a few hours, the inflammation of the joints subsides and they resume their natural size with miraculous rapidity. A sound sleep ensues, "from which the patient awakes perfectly well." Dr. W. affirms that he has never seen a relapse.[2] It is possible that the administration of the medicine in divided doses may prevent the serious consequences otherwise to be apprehended from such heroic treatment.

Rheumatism.—The views of some among the more prominent advocates of colchicum in this disease may serve to show the nature and extent of its power. After Haden's publication in 1820, the medicine began to be tried as a remedy for rheumatism. Locher-Balber reported that it cured the acute disease surely and rapidly whenever it purged, but that it deranged the digestive organs temporarily.[3] About the same time were published the observations of Bart, Williams, Bang, of Copenhagen, Krichow, Bushell, and Godart.[4] The last-named writer pointed out the sedative action which the medicine unites with its purgative operation, or exerts independently of the latter. He particularly described a prickling sensation with warmth which was felt by the patients in the affected limb, and which seemed to promote its power of motion. Afterwards Kuhn published several cases in proof of its efficacy, and in 1830 a complete history, natural

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[1] Brit. and For. Med. Rev., xvi. 467.
[2] Lond. Med. Gaz., xxii. 576.
[3] Revue Méd., xix. 135, 1825.
[4] Archives Gén., xii. 602, 1826.

and medical, of the drug, in which he alludes to the diminished pain and stiffness produced by colchicum, and attributes them to a temporarily blunted sensibility rather than to an improved condition of the part, for the pains, he says, return if the medicine is suspended.[1] Armstrong soon afterwards pronounced a more favorable judgment. In acute rheumatism, he says, "it certainly has given more speedy and decided relief than any other single remedy which I ever saw employed." In doing so, he adds, it did not act through the kidneys or skin, and but occasionally on the bowels, but it lessened the heart's action, the animal heat, and the pain.[2] Dr. A. T. Thompson expressed a similar opinion, but he only prescribed the medicine after calomel, tartar emetic, and opium.[3] Seymour gave an equally favorable verdict, but similarly qualified.[4] Chailly held it to be successful, but only when it produced a cathartic operation.[5] This also is the opinion of Dr. Watson, who ascribes to the remedy "an almost magical effect in quelling the *synovial form* of the disease," particularly when it produces its severer effects of vomiting and diarrhœa. Dr. Maclagan, on the other hand, thinks that the erratic articular form, that in which the internal organs are most apt to be affected, is the one in which colchicum is pre-eminently useful. Dr. Fuller, again, agrees with Dr. Watson that the synovial form is more amenable to the remedy than the fibrous, and that its benefits are dependent upon its evacuant, and especially its diuretic, effect.[6] These opinions should be compared with the statements of Dr. Wigan, above quoted, relative to rheumatic gout. The only attempt at a systematic and rigorous examination of the use of colchicum in rheumatism which we possess is that of Monneret,[7] who, however, from a defective method of classification, necessarily arrived at very discouraging results in twenty-one cases of the articular form of the disease. In eight cases only did the cure seem to depend upon the remedy, and these were either very slight or quite chronic cases. Their improvement was evidently proportioned to the activity of the purgation which the medicine produced. In no instance was there any ground for referring it to a specific action. It is to be regretted that in this analysis the acute and chronic cases had not been distinctly separated, and the synovial from the fibrous variety of the disease. Previous writers had only claimed efficacy for colchicum in the acute synovial forms. Hence we feel no surprise

[1] Archives Gén., xvii. 393; Revue Méd., xxxix. 5, 191.
[2] Practical Illustrations (Am. ed.), p. 237.
[3] Lancet, 1834–5, ii. 73.
[4] Med.-Chir. Rev., xxxiii. 659, 1838.
[5] Rev. Med., i. 207, 1836.
[6] On Rheumatism, &c. (Am. ed.), 1854, p. 89.
[7] Archives Gén., 4ème sér., iv. 269.

when Dr. Cargill[1] reports but fourteen cures out of forty-three cases of *chronic* rheumatism. Dr. Eisenmann[2] contends for the curative powers of colchicum in all febrile and inflammatory affections produced by cold, which, according to him, constitutes them members of the group of rheumatic diseases. He recommends a mixture of six parts of wine of the seeds of colchicum with two of tincture of opium, in the dose of fifteen or twenty drops two or three times a day. The combination is a rational one, and deserves a more extended trial.

In regard to the *modus operandi* of colchicum in curing rheumatism, but more particularly gout, there is no very wide division of sentiment. Some few refer its action to a vital influence, in great part at least. Thus, Casimir Smith, of Warsaw, compares, as Vogt had previously done, its action with that of squill, because they are both sedatives of the circulation; but the former acts upon the bowels and the latter upon the kidneys.[3] Dr. Todd also refers its effects, in part, to its operation on the nervous system. But almost all writers of repute adopt the view originally proposed by Chelius, that it acts as an *eliminant*, or as a purifier of the blood, to use a more homely but more intelligible phrase. Chelius found that it increased the proportion of uric acid in the urine. It is possible that, as Graves pointed out, this was a mere coincidence, since the disappearance of the uric acid deposit from the urine, and not its supervention, is a favorable sign in rheumatism.[4] Kuhn, like Chelius, dwelt upon the value of the remedy in removing uric acid from the system in gout, and thus contributing to prevent the concretions which are so apt to form upon gouty joints. Dr. Lewins (1841) maintained that it promoted the evacuation of *urea* as well as of uric acid.[5] Dr. Holland[6] remarks that there was every reason to believe that colchicum neutralizes or eliminates a gouty materies morbi (he does not attempt to pronounce upon its nature) from the system, for whenever the gouty inflammation manifests itself in the foot, in the bronchi, the eyes, or the head, producing a peculiar form of headache, the specific virtues of the remedy are equally apparent. Moreover, the early suspension of the medicine is apt to be followed by a renewal of the symptoms, as if its depurative action had not been completed. The attempts made to explain this operation have not been remarkably successful. Thus, Mr. Headland, after proving that colchicum acts upon the blood,

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[1] Am. Journ. of Med. Sci., Jan. 1852, from Lond. Med. Gaz.

[2] Bull. de Thérap., lvi. 72, 120, 412.

[3] Abeille Méd., vii. 17.

[4] Lond. Med. Gaz., vii. 584.

[5] Edinb. Med. and Surg. Journ. and BRAITHWAITE'S Retros., No. iv. p. 10.

[6] Notes and Reflections (Am. ed.), p. 89.

remarks: "This hæmatic action must be of a catalytic kind, and may probably consist in the exertion of a special influence over the erring assimilative processes, which tends to resolve them into a right direction."[1] It can hardly be said that these phrases do much to lessen the obscurity of the question.

It has also been maintained that the augmented secretion of solids through the kidneys depends less upon the direct action of the colchicum, than upon the sedative power which it exerts over the circulation, and which permits the discharge of matters, which in a state of greater vascular tension are retained. The following observations of Clarus upon this subject appear to deserve attention.[2] The view just presented explains why colchicum is a more certain remedy for gout than for rheumatism. In the former disease a large quantity of effete azotized matter is accumulated in the blood, the excretion of which must necessarily contribute to abate the fever and distress. In the latter there is no evident retention of a material poison in the blood; on the contrary, the cutaneous secretion is abundant, and the scanty urine results from the fever. In gout we may regard colchicum as a depletory and excretory agent, but in acute rheumatism as an antiphlogistic, and as tending to limit the formation of uric acid.

Various Diseases.—Several writers, among whom may be mentioned Lewins and Haden, speak highly of the efficacy of colchicum in "*fever*," but of what form, under what circumstances, and with what degree of success, does not appear. Mr. Tait conceived that he was very successful in treating *scarlatina* of an inflammatory type with colchicum.[3] Subsequently, Mr. Bennett, in a case of this disease, marked by alternate delirium and coma, and scanty urine without any deposit, gave colchicum together with acetate of potash and spirit of nitric ether. The cerebral symptoms disappeared, and a large quantity of urine rendered turbid by urate of ammonia was voided.[4] The share of the colchicum in this result is open to question.

Colchicum was originally proposed by Störck as a remedy in *dropsy*, and he claims to have used it very successfully. Others have since been equally fortunate. Among them, Mason Good was a very emphatic eulogist of the remedy, for he ranked it next to squill in power. Clark, of Philadelphia, Locher-Balber, and Aran,[5] have reported cases of its success. In *scarlatinous dropsy*, Dr. Maclagan frequently found it of much service, particularly when the urine became very scanty,

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[1] On the Action of Medicines in the System, p. 319.

[2] Handbuch der Speziellen Arzneim., p. 579.

[3] Lancet, 1837–8, i. 198.

[4] Month. Journ. of Med. Sci., Aug. 1851, p. 158.

[5] Bull. de Thérap., xlv. 270.

and indications were given of approaching coma. He thinks that urea retained in the blood is the cause of the symptoms, and that colchicum causes its discharge. The same writer proposes colchicum in the advanced stages of *Bright's disease*, as a means of depurating the blood.

In 1834, Mr. Cotter proposed colchicum as a remedy for *malignant cholera*, and states that he used it successfully in eight cases.[1] In spite of its homœopathic adaptation to this disease, it does not seem to have been used again. Dr. Maclagan suggests its propriety to relieve the *suppression of urine* which sometimes attends the stage of reaction. The danger of reproducing the primary disease would appear to be greater than the prospect of relieving the symptom alluded to. Colchicum has been recommended in the treatment of *tetanus*, by Dr. W. G. Smith, of Port au Prince.[2] As he cured but five out of nine cases, and one only of these belonged to the traumatic variety, his results are not very encouraging, particularly as in the successful cases he employed local depletion and counter-irritation to the spine. In the rheumatic form of the disease, the medicine might, perhaps, be useful. Burdach recommends the following formula as a specific in cases of *facial neuralgia:* ℞.—Corrosive sublimate, muriate of ammonia, of each gr. j; water ℥j; wine of colchicum seeds ♏lxxx.—M. S.—Thirty to sixty drops every two hours. It is added, however, that each dose of the medicine should be followed by a draught of the decoction of the woods; and also, that "to assist the cure" the local application of veratria ointment is sometimes ordered.[3] In some *cutaneous affections* the medicine has been employed with advantage. Dr. Elliotson cured a case of *prurigo* in the course of three weeks, in a man seventy years of age, by giving half a drachm of the wine of colchicum three times a day. In those numerous cutaneous affections, of a scaly sort, in particular, to which gouty persons are subject, this medicine would probably be of advantage, particularly if combined with alkalies. In *gonorrhœa*, and also in *leucorrhœa*, it is said to have been used with advantage by Ticinus of Dresden, and also by Mr. Ritton.

Externally, frictions with the tincture of colchicum have been recommended in *gout* and *rheumatism*, by Gumpert,[4] by Wansbrough,[5] and by Laycock.[6] It would appear in some cases to have afforded very great relief. This preparation has also been used to destroy *vermin* infesting the head and pubis.

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[1] Lancet, 1833–4, ii. 863.
[2] Am. Journ. of Med. Sci., xvii. 66.
[3] N. Amer. Med.-Chir. Rev., iii. 730.
[4] Merat and De Lens, Dict., ii. 361.
[5] Lancet, 1836–7, ii. 662.
[6] Med. Gazette, xxiii. 899.

Administration.—The dose of the *dried bulb* is from two to eight grains, which may be repeated every two or three hours until the specific effects of the medicine are obtained. Of the wine of the root, the dose is stated at from *ten minims* to a *fluidrachm;* of the wine of the seeds, at from *half a fluidrachm* to *two fluidrachms*, and of the tincture about the same. A tincture of the *flowers*, recommended by Sir James Clark, may be given in doses of *ten minims*, and from that to *half a fluidrachm*. The dose of acetic extract of colchicum is *one or two grains*.

Potassæ Bitartras,	vid.	*Cathartics.*
Sodæ Boras,	"	*Irritants.*
Spiritus Ætheris Nitrici,	"	*Diaphoretics.*
Liquor Ammoniæ Acetatis,	"	"
Dulcamara,	"	*Narcotics.*
Oleum Terebinthinæ,	"	*Stimulants.*

EMMENAGOGUES.

Emmenagogues are medicines which promote the discharge of the menses. It is more convenient, however, to embrace under this title all medicines which are employed to influence the uterus, as well in the unimpregnated state as in pregnancy, and whether its functional activity be above or below the normal standard. Without such an extension of the meaning of the term, it may be doubted whether a true emmenagogue exists; and yet it is of the highest practical importance for the physician to be acquainted with the means which are at his disposal for restoring or regulating a function which is one of the most important, if not altogether the most so, in the female during the greater part of her life. It is the sign of her fitness for fulfilling the chief end of her earthly existence, the propagation of the human species, and its varying conditions, more than those of any other function, are the index and the measure of her health.

It was customary, until a very recent period, to consider all of the disorders which are usually associated with derangement of the menstrual function as its direct consequences, but later and more accurate observation has rendered it probable that in the greater number of cases the uterine disorder is secondary, an effect of general morbid

causes involving the whole system, rather than itself a cause of constitutional disease. But this proposition must not receive too wide an extension, since nothing can be more certain than that a suppression of the menses sometimes induces a state of unequivocal and prolonged ill health, which terminates only upon the restoration of the catamenial flow. Apart from all other reasons, we may very safely believe that the cessation of a copious discharge of blood recurring every four weeks must seriously affect the health, for we know very well that in the male sex a much slighter interference with an habitual hemorrhage is often followed by serious or even fatal results. But it would be to form a very inadequate notion of the catamenial flow to regard it as being merely mechanical in its influence. It is, on the contrary, only a sign of a revolution in the uterine system, which prepares for fecundation the germ of a new being, and arouses the sympathetic action of every organ in the economy. During this periodical phase of her life woman is no longer as she was wont to be. Intellectually, morally, and physically she presents new aspects and acquires new powers; her appearance, her manner, and her disposition are changed, and, if no morbid influence disturbs the course of nature, she foreshadows in her condition the phenomena which she often exhibits while preparing for the great work of maternity.

Whether it depends upon the mere sympathies of the rest of the economy with the reproductive organs, or whether the excitement of these organs is itself a local manifestation of a general æstus, it is certain that the whole system is in a state of excitement, and especially that immediately before the menstrual flow begins a plethoric condition is denoted by fulness of the head, oppression of the breathing, tension of the pulse, and a sense of pressure in the loins and in the pelvic region. The nervous system is unusually excitable both by pleasurable and painful impressions, there is an unwonted propensity towards the sexual act, the appetite for food is more vigorous than usual, the bowels are apt to be confined, and the discharge of urine is less abundant. With the appearance of the menses this vital turgor in some degree subsides, and disappears with their cessation, leaving behind a languor which gradually wears away, and is followed by increasing vigor, until the succeeding catamenial period carries it to its height, and allays it by the accustomed discharge.

It is impossible that any cause which, in an otherwise healthy system, directly interferes with the accomplishment of such a function, should not sensibly derange the economy, giving rise especially to an exaggeration of the usual plethoric phenomena, and to an aggravation of the disagreeable sensations which have been referred to, and

even to fully-formed hysteria. Thus, when the os tincæ is too narrow, as often happens at the age of puberty, and continues until after a child is born, or when any other physical impediment, such as a fibrinous clot in the uterus, interferes with the discharge of the blood, the effort to overcome it frequently occasions the severest form of dysmenorrhœa, with pain in the uterus and ovaries, the back, groins, and thighs, and various reflex phenomena in distant parts, such as headache, neuralgia, delirium, spasm, &c. But all of the latter or excited symptoms may exist independently of pain. In many cases, on the other hand, an equally marked general derangement may be produced by menorrhagia, or an excessive menstrual flow, when it is dependent upon a premature or precocious development of the sexual function, such as occasionally takes place in temperate climates, and is very frequent within the tropics, or when it results from an untimely stimulation of the genital organs by sexual intercourse, or other excitants of these parts. But both scanty and excessive menstruation are frequently, and, it must be admitted, even more frequently, dependent upon causes remote from the uterus itself, but in the operation of which this organ shares in common with the rest of the economy. Yet, even under such circumstances, whatever treatment may be employed, and however successful it may be in re-establishing the general health, that result is never complete and permanent unless the catamenial flow is at the same time restored to its normal condition. This is most strikingly the case when it has been entirely suspended by causes which do not necessarily involve organic changes, such as cold, and mental impressions. But in proportion as a suspension of the discharge has resulted secondarily or indirectly from causes acting through the general system, will the return of the menses tend to coincide with that of a healthful condition of all the vital organs. Such is the case when the blood is impoverished by a waste of its elements, as by hemorrhage or depletion, by diarrhœa, hydruria, diabetes, or suppuration; or when it is impaired by a deficiency of food or a want of assimilative power, as in typhus and yellow fever, scurvy, or anæmia from starvation, scrofula, &c.; while in other diseases, such as phthisis, cancer, &c., affecting the whole organism, or exerting a local and mechanical injurious influence upon the uterine system, as cancerous and other tumors of the ovaries or uterus, the duration of the catamenial derangement must usually be permanent, for the cause of it cannot be eradicated.

In looking, then, at the several groups or categories into which cases of menstrual derangement may be divided, we may exclude those which are dependent upon incurable organic disease, or only regard

them in so far as they involve one of the elements contained in the other groups. Thus in phthisis, which is incurable, the immediate cause of the amenorrhœa which so often accompanies the disease, does not differ from that which produces it under the influence of loss of blood and numerous debilitating causes, and which is mainly denoted by a remarkable falling off in the proportion of the red corpuscles of the blood. All of the other groups may be arranged in two classes, one of which contains the emmenagogue agents which restrain, and the other such as produce, excitement. The former are adapted to all of the cases in which a congestive element prevents the due performance of the function, and the latter to those much more numerous instances of torpor, whether strictly local, or arising in connection with constitutional derangement.

Sedative emmenagogues are exclusively agents which tend to diminish the amount of blood in the pelvic viscera. They may consist of general or local depletion, sedative emetics, saline cathartics, and revulsives, including the general warm bath, the hip-bath, and the foot-bath. They are best adapted to the treatment of recent cases of arrest of the menses by cold, mental emotion, or some acute disease; but, even when the affection is chronic, are not to be neglected whenever a menstrual nisus occurs. Under such circumstances they may be used in conjunction with stimulant emmenagogues, either to moderate their action, or to sustain and promote the sanguine afflux towards the uterus which they may have initiated. It will be observed that among sedative emmenagogues some are direct in their action, as leeches applied to the vulva or the os uteri, cupping the sacrum, saline purges, the hip-bath, and warm fomentations applied to the hypogastrium or pudendum; while others, such as general bleeding, mercury, the foot-bath, and emetics, operate more indirectly.

Stimulant emmenagogues are also either direct or indirect in their action. Most of the aromatic plants are regarded as possessing a degree of emmenagogue power, which they exert, as they display their diaphoretic virtues, by stimulating the whole economy. The most commonly employed among them are dittany, chamomile, horehound, and mugwort, but these are inferior in power to several others which appear to have a specific operation upon the uterus. Such are milfoil, tansy, and rue. The physiological stimulants, air, exercise, food, baths, electricity, and finally marriage, must not be forgotten among the stimulant agents of this class.

Still more direct as emmenagogue medicines, are ergot, madder, borax, guaiacum, and belladonna. The first of these, although best known as an agent for exciting contractions in the gravid uterus

at term, is not without an influence upon the unimpregnated organ. Madder, guaiacum, and borax, are analogous to it, but feebler in their operation; and belladonna has the valuable property of causing relaxation of the rigid os uteri in tedious labor and in painful menstruation. Ether and chloroform have the same effect.

Of indirect emmenagogues of the stimulant class, the most important is iron, because it is the specific remedy for anemia and chlorosis, which are generally associated with, and often the cause of, chronic amenorrhœa. Next to it stand acrid purgatives, as black hellebore, aloes, savine, and gamboge, and irritant diuretics, but especially cantharides. An agent which should be included in the present class, is stimulation of the mammæ by suction, by the cupping-glass, or by certain substances, as the leaves of the castor oil plant.

Of all the remedies which have been mentioned in the preceding paragraphs, but one will be found treated of as the representative of the class of emmenagogues. Ergot is the only medicine whose properties in relation to the uterus are more important than those which it exercises upon other parts of the system. This fact may afford an illustration of the remark already made, that it has been doubted whether a true emmenagogue exists. Even ergot possesses this quality, in its restricted sense, in a very slight degree only. Yet it is useful both to know under what conditions attempts to regulate the menstrual function must be made, and what are the agents, and their peculiar powers, which are the most appropriate in each particular case.

ERGOTA.—Ergot.

Description.—Ergot (*seigle ergotisé*, or spurred rye; *mutterkorn*, or womb-grain) is a metamorphosis of rye, or other grain, by which it is converted wholly or in part into a curved, purplish-black, cylindrical, tapering, and grooved excrescence, from one to three lines in diameter, and usually from six to ten lines long. When dry it is firm and brittle, but is flexible and tough when moist, and emits a sickening, heavy smell. Its color internally is white, with a slight tinge of pink. Its taste is nauseous, and somewhat acrid.

Ergot is produced by other cereals besides rye. Mialhe found that the ergot of wheat is identical with that of rye in the qualities of its proximate principles, and in its action upon the gravid uterus.[1] His conclusions have been confirmed by Pourcher,[2] and by Jobert.[3]

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[1] Bull. de Thérap., xxxix. 41.

[2] Ibid., xlviii. 467.

[3] Am. Journ. of Med. Sci., Oct. 1856, p. 479.

The origin of this product is unknown. Some have conceived it to be formed by an insect, and others have regarded it as a fungus. It is most apt to be produced during wet and warm seasons.

The natural history of ergot has been very zealously investigated by Mr. Quekett, whose essay upon the subject the reader may consult with profit.[1] Perhaps the most intelligible account of the subject is that of Debourges de Rollot.[2] He states that the first change in the diseased grain is to become softened, and then friable, during which time it undergoes a species of fermentation, and exhales a nauseous smell. Afterwards the surface of the grain is covered with fissures, and a whitish, viscid, and sweetish fluid exudes from them, which collects at the top of the grain, and glues together the anthers and stigmas. The fluid has an acid reaction. By this time the perisperm, except at the summit of the grain, is destroyed, and no traces of a germ can be detected. If the grain is powdered and mixed with water, the addition of iodine does not reveal the presence of starch. By degrees it turns from white to yellow, and afterwards to brown, beginning at its lower part, its bulk also increases, and its shape passes into that of ergot.

Ergot has several constituents, one of which is known as the alcoholic, and another as the watery extract, neither of which displays any very active properties in the usual and normal state of the system. It also contains a resinous matter which acts chiefly upon the stomach and bowels, and an oil upon which its poisonous properties seem to depend. It is said by Kluge, and by Green, to be more active when gathered from the standing grain at harvest time, than when collected after harvest.[3] Arnal asserts that it is more active when old than when fresh. He affirms that it undergoes, by keeping, a fermentation which develops its virtues, provided it be not exposed to the air.[4] But this statement is not in harmony with general experience. The hæmostatic virtues of the drug are referred by Bonjean to an extract prepared with cold water, and by displacement. This extract, although it has no claim to rank as a proximate principle, he denominates *ergotin*, as Wiggers had previously given this name to an extract prepared with boiling alcohol. To it, also, Bonjean attributes the power of ergot in the gravid and distended state of the uterus. It may here be mentioned that, as early as 1831–2, Dr. C. Hooker, of New Haven, demonstrated that ergot deprived of its oil retained all its parturifacient virtues unimpaired, while it ceased to act unfavorably upon the

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[1] Lond. Med. Gaz. (1836), xxiii. 606.
[2] Bull. de Thérap., xxiii. 310.
[3] Beck, Obs. on Ergot, p. 6.
[4] Bull. de l'Acad. de Méd., xiii. 680.

child. Ergotin, as prepared by Bonjean, is a soft, reddish, and homogeneous substance, of a sour and acrid taste, and with a smell of roasted meat, due to the osmazome it contains. The preparation so called by Wiggers, is a fine, reddish-brown powder, which has a peculiar and repulsive but aromatic odor, and an acrid, bitter, and aromatic taste.

The only officinal preparation of ergot is,

Vinum Ergotæ.—WINE OF ERGOT.

This wine is made by macerating two ounces of finely-powdered ergot in a pint of Sherry wine, for fourteen days, with occasional agitation, and then expressing and filtering the liquor. Dose, from one to three fluidrachms.

HISTORY.—The earliest mention of ergot is by Sigebert de Gembloux, who wrote in 1096. Lonicer, in 1565, described it under the name of *clavus siliginis*. A few years afterwards (1576), the Medical Academy of Marburg attributed to this substance a spasmodic disease which then prevailed in Hesse. It seems to have been known in Germany as a popular oxytocic from a remote period, a fact which is attested by its vulgar names of *mutterkorn*, already cited, and *Gebärpulver*, or *pulvis parturifaciens*. In 1688, Camerarius stated that the midwives of Wurtemberg employed it to facilitate delivery. It seems probable that a Dutch accoucheur, who, in 1747, used a medicine capable of greatly hastening labor, was aware of the efficacy of this substance. In France, according to Bordeu, it was used from time immemorial to increase uterine action. In Italy, too, as Balardini assures us, the midwives employed it in difficult labors. Laneri and Amoretti make the same statement.[1] From a letter of Parmentier to the Abbé Rozier,[2] in 1774, it would seem that a thimbleful of powdered ergot was used as a popular remedy in Alsace, when the pains of labor were lingering and the presentation natural. In the same year its use was interdicted in France. But in 1777, Desgranges, an accomplished accoucheur of Lyons, extolled its efficacy, published many luminous reports of its activity and usefulness, and eventually succeeded in bringing it into general use.[3] Nevertheless it did not find favor with physicians, and was well nigh forgotten by them for nearly half a century.

Meanwhile it came into notice under more favorable auspices in America. For this we are indebted to the late Dr. Stearns, of New York. In 1807 he sent from Waterford, N. Y., to a correspondent, a

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[1] Annales de Thérap., ii. 50.

[2] Journal de Physique, iv. 144, and Eclectic Repertory, ix. 260.

[3] WRIGHT, Edinb. Med. and Surg. Journ., Jan. 1840, p 23.

sample of what he called *pulvis parturiens*, describing it as a spurious growth of rye, and stating that he had for several years used it successfully to expedite lingering parturition when the *pains had subsided, and were incompetent to expel the fœtus.*[1] In this communication he dwells upon the necessity of first ascertaining that there is no obstacle either in the position of the child, or the state of the maternal organs arising from an imperfect opening of the os tincæ, or rigidity of the other maternal parts. He found the decoction more active than the powder. This account was soon confirmed by Dr. Akerly, of New York, who also mentioned his having heard of its use by women in New York and Connecticut, for the purpose of procuring abortion.[2] In 1813, Dr. Prescott called attention to the rapidity of its action, and stated that it began to operate within seven minutes after being taken.[3] Now, for the first time, arose the suspicion, afterwards so generally entertained, that it endangered the life of the child by causing too violent and unremitting compression of its body.[4] The notice of its virtues by Chapman, and the more detailed account of its properties by Dewees in 1817–18, contributed still more largely to recommend and to diffuse its employment. In 1821, Dr. Atlee, of Philadelphia, reported his great success with it in threatened abortion, which the usual remedies could not prevent, and which excessive hemorrhage rendered alarming; in cases of hemorrhage near the end of gestation, connected with atony of the uterus, and in lingering labors without any physical obstacle to their completion. He also described its benefits in hemorrhage after labor from imperfect contraction of the womb.[5]

In France, although the American observations were known, they were generally discredited, because Chaussier and Madame La Chapelle pronounced the medicine inert, nor was this prejudice overcome until the cases presented by Bigeschi to a medical society of Paris in 1823, succeeded in attracting a closer attention to the subject. In England, too, authority was allowed to outweigh experience. Ergot was introduced into that country in 1824, but its acceptance was hindered by a letter from Dr. Hosack, of New York, to Prof. Hamilton, of Edinburgh, in which the former accused it of being *pulvis ad mortem*, rather than *pulvis ad partum.*[6] Even in 1825, Dr. Davis declared, somewhat disingenuously, that although the pretensions of the medicine had been known to the profession for nearly twenty years,

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[1] Med. Repository, ii. 308. [2] Ibid., xii. 341.
[3] A Dissertation on the Natural History and Medicinal Effects, &c.
[4] N. Eng. Journ. of Med. and Surg., ii. 353. [5] Am. Med. Recorder, iv. 141.
[6] Hosack's Essays, ii. 296.

yet the actual fact of its power had not been satisfactorily established.[1] In the same year, however, Dr. Henry Davies published many cases which fully demonstrated its efficacy, and put to shame the hasty conclusions of too sceptical or too prejudiced physicians.[2] Within three years afterwards, so large a mass of testimony upon the subject accumulated, as to set at rest the question of the virtues of ergot. Of these proofs, the most elaborate and conclusive was the Essay of Michell,[3] published in 1828, and that of Villeneuve, abridged by Dr. Adam Neale, in the same year.[4] The exaggerated estimate of its virtues by the former writer was that of a partisan, as may be inferred from his opinion that, "as soon as it is generally known in female practice, it will supersede the necessity for male practitioners, except in very few instances."

ACTION. *On Animals.*—Several experimenters have called attention to the remarkable aversion shown by *dogs* to food containing ergot. Tessier says they would rather die with hunger than eat it. Gross found it impossible to make them retain any of it except by fastening the mouth, and even then a portion of it would be vomited through the nostrils. Wright, in his numerous experiments, introduced the medicine into the stomach through a gum elastic tube. Diez noted as its principal effects, profuse salivation, vomiting, dilatation of the pupils, hurried breathing, frequent pulse, cries, trembling, staggering, paraplegia, sometimes diarrhœa, sometimes constipation, prostration, urgent thirst, convulsions, and death. The like symptoms were observed by Wright.[5] This experimenter injected a strong infusion of ergot into the jugular vein of dogs. The symptoms were dilated pupils, a rapid pulse, convulsions, and flaccidity of the limbs, followed by their tetanic rigidity, which continued after death. When a weaker infusion was employed, it caused great temporary excitement, followed by depression. A still more diluted preparation seemed to exhaust life by a progressive sedative operation. Similar results ensued when the solution was thrown into the peritoneal cavity. The more gradual action of ergot upon dogs was shown by Wright. He mixed from one to two ounces a day with the animal's food, and produced its death in the course of six or seven weeks. The succession of symptoms may be thus described: an immediate but temporary effect was shown by weakness of the hinder legs and dulness of vision, but day after day

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[1] Med.-Chir. Rev., vii. 418. [2] Ibid., viii. 276.

[3] On Difficult Cases of Parturition, and the Use of the Ergot of Rye.

[4] Researches respecting the Natural History, &c., of the Spur, or Ergot of Rye. Lond., 1828.

[5] Ed. Med. and Surg. Journ., lii. 319.

the animals grew duller, suffered from thirst, loss of appetite, and dryness of the nostrils. Then paralysis and anæsthesia of the hinder legs became more evident, the flesh wasted, acrid tears destroyed the hairs upon the face, sight and hearing failed, the heart waxed slow and feeble, the breath fetid, the stools and urine passed involuntarily, and death took place by exhaustion. The muscles were found on dissection to be pale and flabby, the heart was full of dark blood, the bronchial lining membrane and trachea were bathed in pus, the mucous membrane of the small intestine was injected. Tubercles were found in the lungs in some cases, and in some there were purulent collections in the joints.

In Tessier's experiments, ergot was mixed with the food of *pigs*.[1] They showed a reluctance to eat it. Its first effects were redness of the eyes and ears; the latter organs and the limbs then grew cold, the joints swelled, gangrene attacked the ears, limbs, and tail, and the animals died in convulsions. One of them, six months old, lived for sixty-six days. Its intestines are described as having been inflamed and gangrenous.

Parola[2] gave from half an ounce to two ounces daily to a *mule*. From the second day the pulse fell, the heart grew feeble, irregular, and jerking, the breathing slow and deep; the appetite and flesh failed; tremulousness, a staggering gait, and dulness succeeded. On the other hand, Block[3] fed a number of sheep and cows for several months together upon fodder containing a large proportion of ergot. No mischief whatever ensued. Supposing the experiment to be correctly stated, we can only account for the result by supposing that the ergot employed was quite inert.

The action of ergot upon *birds* is much more distinct and decided. Bonjean[4] gave two drachms daily of powdered ergot to *cocks* and *hens*. About the seventh day they became dull, languid, without appetite, and were affected with diarrhœa. In some cases the comb grew cold, bluish, flaccid, and covered with ecchymoses; in others it was ulcerated. Black blood flowed from the nostrils, the animals were unable to walk, their breathing grew slower, and emaciation and death followed. In other cases the plumage was shed, and the beak and claws were surrounded by a bluish circle. The experiments of Tessier on *ducks*[5] furnished results almost identical with these; and in a turkey the symptoms were precisely like those just described. Gross, of

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[1] Revue Méd., xliii. 140.
[2] Annales de Thérap., ii. 89.
[3] Wibmer, Wirkung, &c., v. 85.
[4] Traité Théorique et Pratique de l'Ergot de Seigle, Paris, 1845.
[5] Revue Méd., xliii. 138.

Breslau,[1] gave ergot, or else bread that contained either it or ergotin, to *pigeons*. At first they were disposed to vomit, but in the course of two or three days showed an increased appetite. This, however, was followed by dulness, restlessness or immobility, convulsive twitches of the muscles, diminished action of the heart and lungs, and death between the fourth and seventh day. Similar effects were produced in fowls and small birds, such as *linnets* and *sparrows*, the former of which died within forty-eight hours after eating fifteen or twenty spurs of ergot.

Bonjean gave three drachms of the *oil* of ergot to a rabbit; it appeared distressed and feeble, and was afterwards convulsed, with opisthotonos. To birds it generally proved fatal, but first produced symptoms of narcotism. Six-drachm doses were not fatal to dogs, but occasioned in one case spasmodic symptoms, and in another only nausea and drowsiness. The earlier experiments of Wright with oil of ergot gave similar results to these.

The lesions produced in animals by chronic ergotic poisoning may be thus summarily described. The venous system is engorged. In poultry, the general color of the comb and wattles is purplish with small blackish points, and the edges of these appendages are always quite black, and sometimes also hard and brittle. The gastro-intestinal mucous membrane is usually injected, particularly at its upper portion, sometimes softened, and occasionally ulcerated or gangrenous. In birds, the gizzard is soft and vascular; the liver is generally enlarged, and its consistence is sometimes diminished; the meningeal vessels are usually injected, and the brain and spinal marrow, in a small proportion of cases, softened; the lungs are congested, and the blood is liquid and black; in nearly every case the muscles are rigid for some time after death; in some instances this condition is permanent, especially in the hinder limbs of quadrupeds.

The influence of ergot upon the gravid uterus in animals is not uniform. In some cases it seems to have been purely negative, in others to have destroyed the product of conception without producing its expulsion, and in still others, and these are the most numerous, to have caused abortion. Bonjean gave ergot to a female *guinea-pig* during the early stages of gestation. Abortion was not occasioned, nor, indeed, any symptoms whatever; so that the result of the experiment was purely negative.[2] The experiments of Wright were to this effect. He mixed ergot with the food of a pregnant rabbit; no tendency to abortion was excited, and in due time six healthy young ones

[1] CANSTATT's Jahresbericht, 1845, p. 255.

[2] Op. cit., p. 78.

were born. The animal, still kept upon the same food, was again impregnated. She looked drowsy and moped, the fur grew erect and rough, gestation was *protracted* beyond its usual term, and three young ones were born, two of which were dead and the third survived but a few hours. Subsequently an abscess formed under the lower jaw, the front teeth dropped out, pus flowed from the eyes, diuresis and diarrhœa succeeded. In the twelfth week the animal died. The lungs and mesentery were tuberculous, but the intestines were sound. The same experimenter, after many trials of ergot upon pregnant bitches, concluded that it did not act as a parturifacient in them, although it sometimes appeared to injure or destroy the product of conception.

On the other hand, according to Diez, it produced abortion in *bitches* and in *guinea-pigs* without harm to the mother or the young, when the dose was moderate; but large doses destroyed both, and excited inflammation of the womb. In 1825, Dr. Oslere gave ergot to a *sow*, a *cow*, and a *cat*, before the completion of pregnancy, and in each case produced abortion.[1] In 1841, an epidemic of abortion among *cows* occurred in the neighborhood of Trois-Crois, in France, which was traced to the ergoted state of the rye and other gramineæ in that district.[2] According to Percy and Laurent, a decoction of ergot injected into the veins of a *cow* caused the animal to calve speedily.

The following statement of Youatt shows conclusively that ergot acts upon the uterus of animals in labor precisely as it does in the case of the human female: "I have for the last six or seven years been in the habit of administering the ergot of rye to quadrupeds in cases of difficult or protracted parturition. . . . In the *monogastric*, if I may venture to use the term, I have never known it fail of producing considerable effect, even when the uterus has been previously exhausted by continued and violent efforts. In the *ruminant*, with its compound stomach or stomachs, I have witnessed many a case of its successful exhibition. . . The uterus has in every case responded; it has been roused to a greater or less degree of renewed action."[3]

On Man.—In 1824 Lorinser and several companions took each of them two drachms of powdered ergot upon bread and butter. The symptoms in all the cases were alike, and consisted of some colic, nausea and vomiting, salivation, occasionally diarrhœa, and a sense of fulness in the head.[4] Similar effects were obtained by Gross and an

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[1] Phila. Journ. of Med. and Phys. Sci., xi. 106.

[2] Edinb. Month. Journ., Jan. 1842, p. 73.

[3] Pereira, Mat. Med. (3d Am. ed.), ii. 137.

[4] Edin. Med. and Surg. Journ., xxvi. 453.

associate who each took a drachm of ergot.[1] And such also are the symptoms ascribed to the medicine by Raige-Délorme.[2] Trousseau and Maisonneuve, besides the above effects, particularly noticed dilatation of the pupils as the most constant phenomenon. It began within twelve or fourteen hours and continued for several days. The sight was not affected. Headache and vertigo, sometimes so marked as to resemble intoxication, and followed by drowsiness, were also observed.[3] Hussa describes similar symptoms as produced by bread containing a sixth or a fifth part of ergot. The headache generally continued for several days.[4] Bonjean took a drachm of powdered ergot in three equal doses before breakfast, and found that the symptoms were precisely such as have been described. Other testimony to the same purpose might be adduced, but it is scarcely necessary, since the results here cited were so uniform. It should be mentioned, however, that writers may be found, including Parmentier, Lalesque, Uberti, &c., who assert that ergot has no effect upon the healthy system, except, perhaps, to render the pulse less frequent.

The power of ergot to lower the *pulse* is unquestionable. In some experiments upon himself, Parola found that his pulse fell from 74 to 60, and from 79 to 72,[5] and Dr. Quinton Gibbon, of New Jersey, observed a decline of the pulse in himself from 70 to 57, and in another person from 64 to 55. In this case the repetition of the trial produced the same result. Arnal's numerous experiments showed that the action of a drachm of ergot commenced within the hour, and in the course of four hours lowered the pulse from 84 to 62. After allowing for the influence of natural causes, the time of day, rest, &c., it appeared that the pulse was still lowered, on an average, eight beats in a minute. In febrile affections the influence of the medicine was still more marked, and sometimes the pulse fell thirty and even thirty-six beats in the course of five hours. The experiment upon the healthy system was four times repeated at intervals of ten days, and uniformly with the same result.[6] Bonjean found that a drachm of ergot lowered his pulse from 70 to 60. In parturient females Dr. Hardy observed that within fifteen or at most thirty minutes the medicine produced a marked diminution of the pulse which sometimes continued for several days.[7] Beatty estimated its reduction under like circumstances, at twenty beats in a minute. According to Bonjean

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[1] Canstatt's Jahresbericht, 1845, p. 256.
[2] Dict. de Méd., 2ème éd. xxviii. 271.
[3] Bull. de Thérap., iv. 106.
[4] Ibid., liii. 285.
[5] Annales de Thérap., ii. 91.
[6] Bull. de Thérap., xxxvi. 534.
[7] Dublin Journ. of Med. Sci., xxvii. 225.

ergotin reduces the force, but not the frequency of the pulse; but Guilland and Arnal state that it does both.

The earliest experiments to illustrate the powers of *oil* of ergot were performed by Dr. Charles Hooker, of New Haven, in 1831-2. He obtained the oil by macerating ergot for several days in ether, decanting the liquid, and evaporating the ether. To a medical student he gave half a drachm at two o'clock P. M., a drachm at three o'clock, and the same quantity at four o'clock. Under the second dose the pulse fell from 82 to 65, and under the third dose to 36; and the respiration from 19 to 8. Of the general symptoms, the first was a sense of tightness followed by an unpleasant heavy and confused feeling in the head, and nausea like sea-sickness, general languor and lassitude, constant spitting, and vivid flashes of light before the eyes. Under the second dose there was, in addition, painful rigidity of the muscles, lassitude, lividity of the skin, dilated pupils and a heavy countenance. Under the third dose there was, besides an increase of these symptoms, diuresis. The same phenomena were manifested in another experimenter, and in neither case did they entirely disappear for nearly a week afterwards. For three days the pulse continued under 50, the skin was still dusky, and the muscles sore. When the same oil was given in labor no influence whatever on the uterus was displayed, but upon the child a very marked impression, as will presently be seen. Dr. Hooker then used the ergot, from which the oil employed in the above experiment had been abstracted, and found that its ecbolic powers were entirely unimpaired.[1]

If the phenomena here described are compared with those produced upon man by ergot in large doses, it is evident that they are identical, and that the toxical effects of this substance are due entirely to the oil which it contains.

Mr. Wright also states that the *oil* of ergot lowers the pulse and renders it less frequent. It may also be mentioned here, he found that the vapor of this preparation diffused through the air of a close room produced a tingling sensation in his limbs, distressing lassitude, irritability, and giddiness.[2]

Schroff, in his experiments, observed that pure ergotin in doses of from one-third of a grain to one grain produced fulness of the head, headache, and dilatation of the pupils, followed by colic and infrequency of the pulse.[3]

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[1] Bost. Med. and Surg. Journ. (1834), x. 298.

[2] Edinb. Med. and Surg. Journ., July, 1840, p. 51.

[3] Reil's Mat. Med. d. rein. chem. Pflanzenstoffe, p. 166.

Among the effects of ergot may be noticed those which are occasioned by the use of food containing a large proportion of this substance, and which are included under the general name of *ergotism*. The records of this disease have been traced back to classical times, but they are more clearly to be recognized in the descriptions of epidemics of dry gangrene, one of which was recorded by Sigebert de Gremblour, in 1096.[1] In 1597, a spasmodic disease which was attributed to ergoted rye, prevailed in Hesse and the adjacent territories. Epidemics of the same sort occurred in 1648, 1675, 1702, and 1716, in Germany, as well as in Flanders, and in France. In Sologne, a French province where rye is much cultivated, this disease has repeatedly been prevalent. Two forms of the affection have been described, the spasmodic and the gangrenous.[2]

Spasmodic ergotism begins with malaise, formication of the whole skin, cramps and numbness of the extremities, and pains in the head and back. This state lasts from one to three weeks, and ushers in heartburn, epigastric oppression, vertigo, syncope, deafness, paroxysmal or permanent flexure of the joints, or equally violent extension and opisthotonos, twitching of the facial muscles, sometimes violent delirium, with cold skin, intense internal heat, and fetid sweats. The attacks are sometimes preceded by digestive disturbance, and last from half an hour to two hours or more. After a time the convulsions cease. They are followed by exhaustion, debility, oppression, heartburn, and a ravenous appetite, which it is dangerous to gratify. Sometimes strabismus or loss of sight succeeds, with an eruption of bullæ upon the skin, or general insensibility. After death in fatal cases, the stomach and bowels are found inflamed, and the parenchymatous organs congested. The attack usually lasts for three or four weeks, and is very fatal. In 1735, during an epidemic in Wurtemberg, out of five hundred persons attacked, three hundred under fifteen years of age perished.

The *gangrenous* form of ergotism is quite different from the foregoing. The first symptom is a dull pain and weariness of the limbs, with a heavy and stupid expression of countenance. The skin has an earthy or jaundiced hue. The extremity or the nose about to become affected grows quite cold, and the skin over it is of a dusky red color. The gangrenous process generally begins in the central parts

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[1] Goupil, Journ. des Progrès, iii. 161.

[2] Ozanam, Maladies Epidem., iv. 226; Bergen and Muller, Haller's Disputations, i. 78; Duvivier de Saint Hubert, Traité Philosophique des Maladies épidemiques, &c., Paris, 1836; Heusinger, Studien über den Ergotismus, Abstract in Journ. f. Pharmakodyn., i. 404.

of the limb, and afterwards attacks the skin, extending upwards towards the trunk from the fingers and toes, causing these parts to blacken, shrivel, and harden, until they resemble the flesh of a mummy. Sometimes, however, they have the appearance of ordinary gangrene. In either case the finger, the toe, the nose, or even the extremity separates itself from the body without hemorrhage, leaving a clean wound behind. Sometimes the flesh only is thrown off, and the bone has to be divided artificially. Cases are reported in which all four of the extremities were thus cast off. Meanwhile, the digestion is not always deranged, although death is sometimes preceded by diarrhœa. The attack is seldom shorter than three weeks, and in the vast majority of cases is fatal.

It is proper to state that the dependence of these epidemics upon ergot has been denied by several writers, among whom, as of current authority, Trousseau and Pidoux may be mentioned,[1] but the weight of evidence is on the opposite side. Among the more recent affirmative proofs, two may be cited, as each illustrates one of the forms of ergotism above described. In 1841, a family of eight persons lived upon heavily-ergoted rye bread, which was gathered during the wet harvest of the previous year. The chief symptoms were these: malaise, anxiety, exhaustion, faintness, coldness of the whole body, a sharp, pricking pain and formication, numbness of the hands and afterwards of the arms, alternating with spasms, which were so severe as to extort tears. The muscles of the lower extremities were affected in the same manner, and in one case those of the right side of the face; subsequently the abdominal muscles were spasmodically contracted. About the sixth day, nausea, vomiting, and diarrhœa took place, with severe pains in the bowels and bladder. About the fourteenth day, two of the children lay as if stupefied, or if roused raved wildly, or complained of pains in the head and limbs; at the same time a pruriginous eruption appeared on the skin. They died on the twenty-first day in violent convulsions.[2] The other case is reported by Bonjean.[3] Like the former, the sick family consisted of eight members. Of these, four were not affected, two were but little so, and of the remaining two, one perished and the other lost his leg. All of them had lived upon the same ergoted bread. In the fatal case the symptoms were these: pain in the left groin; a dark spot on both calves; coldness and pain in the legs, followed by an eruption of

[1] Thérapeutique, 3ème éd., i. 807.

[2] Aschoff, Canstatt's Jahresbericht, 1844, p. 240. A case of the same sort was presented by a family of seven persons in the village of Envers, Upper Savoy. Bonjean, op. cit., p. 146.

[3] Op. cit., p. 158.

vesicles, with violent itching; gangrene of the lower third of both legs. In three weeks, the sphacelated part began to separate; the feet were black and dry; the upper part of the legs was affected with humid gangrene; both were amputated below the knee; very little blood flowed. No extension of the disease followed, but the patient died of pneumonia, which was probably metastatic. In the other child but one leg was attacked; its symptoms were the same as in the first case, but spontaneous separation of the limb at the knee took place, and recovery followed.[1]

Some experiments of Bonjean appear to show that the process of fermentation in making bread and the action of heat in baking it diminish greatly the activity of any ergot it may contain. Hence, he says the crust of such bread is less injurious than the crumb.[2]

Uses. *In Labor.*—Dr. Stearns, soon after his introduction of ergot into medical practice, so far from advocating its habitual employment, stated expressly that he had not found it necessary in more than one out of thirty cases. The indications for its use, as given by him, are the following: To use it, 1. In lingering labors when the child is low, the parts relaxed, the pains absent or feeble, and there is danger of delay from hemorrhage or other alarming symptom. 2. When the pains are suspended and convulsions set in, premising venesection. 3. In inevitable abortion. 4. When the placenta is retained by uterine inertia. 5. In post-partum hemorrhage under like circumstances. Subsequent experience has confirmed the soundness of these rules, and has not made any essential addition to them. Obstetricians have clothed them in every form of language, but without altering their spirit. The only question which may admit of different solutions is, at what period of the passage of the child through the pelvis is the administration of ergot advisable? The more prudent and skilful tend to restrict its use. Thus, Dr. Meigs says that he scarcely gives ergot as an *expulsive* agent. He chiefly employs it at the moment of, or just before, the birth of the child, in order to secure a good contraction of the womb in women who are known to be subject to hemorrhage. To administer it merely for the purpose of hastening

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[1] A case occurred in Ireland of ergotic gangrene. *Vid.* Taylor, Med. Jurisp. (1st Am. ed.), p. 432.

[2] The fullest account of epidemic ergotism will be found in the paper of Mr. Wright, in the Edinb. Med. and Surg. Journ., lii. 207; and besides this and the papers referred to above, the reader will find an interesting abstract of its history by Laségue in Archives Gén., Mai, 1857, p. 594. A brief notice of an epidemic at Lyons in 1854 is given in the same journal, Nov. 1855, p. 605; and "A Supposed Case of Ergotism," with interesting historical details, is published by Mr. Camps in Brit. and For. Med.-Chir. Rev., Jan. 1855, p. 196.

natural labor and abridging the attendant's weariness of waiting is wholly inexcusable, and argues a culpable ignorance of the powers of the drug. We shall consider in succession its action upon the *mother* and upon the *child*.

Several writers have called attention to a painful, spasmodic, and, as it were, tetanic contraction of the gravid uterus provoked by ergot, which, so far from indicating an expulsive effort on the part of the organ, shows directly the reverse. To this action, it may here be stated, a share of the disastrous influence of ergot on the child is fairly to be attributed. Dr. Hardy has drawn attention to the fact that, when ergot is used, the volume of the uterus is often found much greater than after ordinary labors, imparting to the hand almost the feel of a uterus before the expulsion of the placenta. It is at the same time hard, and remains so for several days.[1] It is sometimes stated that ergot may occasion rupture of the uterus. Several cases of the sort are reported. One is upon hearsay evidence, and occurred in the hands of a medical student.[2] Another was under the care of a midwife.[3] A third was in similar hands.[4] Of three cases of rupture attributed by M. Dépaul to ergot, one was in a female with spinal curvature, and treated by a midwife, and the medicine was prematurely administered; in a second, the rupture did not take place until four or five hours after the administration of two doses, each of only ten grains; in the third case only do the conditions appear to have been suitable for the employment of the drug.[5] Another instance of this accident occurred in the practice of a physician, who, after having administered ergot in two doses of about eight grains each, was absent from her for several hours, during which the rupture occurred.[6] In all of these cases but one the medicine was administered in direct opposition to the rules which should govern its employment, and yet its agency in producing the result is not clearly demonstrated, since uterine rupture is known to take place quite independently of ergot. Indeed, when the third case referred to was reported to the London Medical Society, the operation of this cause was by no means admitted. And, on the other hand, if we examine the immense number of cases in which the medicine has been used, we shall find scarcely any in which it can even plausibly be charged with the accident in question.

Dr. Catlett attributes puerperal convulsions, in some cases, to the

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[1] Dublin Quart. Journ., xxvii. 230.

[2] Armstrong, Lond. Med. Gaz., July, 1838, p. 734.

[3] Coward, Ibid., Nov. 1840, p. 372.

[4] Hooper, Lancet, March, 1837, p. 824.

[5] Abeille Méd., x. 93, &c.

[6] Bull. de Thérap., xlviii. 351.

action of ergot, as well as the production of hourglass contraction of the uterus.[1] Rupture of the perineum, and laceration of the os uteri, have likewise been laid to its charge. According to Dr. Barnes,[2] prolapsus and procidentia of the uterus and bladder may result directly from the violence of ergotic contractions. He cites a case in which these organs were driven down so that the bladder appeared outside of the vulva. Still earlier, Dewees had reported a case in which the too free use of ergot by the patient after miscarriage, caused the escape of a considerable portion of the uterus through the os externum.[3] Retention of the *placenta* is sometimes attributable to ergot, and with apparently good reason. During natural labor, the alternate repletion and evacuation of the placental sinus is doubtless a chief cause of the separation of this organ from its attachment. The continuous and steady contraction produced by ergot, yet not going as far as that of natural labor, renders the retention of the after-birth more probable. Dr. Hasbrouck, of Rockland County, New York, has reported four cases of this accident, which suggest the explanation just given.[4] In addition to these effects, it may be mentioned that certain of the peculiar poisonous actions of the oil of ergot are sometimes manifested in the mother during labor, such as delirium and headache, dulness, incomplete coma, lividity of the countenance, muscular rigidity, &c.[5]

The influence of ergot upon the child is by far the most important question that relates to this medicine. At the commencement of its use we had the high authority of Dewees for believing that there was no decisive instance of its having a direct and unfriendly influence on the child. The cases to the contrary he held to be those in which it was given too early, when the soft parts were unrelaxed, or the head was not well situated. The same opinion was expressed strongly by Chapman.[6] But as early as 1822, we find Dr. Moore, of New York, stating that "it appears to be injurious to the child at all times, for in every case in which I have seen it exhibited, the child has been still-born, and in the greater part of them it was not possible to restore it to life."[7] In 1828, Dr. R. M. Huston maintained that, even when given under all the favorable conditions admitted to be necessary, the medicine was still chargeable with the death of many children, and he refers to the experience of Church, Holcombe, Hall, and others, for a con-

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[1] Month. Journ. of Med., Feb. 1842, p. 209.

[2] Lancet, Oct. 1853, p. 434.

[3] Am. Journ. of Med. Sci. (1828), i. 258.

[4] N. Y. Journ. of Med., Nov. 1853, p. 324.

[5] Maunsell, Lond. Med. Gaz., xiv. 605. Trastour, Brit. and For. Med. Chir. Rev., Oct. 1857, p. 523.

[6] Therapeutics, i. 340.

[7] Hosack's Essays, ii. 296.

firmation of this statement.[1] In 1834, Dr. Hooker, of New Haven,[2] used the oil of ergot in six cases of labor. In three of them twenty, thirty, and forty drops were given without effect. In the fourth case fifty drops were administered, and the woman complained of a strange sensation in the head. In the fifth case sixty-five drops, and in the sixth case seventy-five drops were used. In both the labors were easy, but "the children for a considerable time after birth had a livid appearance, and respired with much difficulty and irregularity, with the ordinary appearance of ergotism." In no case was there any increase of the uterine contraction. More recently Drs. McClintock and Hardy have said, "It by no means follows as a consequence that the ergot will not act upon the child, because it does not act upon the uterus, for we have seen numerous instances where the child was unquestionably affected by it, although the uterus was wholly unaffected, or nearly so."[3] Signs of congestion in the fœtus were observed to arise from ergot by Lorenz, who ascribed them to the dose being too large, viz., fifteen to twenty grains.[4] Dr. Catlett maintained that it tends to produce hydrocephalus in the early stage of infantile life.[5]

All of the statistics, embracing many cases of labor in which ergot was employed, show a large proportion of stillbirths. Prof. Busch, of Berlin, administered it in 175 cases, on account of weak labor-pains, after the os uteri was well dilated. 177 children were born, of whom 17 were dead, and 18 in a state of asphyxia.[6] Again, Mr. Chatto refers to 420 cases of labor, in 80 of which ergot was exhibited. 422 children were born, of whom 31 were dead. 10 stillbirths occurred among the 80 cases treated by ergot, and 21 among the remaining 340 cases. So that the proportion of deaths in the former class was *one in eight*, but in the latter only *one in seventeen*.[7] In the Report of Drs. McClintock and Hardy we find that out of 259 tedious and difficult labors, 173 deliveries took place without any instrumental assistance. "Of this number thirty got ergot to overcome inertia in the second stage of labor, and only *ten* out of the *thirty* were born alive."[8] In other words, the proportion of deaths attributed to this agent was *one* in *one and a half*. Dr. R. U. West, in defence of ergot, has published an abstract of sixty-nine cases of labor in which it was administered.[9]

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[1] N. Amer. and Surg. Journ., vii. 81. See, also, Beck, Obs. on Ergot, p. 8.

[2] Boston Med. and Surg. Journ., x. 298. [3] Loc. inf. cit.

[4] Dierbach, Neueste Entdeck, i. 135.

[5] Edinb. Month, Journ., Feb. 1842, p. 210.

[6] Neue Zeitschrift für Geburtskunde, Bd. xv., and Lond. Med. Gaz., xxiv. 337.

[7] Lond. Med. Gaz., xxiv. 575. [8] Dub. Quart. Journ., Feb. 1851, p. 36.

[9] Times and Gaz., Dec. 1855, p. 617.

Nine children were stillborn, or rather more than *one in eight*, a proportion regarded by Mr. Chatto as condemnatory of the use of this drug. These statistics leave no doubt of the fact that ergot administered during labor has proved very destructive to the life of the child.

Is this danger inherent, or does it depend upon the conditions under which the medicine is employed? In seeking to find an answer to this question it may be stated, first, that a different result from those just quoted has sometimes been obtained. Thus M. Godquin, comparing the success of ergot with that of the forceps, concluded it to be less injurious to the child. He draws this inference from an analysis of 1885 labors, of which 780 took place after he began to employ ergot. Previously, he had found it necessary to apply the forceps in 1 out of every 25 cases, and lost 1 child in 88; while subsequently he was obliged to use the forceps but once in 65 cases, and lost but 1 child in 260.[1] It may be said that the timely intervention of the forceps prevented the mischievous effects of the ergot; and this we suspect to be a just commentary upon the facts; for the state of the fœtal heart under the action of the drug proves clearly that the *duration* of this action is the chief source of danger to the child. As Dr. Beatty remarked, if it be short the child will be born alive, but if it be delayed two hours, the child will be stillborn.[2] The danger from delay is manifold.

The author just named is of opinion that ergot is capable of directly exciting muscular spasms terminating fatally. He also reports six cases of which the distinguishing characters were the general lividity of the surface, universal rigidity of the muscular system, producing stiffened limbs and clenched hands in those infants in whom life was extinguished, and a remarkable kind of alternating spasm and palsy in those that were resuscitated. It is true that Dr. Denham doubts the dependence of these symptoms upon ergot, remarking that children are sometimes born in a cold, livid, state, and more or less convulsed, when no ergot has been administered to the mother. But, it may be rejoined, these symptoms were shown by Dr. Hooker to follow the use of oil of ergot, which has no influence on the contractile action of the womb. But, apart from this fact, the direct action of ergot upon the fœtal heart is no longer questionable. Dr. Hardy found that it diminished the frequency of the heart's pulsations, and sometimes produced irregularity and even intermittence of them. He observed, indeed, that when the number of the pulsations had been steadily reduced below 110, and were at the same time intermittent, the child

[1] Bull. de Thérap., iv. 127.

[2] Dublin Quarterly Journal, xxv. 204.

was rarely saved. He was careful to note that this effect was sometimes quite independent of the compressive action of the uterus.[1]

The changes produced by ergot in the circulation within the uterus have been carefully examined by M. Dépaul. He has shown that during the contractions of this organ in natural labor, its peculiar murmur becomes altered in tone, and fainter, and sometimes even ceases to be heard. At the same time the fœtal pulsations grow hurried and feebler until the end of the pain, when both sounds resume their proper characters.[2] The intermittent action of the uterus appears to be intended to prevent the dangers of a suspended circulation in the uterine vessels, and it is only towards the close of labor when the head and chest of the child have been in a great measure released from the grasp of the uterus that the pains become more continuous and steady. But ergot excites tonic and continued contraction, so that the child's head and trunk are subjected to the unrelaxing pressure of the womb. No truce is allowed to repair exhaustion and permit fresh blood to fill the uterine and fœtal vessels. It cannot be denied, therefore, that at full term, and when the child is relatively large, its danger is increased by ergot, and that there *is* a rational ground, as well as a motive drawn from direct experience, why this agent should be charged with many deaths which a timely resort to the forceps would have prevented.

In France the mischievous influence of ergot in child-birth became so strongly suspected, that in 1845 the Prefect of the Seine addressed a communication in regard to it to the Academy of Medicine.[3] A committee appointed to investigate the subject, reported in 1850, that ergot when *imprudently* used, might injure the mother and destroy the child, by a direct sedative influence on the circulation, as well as by subjecting it to the prolonged compression of a rigidly contracted uterus.[4] The subject was again before the Academy in 1853, when the conclusions of M. Dépaul were adopted, that except in miscarriage, in certain labors attended with hemorrhage, and occasionally at the conclusion of natural labor, parturient women would be gainers by the complete disuse of ergot. M. Dépaul insists strongly upon avoiding ergot altogether when the fœtal circulation is weak or disordered.[5]

There is reason to believe that ergot is not less injurious to the child, in premature labor, than at full term, if not, indeed, much more so. It appears to endanger the fœtus more than when puncture or

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[1] Dublin Quarterly Journal, xxvii. 224. [2] Abeille Médicale, Avril, 1853, p. 97.
[3] Bull. de l'Acad., x. 565. [4] Ibid., xvi. 6. [5] Loc. sup. cit.

separation of the membranes is resorted to. Dr. Ramsbotham compares thirty-six such cases in which the latter expedient was adopted, with twenty-six in which ergot was administered. Nineteen children, or more than one-half, of the former class, and four children, or less than one-sixth of the latter class, survived.[1] In 1847, Hoffmann extended the tables of Ramsbotham, by adding new cases, and from the whole it appeared that twenty-seven out of thirty-eight children perished in premature labors in which ergot was employed.[2] The advantages to the mother are, however, very great, and leave no doubt of the propriety of resorting to the production of abortion or of premature labor by means of ergot, in connection with the other operation or not, as the circumstances may require. In his earlier practice, Dr. Ramsbotham employed ergot alone. It had previously been used by Dr. James, of Philadelphia,[3] and cases of its success are related by Dewees, Weike, Paterson, Rigby, Heane, Churchill, Dubois, Müller, of Stettin, &c.[4]

If, now, we examine the influence of ergot upon the gravid uterus in the earlier stages of pregnancy, and before quickening, when it is most likely to be resorted to with criminal intentions, we shall find that in proportion as we recede from the period at which the spontaneous action of the womb begins, ergot fails to exhibit its specific influence. In his report to the Academy of Medicine, M. Danyau says, "We do not believe that, independently of labor, of direct manipulation, or of some other external influence, that ergot of itself can excite uterine contractions during the first half of pregnancy." Such, also, is probably the opinion of physicians who have had the best opportunities of studying the subject. It is, however, to be recollected that the distension of the uterus at this period is a normal condition, and it does not follow that an equal or even a less degree of enlargement should not have a different result when it depends upon morbid causes. This is the case in menorrhagia. It was so in a singular accident reported by Dr. J. E. Taylor, of New York. A female who was not pregnant, had some leeches applied to the neck of the uterus to relieve engorgement of that organ. One of them found its way into the cavity of the uterus, where it occasioned bearing-down pain and a bloody discharge. Ergot was administered, and a clot expelled holding in its centre a dead leech.[5] There is reason to think that, under certain circumstances, ergot may even prevent the

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[1] Lond. Med. Gaz., xxiv. 421. [2] Bull. de l'Acad., xvi. 19.

[3] Phil. Journ. of the Med. and Phys. Sci., xi. 114.

[4] Dierbach, Neueste Entdeckungen, i. 139.

[5] New York Journ. of Med., Sept. 1853, p. 219.

progress of abortion when it depends upon a relaxed or debilitated state of the uterus, if the medicine is given in small doses. This may be inferred from several cases reported by Dr. Gardner, of New York. The patients, in an early stage of pregnancy, had been strained by lifting weights, or had received a blow upon the back. Blood was discharged per vaginam, and the os uteri was dilated, but there were no decided labor-pains. Small doses of ergot were administered, which appear to have arrested the hemorrhage and prevented miscarriage.[1] Still more to the point is a case reported by Mr. Ker, of a woman who had for several years suffered from prolapsus of the uterus with leucorrhœa. The prolapsus at length became complete and irreducible. Under the idea that the enlargement was of an asthenic nature, and might be relieved by stimulants, ergot was administered. The tumor then contracted sufficiently to admit of its reduction.[2]

Uterine Hemorrhage.—Ergot was early employed to check hemorrhage during or subsequent to labor. In the *Historia Plantarum* (1688) Ray speaks of the remarkable power of ergot to restrain the lochia, "singulare præsidium ad compescendum lochiorum fluxum." It was prescribed for this purpose in Philadelphia in 1821, by Eberle and Dr. Shallcross,[3] and soon afterwards by Goupil in France, whence it grew into general use. Its most obvious advantages are obtained when the uterus remains distended with coagula after delivery. In unavoidable hemorrhage from placenta prævia, Dr. Ramsbotham says that, when the uterus is flaccid, and the female exhausted, before the operation of turning is resorted to, diffusible stimuli should be given, and a dose or two of ergot.[4] A similar practice had been advised by Dr. Ward, of New Jersey, but Dr. Dewees condemned the practice strongly, unless the os uteri were dilated or easily dilatable,[5] as did also Dr. Jackson (of Northumberland), upon the ground that the state of the parts cannot be determined with accuracy.[6]

Menorrhagia.—In the seventeenth century, ergot is said to have been used for this affection by Gaspard and Bauhin, and certainly no other remedy is more prompt and certain in its effects. In 1824, Dr. Hosack spoke highly of its virtues in menorrhagia connected with general or local debility.[7] Dr. Marshall Hall soon afterwards[8] illustrated its powers by the cure of a case in which, during the intermenstrual periods, there was profuse uterine leucorrhœa. In Italy,

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[1] New York Journ. of Med., Sept. 1853, p. 226.
[2] Lond. Med. Gaz., xiv. 604.
[3] Am. Med. Recorder, iv. 218.
[4] Lond. Med. Gaz., xiv. 660.
[5] Am. Journ. of Med. Sci., i. 260.
[6] Ibid., ii. 89; and iii. 362.
[7] Med. Essays, ii. 295.
[8] Med. and Phys. Journ., vi. 379.

Cabini and Sparjani (1831) reported ten cases of its success, and (1833) Negri five additional ones.[1] In 1842, Dr. Fife reiterated the original opinion that it was mainly adapted to passive asthenic cases, and that when plethora was present, bleeding and saline laxatives must be premised.[2] Three years later, Ebers, of Breslau, found that *ergotin* promptly and thoroughly controlled all forms of uterine hemorrhage, including that from cancer of the womb. These observations were confirmed by Besson, of Chambéry, Girola, and Cossu, of Turin, Gaston, of Columbia, S. C.,[3] and many others. To these we may add some personal testimony. In one remarkable case of uterine cancer in which the patient was reduced to complete anæmia and exhaustion by the constant loss of blood, ergot arrested the flow, and, with iron, produced a suspension of the active symptoms for several months. MM. Trousseau and Maisonneuve (in 1832) published twelve cases, nine of which were simple, two complicated with abortion, and one with cancer of the womb, in all of which ergot completely arrested the hemorrhage;[4] and, subsequently, the former of these writers presented a larger series of observations, all tending to the same result.[5] He states that the duration of the disease does not lessen the efficiency of the medicine, a few hours sometimes sufficing to put a stop to a loss of a month or six weeks' duration. Sometimes a pale or colorless flow takes the place of the bloody discharge. The dose must be varied in different cases, and sometimes carried to the same extent as during labor, but generally one-half of this quantity will suffice. Its influence is often, although not uniformly, demonstrated by the supervention of periodical uterine pains, and, when these occur, the flow will generally abate.

Besides the uterine, all other forms of *hemorrhage* are said to have been successfully treated by ergot. Sparjani, Cabini, and Negri, more particularly, vaunted its efficacy in *hæmatemesis*, *epistaxis*, and *hæmoptysis*, and Ross in *purpura hæmorrhagica*. Mr. Neate has reported a case of copious gastric hemorrhage apparently resulting from the suppression of perspiration, and which was arrested by ergot after the failure of diluted sulphuric acid, muriated tincture of iron, and oil of turpentine.[6] Mr. Wright found the *oil* of ergot an efficient hæmostatic in bleeding from the gums and from leech-bites; and both Arnal and Bonjean used *ergotine* successfully in every form of spontaneous hemorrhage. The experiments of Wright, Bonjean, and

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[1] Lond. Med. Gaz., xiii. 361.
[2] Edinb. Month. Journ., Feb. 1842, p. 208.
[3] Charleston Journ., xii. 459.
[4] Bull. de Thérap., iv. 69.
[5] Thérapeutique, 3ème éd., i. 814.
[6] Lancet, Aug. 1854, p. 101.

others, upon sheep and other quadrupeds by which they professed to demonstrate the hæmostatic properties of this preparation, are quite inconclusive; for, as Velpeau pointed out, and as the Philadelphia committee on the so-called Brocchieri water demonstrated, the natural plasticity of the blood in these animals is so great that wounds even of large arteries seldom destroy them. To a great extent, also, hemorrhage in man will cease under the combined effects of rest and slight compression when arterial trunks are wounded, so that there is no longer any doubt that, so far as hemorrhage of this sort is concerned, ergot and its preparations are useless.

Leucorrhœa, probably of the uterine form, was successfully treated with ergot by Marshall Hall in the example already alluded to. Eight very interesting cases of the affection were cured by Bazzoni,[1] and seven by Negri;[2] Fife also cured by its means several distressing cases where the strongest astringent injections had been employed without any effect, or with that of exciting inflammatory action.[3]

In *amenorrhœa* ergot is said by Ackerly to have been used successfully by Dr. Beckman, of New York, in 1809;[4] and some other cases are quoted by Neal, Wright, and Davies. According to Dieu[5] it has succeeded with many physicians in restoring the flow of the menses in young girls after a suppression of several months, and when ferruginous preparations had failed of their effect, and Neligan states that in several cases of chlorotic amenorrhœa he employed the infusion with the most beneficial results.[6]

"*Engorgement of the Uterus.*"—Arnal has published a number of cases of this affection as having been cured by ergot.

Uterine Hydatids.—Dr. Dewees first proposed the use of ergot to procure the expulsion of hydatids when the uterus will not readily admit the hand, or when its contractions are too feeble or are insufficient to produce their extrusion. This method was employed successfully by Dr. Macgill, of Hagerstown, Md. The uterus threw off a mass of hydatids as large as a child's head at birth, and the woman recovered without accident.[7]

Uterine Tumors.—Dr. Dewees suggested that ergot might be useful in cases of polypi, to force them beyond the neck of the uterus for the purpose of applying a ligature, or with a view to their excision;[8] and Dr. Davies appears to have been the first (1825) to carry out this

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[1] Archives Gén., xxvii. 410.
[2] Lond. Med. Gaz., xiii. 369.
[3] Edin. Month. Journ., Feb. 1842, p. 209.
[4] Med. Repository, xii. 346.
[5] Matière Méd., ii. 714.
[6] Medicines, their uses, &c., 4th ed., p. 215.
[7] Diseases of Females, 3d ed., p. 302.
[8] System of Midwifery, 6th ed., p. 630.

recommendation. In 1828 Dr. McFarlane had a successful case, and in 1841 Dr. Somerville, of Edinburgh, a similar one.[1] Two very interesting instances of its success were published by Mr. Moyle,[2] and one by Dr. Parr, of Newcastle-upon-Tyne.[3]

Negri reports several examples of *gonorrhœa*, or rather of *gleet*, in the female cured by ergot; but it was of no service in males or during the acute stage of the disease.[4] Lallemand derived advantage from it in *seminal emissions*, and Sacchero affirms that it is "constantly curative" in this affection.

Paralysis.—In 1831 Barbier reported two cases of *paraplegia* in a male and a female. Both were unable to walk, and suffered from dyspnœa and *retention of the urine.* Under the use of this medicine both experienced spasmodic movements of the legs, and the urine was discharged by jets. In the man, also, the penis recovered its erectile power, and complete recovery followed. The woman, however, ultimately died. Barbier ascribed the sensible effects of the medicine to an action upon the spinal marrow, and doubtless such is the most probable explanation of its influence in these cases and in those still to be mentioned, as well as in parturition.[5] Numerous other examples of the same result might be mentioned. Thus Allier reported four cases of retention of urine in old men which arose from neglecting to void the bladder. The medicine effected a cure after producing tenesmus of the bladder and pain in the hypogastrium.[6] Steinbeck published three cases, which, however, were acute and may have owed their improvement to rest and time;[7] Dr. Ross, in Scotland, met with a case resembling these,[8] and Dr. Houston, of Dublin, one of more decided senile paralysis.[9] Both of the latter were cured by ergot in from two to four weeks. Dr. Bernard, of the same city, has reported an example of this form of paralysis of the bladder cured by ergot.[10] Dr. Hargrave has given the history of a girl who seems to have had hysterical paralysis of the bladder which continued for nearly six years. Five grain doses of ergot repeated twice a day restored the function of the organ in a few days.[11] Arnal also saw it cure paralytic incontinence of urine. Saucerotte has published a very remarkable case of this

[1] Month. Journ. of Med. Sci., Aug. 1841, p. 570.
[2] Ibid., June, 1841, p. 416.
[3] Ibid., Feb. 1842, p. 208.
[4] Lond. Med. Gaz., xiii. 390.
[5] Revue Méd., xlii. 332.
[6] Bulletin de l'Acad., xiii. 1132.
[7] Lancet, Mar. 1843, p. 838.
[8] Edin. Med. and Surg. Journ., Jan. 1844, p. 43.
[9] Braithwaite's Retrospect, No. ix. p. 63.
[10] Dub. Journ. of Med., Feb. 1859, p. 218.
[11] Braithwaite's Retrospect, No. ix. p. 63.

condition connected with general paralysis produced by exposure to wet and cold, which was cured by ergot after a long and fruitless trial of other remedies.[1] Pétrequin found it successful in paraplegia when other means had failed, and he observed that, like strychnia, it produced prickling and formication of the palsied limbs.[2] He gave doses of six or eight grains, and gradually increased them until forty grains a day were taken. Payan was equally successful; one of his cases was of senile paralysis, and two others, the result of concussion of the spinal marrow.[3] Giraud, of Marseilles, has also published three cases of paraplegia, the credit of whose cure is plainly attributable to ergot,[4] and Saucerotte two others of the same character.[5]

ADMINISTRATION.—To produce contraction of the distended uterus, the *infusion* of ergot is the most appropriate preparation. *Two drachms* of freshly-powdered ergot may be infused for one hour in *nine fluidounces* of hot water, and the liquid given in *wineglassful* doses. Such, at least, is the usual rule, but it is preferable to administer *tablespoonful* doses of the infusion at intervals of five or ten minutes. The *powder* should rarely be given in substance during labor, unless the child is near the os externum. Its dose is from *ten* to *twenty* grains, repeated every fifteen minutes. To control menorrhagia, smaller doses, such as *ten grains* every hour, at first, and then at longer intervals, will suffice. The *wine* and the *tincture* of ergot are seldom employed; of the former, the dose is from *one* to *three fluidrachms*, and of the latter, somewhat less. Of the *oil*, the dose is from twenty to fifty drops; of Bonjean's *ergotin*, from *one grain and a half to three grains* every quarter of an hour during labor; and of Wigger's preparation, from *one-sixteenth of a grain to two grains.*

Rubia Tinctorum.—MADDER.

Of non-officinal substances which have been reputed to exert a peculiarly powerful action in restoring suppressed menses, this one is deserving of mention. Tournefort said of it that "it strongly provokes the courses." Francis Home pronounced it, after repeated trials, to be the strongest and safest emmenagogue with which he was acquainted, and he reports nineteen cases of *amenorrhœa*, of which fourteen were cured by its use. Its sensible effects were scarcely evident. It was administered by him at first in doses of *half a drachm* of the *powder* four times a day, and the quantity was gradually increased to a drachm at each dose.[6] Other writers have also attested

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[1] Bull. de Thérap., xlv. 503. [2] Am. Journ. of Med. Sci., xxv. 205.
[3] Bull. de Thérap., xvi. 339. [4] Ibid., xli. 199. [5] Ibid., l. 32.
[6] Clinical Experiments, p. 422.

its efficacy, among whom may be mentioned Osiander, G. A. Richter, and Jahn.

Sabina,	vid.	*Irritants.*
Juniperus Virginiana,	"	*do.*
Cantharis,	"	*do.*
Sodæ Boras,	"	*do.*
Ferrum,	"	*Specific Tonics.*
Millefolium,	"	*Stimulant Tonics.*
Ruta,	"	*do.*
Tanacetum,	"	*Anthelmintics.*
Guaiacum,	"	*Diaphoretics.*
Aloes,	"	*Cathartics.*
Helleborus Niger,	"	*do.*

ANTHELMINTICS.

Anthelmintics are medicines capable of destroying or expelling worms which inhabit the intestinal canal. They have little, if any, effect upon *oxyures vermiculares*, which excite symptoms in the rectum alone, but they are chiefly used for the removal of *tæniæ* and *ascarides lumbricoides*.

Worm remedies may be thus divided, according to their mode of action:—

1. Those which are merely irritant, to which class belong all drastic, and especially resinous, cathartics, cowhage, and tin. These substances, by their violent action upon the bowel, increase its peristaltic movements, and thus tend to force the parasite to let go its hold upon the intestine; or they disperse the dense mucus in which it lies imbedded, and expel it from the bowels. Cowhage and powdered tin, administered to dogs, which afterwards were killed, had evidently produced a powerful irritation of the intestinal mucous membrane, and even points of bloody extravasation were found upon it. (*Kuchenmeister.*)

2. Medicines which exert an irritant action upon the stomach and bowels, occasioning more or less vomiting, diarrhœa, and colic. These are male fern, kousso, kameela, and saoria, the three first of them being among the most certain remedies for tapeworm.

3. Medicines which, besides producing more or less derangement of the stomach, act upon the nervous centres. These include American and European wormseed, pomegranate, wormwood, pinkroot, azedarach, and oil of turpentine. The nervous symptoms produced by them are numerous, but, in some instances, consist only of headache, giddiness, confusion of ideas, and weakness of the limbs, and in others of disorders of vision, strabismus, dilatation of the pupils, drowsiness, stertor, spasms, or convulsions.

4. There is only one anthelmintic medicine which is efficient in the treatment of tapeworm, and which, at the same time, gives rise neither to vomiting, purging, colic, or nervous symptoms. This is pumpkin-seed .

The efficacy of vermifuges bears no relation whatever to their sensible properties. Tænia is the most difficult to remove of the intestinal worms, and it might be expected that the most powerful agents of the present class, those of which the action upon the economy is most decided, would be the most efficient in destroying it; but such is not the case. For if oil of turpentine and pomegranate, which occasion marked disturbance of the nervous system, are successful as tænifuges, kameela, kousso, and male fern, which produce no such effects, but act only on the alimentary canal, are quite equal to them in efficacy; and pumpkin-seeds, which give rise to no sensible phenomena at all, are scarcely inferior to either. On the other hand, santonicum and its preparations, chenopodium, wormwood, spigelia, and calomel, which are the most successful remedies for the round worm, have little or no effect upon the tapeworm.

In regard to the comparative value of the different tænicide medicines there is not a very great unanimity of opinion, although the weight of evidence is in favor of the oil of male fern. Dr. Peacock gives the preference to it above all other remedies, and ranks kameela next to it in virtue.[1] According to Dr. Ramskill, the alcoholic preparations of kameela are more uniformly effective than oil of male fern or than spirit of turpentine, and infinitely less disagreeable than either.[2] Mr. Leared would set down the relative merits of the remedies as follows: Kameela is decidedly superior to kousso, which is a less certain vermicide, and is productive of great disturbance of the stomach, and other unpleasant effects. But he does not positively decide on the superiority of the former medicine to pomegranate bark, spirit of turpentine, and the extract of male fern.[3] Mr. Adams,

[1] Times and Gaz., Nov. 1858, p. 472.
[2] Lancet, May, 1858, p. 476.
[3] Times and Gaz., Jan. 1859, p. 57.

on the other hand, concludes that kameela is not superior to any of these remedies;[1] and Kuchenmeister, supported by a large and well-weighed experience, concludes that male fern, and especially its ethereal extract, is most efficient for the expulsion of *bothriocephali*, and the latter preparation, with the aqueous extract of pomegranate bark, is the most certain cure for *Tænia solium*.[2]

It is probable that all of the medicines of the anthelmintic class may be considered as either *vermifuge* or *vermicide*, or both at once. As mere vermifuges, drastic purgatives hold the first rank; they tend to expel the parasites without necessarily destroying them, and hence they are of comparatively little efficacy in the treatment of tænia, whose hold upon the bowel, at least by its essential organ, the head, is much more firm than that of other intestinal parasites. Tin and cowhage, possess an analogous action, but are more potent in destroying the bodies of the worms, and are also more successful than drastics, especially in the treatment of tænia, which are more delicately constituted, and, therefore, more susceptible of mechanical injury. All other anthelmintics are probably in a greater or less degree vermicide, and their relative efficacy can be determined only by experience. The best ascertained elements for solving this still unsettled question have been set forth in the preceding paragraphs. It is often of capital importance, however, that the two kinds of worm medicines should be conjoined in the treatment; and that, after a vermicide agent has been duly administered, the weakened or dead worms should be acted upon by a drastic or other purgative medicine, in order to expel them from the bowel.

MUCUNA.—Cowhage.

Description.—"The bristles of the pods of *Mucuna pruriens*." These bristles, setæ or spiculæ, form a hairy down upon the pods. They are delicate, sharp, stiff, brittle, and shining. The plant is a native of the West Indies, but a very similar one, called *Mucuna prurita*, is obtained from the East Indies. The former is a perennial climbing plant, bearing clusters of red or purplish flowers, which are succeeded by a coriaceous pod shaped like an *f*, and studded all over with bristly hairs which the touch readily removes.

History.—The anthelmintic virtues of cowhage were first made known in Europe by Chamberlain, in 1784. Browne, in his *Natural*

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[1] Times and Gaz., Jan. 1859, p. 59.

[2] On Animal and Vegetable Parasites of the Human Body (Syd. Soc. ed.), i. 176.

History of Jamaica, states that a syrup prepared with it is used in that island as an anthelmintic, and Bancroft says that it is employed by the negroes of Guiana for the same purpose. In the East Indies its employment as a vermifuge was introduced by the English practitioners, but the Tamool doctors had long before prescribed an infusion of the root of the plant sweetened with honey, as a remedy for cholera morbus.[1]

ACTION.—When applied to the skin, the spiculæ adhere and cause a prickling and intolerable itching which lasts for a considerable time. Dr. Bigelow states,[2] that when thus applied and retained in place by means of lint and adhesive plaster, they excite redness on the second day, and afterwards papules, which increase in size for a week, and terminate in pustules and scabs. But when thoroughly moistened before being applied, the irritation is very slight indeed. Dr. Bigelow first noticed the curious fact that when the spiculæ are applied to the interior of the mouth, they excite none of the peculiar effects just described. Thus we have explained the comparative innocuousness of the medicine when taken medicinally. Even in large doses its effects are slight. Chamberlain states that his child of five years old swallowed by stealth three or four ounces of syrup filled with cowhage, but no inconvenience resulted beyond a diarrhœa, "which did more good than harm." To relieve the itching of the skin caused by this substance, the spiculæ may sometimes be removed by means of a mixture of plaster of Paris and water allowed to harden upon the part. When it is removed, it carries the spiculæ with it. This method would not be applicable to hairy portions of the skin. Frictions with a mixture of oil and ashes have also been recommended, and rubbing the part with the pile of a fur hat.

USES.—*As a vermifuge*, there is no doubt that the irritant properties of cowhage led to its being originally employed. It is generally supposed to act mechanically upon intestinal worms, irritating and wounding them and obliging them to yield to the peristaltic action of the intestine.[3] This was Chamberlain's view, and also Bancroft's. The latter states that he found no advantage from using either the tincture or the decoction, but that the spiculæ were efficient when mixed with syrup or honey. Dr. Bigelow, however, is disposed to believe that the

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[1] AINSLIE, Mat. Ind., i. 92.

[2] Essays, p. 154.

[3] KUCHENMEISTER gave a drachm of cowhage in syrup to a dog, who afterwards voided some fragments of tænia. Other doses were given to the amount of half an ounce. The animal was then sacrificed, and the tænia in his bowels was found quite lively, but, perhaps, rather less firmly attached than usual to the mucous membrane.

medicine is quite inoperative without the purgatives which are always given in connection with it; an opinion which there is every reason to believe correct. The materia medica furnishes so many other anthelmintics of decided power, that one of such doubtful efficacy as this might well be dispensed with.

Cowhage has been used *externally* by Graefe, in the treatment of *paralysis*. He applied a layer of it upon the affected limb, covering it with blotting paper, supported by adhesive plaster. Intense itching was produced, and an eruption which, in some instances, appears to have been followed by cure. M. Blatin[1] proposed the substitution of cowhage for tartar emetic and croton oil, as a *cutaneous irritant*. He directs an ointment prepared with seven or eight grains of the spiculæ to an ounce of lard, to be rubbed into the skin for ten or fifteen minutes. An eruption of flat papulæ is shortly produced.

Administration.—Internally, the setæ of cowhage are given in the form of an *electuary* made with honey or molasses. *One or more teaspoonfuls* should be taken, fasting, for several successive days, after which, a purge of calomel and jalap should be prescribed.

STANNI PULVIS.—Powder of Tin.

Preparation.—Powder of tin is prepared by stirring melted tin during the process of cooling, and then separating the finer particles by means of a sieve. Care should be taken that it is free from arsenic, lead, or other impurities.

History.—Although tin has been known from a remote antiquity, and formed, it is said, an article of trade from England and Spain to Phœnicia as long ago as a thousand years before Christ, it does not seem to have been used medicinally until a comparatively recent period. According to Sprengel,[2] tin was proposed by Paracelsus as an anthelmintic, but it was more particularly introduced to professional notice in 1735, by Alston,[3] who ascribed his knowledge of it to an "empiric receipt" which some years before fell into his hands. Fourcroy also states that in some rural districts of France it is customary to use, as a vermifuge, sweetened wine that has been kept for twenty-four hours in a tin vessel.[4]

Uses.—Alston recommended powder of tin for the armed as well

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[1] Am. Journ. of Med. Sci., July, 1853, p. 191.

[2] Histoire de la Méd., v. 516.

[3] Edinb. Med. Essays and Obs., 3d ed., v. 77.

[4] Mérat and De Lens, Dict. de Mat. Méd., iii. 158.

as the unarmed *tapeworm*, and for the *lumbricoid or round worm*. His mode of prescribing it was imitated from the nostrum already alluded to, and may be described as follows: The patient first of all was to be purged with senna and manna, and on the following day to take an ounce of tin in four ounces of molasses, the third, and also the fourth day half of this quantity was given. On the fifth day the purgative infusion was repeated. The result is described as having been almost uniformly successful. It may, perhaps, be suspected that such quantities of an irritant substance might injure the bowel, and, indeed, cases are recorded of bloody vomiting apparently produced by it. In one, also, fatal obstruction of the bowel is ascribed to its use.[1]

Later writers claim to have been successful with smaller doses. Thus Mead, who recommends tin filings as "very efficacious," directs one drachm of them, with an equal quantity of red coral, to be reduced to a fine powder and made into a bolus with conserve of wormwood. Of this preparation a drachm twice a day was the dose.[2] Brera says that in cases of old, large-armed tæniæ, tin filings regularly administered produce the effect promptly and certainly, even when the preparations of male fern are ineffectual.[3] Mayor, of Geneva, assures us that tin is one of the surest remedies for the armed tænia. He directs a scruple at a dose, mixed with honey; but states that an ounce may be given if necessary.[4] Other successful cases are reported by Fordyce, Pallas, Monroe, Rudolphi, Bremser, Bloch, &c. Sometimes an amalgam of tin and mercury has been used. This was done by Spilman, who also added carbonate of lime and of magnesia, and made of the whole an electuary with conserve of wormwood.

These are sufficient proofs of the efficacy of tin as a remedy for worms. Its mode of action is in dispute. It is generally supposed to act by its physical or mechanical properties, subjecting the worms to a rude attrition which destroys them. On the other hand, the juices of the bowels are supposed to form with the metal salts which are poisonous to the parasites. The property which wine is said to acquire by contact with tin has already been alluded to, and, moreover, Callisen, Geoffroy, and Alibert, assert that some of the salts of this metal are anthelmintic. It, indeed, seems probable that its chemical must be added to its mechanical action in accounting for the effects of this medicine. True, these effects have been called in question by Kuchen-

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[1] Richter, Ausfürlich. Arzneim., iv. 555.

[2] Med. Works, p. 383.

[3] Treat. on Verminous Diseases (Am. ed.), p. 238.

[4] Dierbach, Neuste Entdeck, iii. 318.

meister, in consequence of his experiments upon dogs.[1] But his results are of comparatively little weight against the multiplied and various experience of physicians.

FILIX MAS.—Male Fern.

Description.—"The rhizome of *Aspidium filix mas*," *U. S.*, according to other authorities of *Polypodium* or of *Nephrodium filix mas*, &c.

This is a cryptogamic plant, of the Nat. Ord. *Filices*, which abounds in the temperate regions of the old and new world. It is, however, doubted whether the American is identical with the European plant. Its leaves, which are annual, are bipinnate, but the root, or rhizome, is perennial. It is from six to twelve inches long, and about an inch thick in its recent state, and when enveloped by the imbricated remains of the leafstalk and numerous radical fibres. In commerce it generally occurs in fragments which are yellowish-white internally, when not deteriorated by keeping. It has a sweetish, bitter, astringent, and nauseous taste. The virtues of male fern appear to be contained chiefly in an extract (*oleum filicis maris*) which comprises both a volatile and a fixed oil, resin, tannin, filicic acid, &c. The volatile oil is stated by Bock to be in the proportion of 0.4, and the fixed oil in that of 60.0, in 1000 of the dried rhizome. One or both of these oils may be considered as the anthelmintic element of the medicine.

According to Peschier, the most active portions of the plant are the immature *bourgeons*, or germs. Hence he recommended that the root be gathered at the close of summer, because earlier than this they are too soft and milky, and later they are too ligneous. Christison, however, states that he found an extract prepared from roots gathered in February, perfectly successful.

History.—Pliny describes two species of fern, of which one is the male. He says that these ferns destroy intestinal worms, tæniæ when mixed with honey, and other sorts when given in wine. They are more sure of their effects, he adds, when associated with scammony. This author states that they are apt to induce barrenness, and also abortion in pregnant females.[2] The same account is given by Dioscorides,[3] Theophrastus, Galen,[4] Paulus Ægineta,[5] and by the Arabian writers,[6] who also recommend male fern for bruises and rheumatic pains. In the sixteenth century, Gérarde and Valerius Cordus, and in the seven-

[1] Clarus, Arzneimittellehre, p. 877.
[2] Hist. Nat., lib. xxvii. sect. lv.
[3] Lib. iv. cap. clxxvii. et seq.
[4] Matthiolus, Comment.
[5] Adams's Comment., iii. 312.
[6] Ebn Baithar, ed. Sontheimer, ii. 9.

teenth century Simon Paulus and Sennertus, refer to its vermifuge properties; and at the close of the eighteenth century they were more particularly described by Wendt.[1] Somewhat earlier it had been recommended for the cure of tænia by Andry,[2] who, however, concealed his method of preparing it. Subsequently it formed an ingredient of several nostrums which enjoyed great repute for their vermifuge properties. Such was the specific of Madame Nuffer, the widow of a Swiss military surgeon, who received eighteen thousand livres for the publication of its composition; the Herrenschandt remedy, that also of the Berlin apothecary, Matthieu, purchased by the Prussian government, at the price of a pension and a title, and still another receipt, which was bought by the Medical College of Wurtemberg.[3] In all of these cases drastic purgatives were given, either along with or after the preparation of fern.

Uses.—Male fern and its preparations are almost exclusively used for the cure of *tapeworm*. Bremser says it is an approved remedy for *tænia lata* (bothriocephalus) or unarmed tænia, but is by no means equally so against *tænia solium*, or armed tænia,[4] and other physicians have expressed the same opinion.[5] It is true that it was found most successful in Russia, France, and Switzerland, where the unarmed tænia prevails; but, as Brera himself related, the armed tænia, when young, will not always resist the medicine. Subsequent observations have gone farther, and shown, particularly as regards the extract of male fern, that it is capable of removing both species, although the armed tænia may somewhat more obstinately resist its influence.

So much stress is laid upon systematic administration of male fern by all who have used it most extensively, that we shall describe several of the most approved methods. Wawruch treated *two hundred and six* cases, nearly all of tænia solium, according to the following plan: *Preparative treatment.*—During four or five days a solution was every day given containing twenty grains of sal ammoniac; the patient meanwhile taking no food but a thin broth at each meal. *Expulsive treatment.*—The night previously, a simple injection was given. The following morning, a bowl of thin soup without salt was eaten, followed in an hour by two ounces of castor oil in two doses. In the interval between these, from half a drachm to a drachm of powdered male fern was administered in two or three doses, and an enema of milk and oil. Some time after the last dose of fern, a drastic purge

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[1] Murray, App. Med., v. 456. [2] Génération des Vers., ii. 531.

[3] Strumpf, Handbuch, i. 581.

[4] Lebende Würmer im lebenden Menschen, p. 154.

[5] Brera, Am. ed., p. 122.

of calomel and gamboge was given, and under its operation the tænia was generally discharged. This method occasioned a good deal of pain and often vomiting, rendering the use of emollients and narcotics necessary.[1] The treatment pursued by Albers, of Bonn, and which proved successful in a large number of cases, was almost exactly the same as that just described, except that the ethereal extract was the preparation of fern employed.[2] Lambert preceded the administration of the fern by a diet of herring, onions, and similar crude articles.[3] Trousseau's method, which he states was very successful, is as follows: First day, absolute milk diet; second day, fifteen grains of the ethereal extract of male fern to be taken fasting and repeated every quarter of an hour until four doses are taken; third day, repetition of the extract as on the preceding day. After the last dose, about two ounces of syrup of ether, and, in half an hour later, an emulsion containing three drops of croton oil.

Since the introduction of the extract of male fern there does not seem to be, as indeed Peschier distinctly pointed out,[4] any need of resorting to the disgusting and violent, if not hazardous methods, such as that of Wawruch, or of Nuffer, which was still more complicated. The medicine appears to act as a poison to the animal and destroy it, whereupon its expulsion follows through the natural action of the intestine, or on the administration of a simple laxative. We can now, with our actual knowledge of its vermicide power, say with more emphasis than even Murray did, "Sufficit scire quid efficiat etiamsi modus nos lateat."

It occurred to Peschier, that the oil (or volatile extract) which Morin had discovered in male fern might possess its anthelmintic properties, and he accordingly administered it in doses of from eight to twenty or thirty drops, followed by a mild purgative, and with such perfect success that he could in a short time reckon one hundred and fifty cases cured by its means. Ebers, of Breslau,[5] used an alcoholic extract, which, however, requires to be given in larger doses than the ethereal preparation. He claimed that it always acted mildly and with great certainty. Fouchon, of Neufchâtel, inclosed the oil in gelatin capsules, which he administered with success.[6] Many others have furnished equally favorable reports of this preparation, but the only one whom we shall cite is Dr. Christison, who reports the results

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[1] Arch. Gén., 4ème sér., i. 207; Brit. and For. Med. Rev., xviii. 328.

[2] Bull. de Thérap., xxv. 76.

[3] Ibid., xlii. 364.

[4] Rev. Méd., xx. 268.

[5] Archives Gén., xvii. 121.

[6] Edinb. Month. Journ., i. 674.

of upwards of twenty cases of tænia treated by the oleo-resinous extract.[1] In every case the worm was discharged after a single dose, and usually in one mass. In some it was brought away without any laxative, and, for the most part, without pain or other uneasiness, though occasionally with griping, sickness, and even vomiting. He administered the medicine in doses of from eighteen to twenty-four grains.

For other cases in which male fern or its preparations have been successfully employed to destroy tænia, the reader is referred to the reports of M. Solon, Budd, Todd, Pollard,[2] Gairdner,[3] Bennett,[4] Corbett,[5] Crowther,[6] and Gull.[7] Dr. Gull used the oil of male fern in fifty cases, and refers to two hundred in which it was employed successfully at Guy's Hospital. It was equally efficient in destroying both species of tænia. It was administered by him in doses of one and a half or two drachms in a mucilaginous draught, but the opinion is expressed that one drachm would be sufficient in the majority of cases. Even the latter dose is much larger than other physicians have found necessary.

Administration.—The forms and doses of the medicine have already been described; it is sufficient here to mention that the dose of the powdered root is from *one to three drachms*, and of the ethereal extract from *twelve to twenty-four grains or drops.*

CHENOPODIUM.—Wormseed.

Description.—The fruit of *Chenopodium anthelminticum.* This plant, which is also known as wormseed, stinkweed, Jerusalem oak, &c., abounds in many parts of the United States, but most so in the southern country. "It grows in the vicinity of rubbish, along fences, in the streets of villages, and in open grounds about the larger towns." It has a strong, heavy, disagreeable odor, which is due to the presence of a volatile oil. This oil is most abundant in the seeds. They are about the size of a pin's head, rounded, of a light brown color, with an aromatic, but nauseous smell, and a pungent, offensive taste. When fresh, the oil has a light yellow color, but it grows darker by age.

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[1] Edinb. Month. Journ., July, 1853, p. 47.

[2] Braithwaite's Retrospect, Am. ed., No. xxiii. p. 122.

[3] Edinb. Month. Journ., June, 1852, p. 556.

[4] Ibid., Feb. 1855, p. 107.

[5] Dublin Quart. Journ., Feb. 1857, p. 226.

[6] Lancet, Nov. 1855, p. 322.

[7] Guy's Hospital Reports, 3d ser., vol. i.

HISTORY.—Wormseed appears to have been first used in Virginia as an anthelmintic. Dr. Wilkins, of Baltimore, writing in 1828, stated that for thirty years it had been employed in this manner.[1] It is still much used among the negroes of the South; but there, as elsewhere, it has been gradually supplanted by the essential oil.

USES.—According to Chapman, all parts of the plant possess vermifuge properties, and Eberle says that a tablespoonful or two of the expressed juice, given two or three times a day, is occasionally employed for children. But this preparation is even more disagreeable than the oil. Eberle employed the latter with success to expel *lumbricoid worms* after the failure of other medicines. Dewees recommended it, provided there was no fever present. Dr. Condie employed it in some cases with decided advantage. Long ago Wilkins said that "in various instances where parents have erroneously supposed worms to exist, this fine stimulating oil has removed general debility, indigestion, and colic, with various other unsuspected disorders, and has restored health to the little patient." Dr. J. F. Meigs has been struck with similar qualities in the medicine, for he says,[2] "It not only produces the expulsion of the parasites when they exist, but also acts beneficially upon the forms of digestive irritation which simulate so closely the symptoms produced by worms." Dr. Monsarret, of Kibeggan, has reported the particulars of a case of *tænia* cured by this oil, and says there are many other cases in which he has used it with complete success.[3]

The oil of chenopodium has also been used in *intermittent fever*, *hysteria*, *chorea*, and other *nervous affections*.

ADMINISTRATION.—The *expressed juice*, when fresh, may be given in *tablespoonful* doses twice or thrice daily. A *decoction* made by boiling an ounce of the *leaves* in a pint of milk or water has also been used. The bruised or pulverized *seeds* are given in an electuary, in doses of *one or more scruples* three times a day. It is often useful to combine carbonate of iron with this preparation. The dose of the *oil* (OLEUM CHENOPODII) is *five or ten drops* three times a day for a child three years old. It may be mixed with powdered sugar or made into an emulsion. Whatever preparation is selected, after two or three days' use of it, a dose of castor oil should be given.

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[1] Coxe's Med. Museum, v. 252.

[2] Diseases of Children, 2d ed., p. 695.

[3] Med. Times, Dec. 1844, p. 140.

SANTONICI SEMEN.—European Wormseed.

This medicine, which is not officinal, consists of the unexpanded buds of *Artemisia contra*, which grows in Persia and the adjacent countries, or of *A. Sieberi*, *glomerata*, or Barbary wormseed. It is said to have been introduced into European practice by the Crusaders. When rubbed, it emits a strong, peculiar, and somewhat aromatic smell, and has a warm, bitter, and spicy taste. These properties depend, in part, upon an essential oil. It also yields a crystallizable substance called *santonin*.

Small doses of the seeds of santonicum increase the appetite and stimulate the digestion but slightly; larger doses produce some general excitement, quickening the pulse and augmenting the warmth in impressionable persons. Still larger doses occasion gastric oppression, nausea, vomiting, colic, and diarrhœa.[1] Dr. Spencer Wells was the first to describe what other persons have since reported, that under its influence or that of santonin, the vision becomes affected so that objects are seen as if through a yellow medium, the blue appearing green, &c.[2] If the dose is very large the field of vision may be red.[3] In doses of more than three grains, santonin sometimes occasions nausea and vomiting, with abdominal pain, great thirst, giddiness, and profuse diarrhœa.[4] Santonicum possesses decided anthelmintic properties, as its title of *semen contra*, i. e. *semen contra vermes*, plainly shows. It is generally successful in destroying lumbricoid and vermicular ascarides, and, in some instances, it has procured the discharge of the tapeworm also. Santonin is even more certain in its effects. Numerous reports of its efficacy have been published by Perry,[5] Bishop,[6] Garnies,[7] Smith,[8] More,[9] and others.

The *dose* of this medicine in powder is from *ten grains to a drachm* three or four times a day. It may also be prescribed in either of the forms recommended for chenopodium. Of *santonin* from *three to six grains* may be given, mixed with sugar, every four hours until three or four doses have been taken, when they should be followed by a dose of castor oil.

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[1] Mitscherlich, Lehrbuch, ii. 120.
[2] Canstatt's Jahresbericht für 1853, p. 150.
[3] Annuaire de Thérap., xix. 237.
[4] Lancet, April, 1859, p. 402.
[5] Times and Gaz., May, 1856, p. 492.
[6] Ibid., July, 1856, p. 22.
[7] Annuaire de Thérap., 1857, p. 235.
[8] Lancet, April, 1859, p. 349.
[9] Ibid., p. 402.

TANACETUM.—Tansy.

This plant belongs to the secondary list of the U.S. Pharmacopœia. The herb, flowers, and seeds are all endowed with medicinal properties. Tansy is indigenous to Europe, but is cultivated in our gardens, and grows wild in the neighborhood of old settlements. It is a perennial herbaceous plant, bearing yellow flowers arranged in a dense terminal corymb. It exhales a strong, penetrating, but not unpleasant odor when fresh, and its taste is bitter and aromatic. These qualities depend mainly upon an essential oil which is most abundant in the flowers and seeds; the latter, also contain a large proportion of a bitter principle. The essential oil is of a yellowish-green color, and has, in a high degree, the odor of the plant. The virtues of the plant are imparted to water and alcohol.

According to some authors tansy, in moderate doses, acts as a gentle stimulant to the digestive organs, and when more freely given, produces some general excitement, augments the urine and perspiration, and may bring on nausea, vomiting, and diarrhœa. In overdoses the oil acts as a fatal poison, producing unconsciousness, flushed cheeks, dilated pupils, hurried stertorous respiration, strong spasms, a full and frequent pulse, repeated convulsions, and then a failing pulse, and death.[1] Even when not fatal, it may occasion convulsions and insensibility.[2]

Tansy was used in the middle ages, and formed one of the remedies of Hildegarde, for *amenorrhœa*;[3] other chronic affections, particularly of the abdomen, were treated by its means. Floyer (1687) states that the juice and the seeds are given for *worms*, and that the latter are diuretic.[4] Alston presents a similar statement with more details.[5] Dubois gives the following summary of opinions in regard to its vermifuge properties.[6] Hoffmann considers enemata made with milk in which tansy has been infused, as one of the best means of destroying ascarides. Bourgeois regards an infusion or decoction of the tops as an excellent vermifuge. Geoffroy caused the evacuation of thirty-two lumbrici, by applying tansy to the abdomen. Schenckius administered tansy seeds to a child, and produced the expulsion of more than one hundred lumbrici. Dubois, himself, says that in nineteen out of thirty cases in which this medicine was exhibited as a vermifuge, more

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[1] Dalton, Am. Journ. of Med. Sci., Jan. 1852, p. 136.

[2] Chapin, Boston Med. and Surg. Journ., Dec. 1857, p. 383.

[3] Strumpf, i. 578.

[4] Touchstone of Med., p. 189.

[5] Mat. Med., ii. 232.

[6] Mat. Méd. Indig., p. 387.

or less worms were discharged. He also relates a case of *tænia* which was cured by its use. These facts, and others which might be cited, demonstrate the possession of real anthelmintic virtues by this plant.

Of the other uses of tansy, in *hysteria*, *gout*, *rheumatism*, and *dropsy*, it is needless to say anything, as other more appropriate and powerful remedies for them are at hand. The popular use of the medicine to overcome *irregular or suppressed menstruation* arises, no doubt, from its general stimulant property, and not from its specific emmenagogue virtues. In the cases of poisoning by oil of tansy already alluded to, the medicine had been taken with the criminal purpose of producing abortion, but without avail.

ADMINISTRATION.—The dose of the powder of the *seeds* of tansy is from *ten to forty grains*, of the *flowers*, from *a scruple to two drachms*. An *infusion* made by adding from half an ounce to an ounce of the seeds, or twice that quantity of the flowers to a pint of boiling water, may be given in doses of *one or two ounces*. Of the *oil*, the dose is from *one to four drops*, or more.

GRANATI FRUCTÛS CORTEX.—POMEGRANATE RIND.

GRANATI RADICIS CORTEX.—BARK OF POMEGRANATE ROOT.

DESCRIPTION.—The pomegranate tree, *Punica granatum*, is a native of the South of Europe, Barbary, Arabia, Persia, and Japan, and is cultivated in the West Indies and the United States. It is a small tree, but in favorable situations often rises to the height of eighteen or twenty feet. The leaves are of a light-green color, pointed at either end, and about three inches long by half an inch broad in the middle. The flowers are of a beautiful red color, but have no smell. The fruit is about the size of an orange; its rind is extremely hard and tough, and of a reddish-brown color. It contains a subacid and succulent pulp, and numerous seeds.

As found in commerce, pomegranate flowers (*balaustines*) have a bitter and astringent taste. The rind of the fruit occurs in irregular fragments which are very hard and brittle, of a reddish-brown color externally, but paler within. The bark, as found in the shops, is in quills or fragments of a grayish-yellow color externally, and yellow within. It is inodorous, has an astringent taste without bitterness, and, when chewed, colors the saliva yellow.

The analyses of pomegranate rind and bark have not furnished very definite results. The former would appear to contain the larger proportion of tannin, the latter of a fatty matter described by Wackenröder as "rancid fat oil." It is probably on this oil, as well as upon tannin, that the vermifuge qualities of the medicine depend.

HISTORY.—Pomegranates were among the most anciently known of fruits. They are mentioned, along with grapes and figs, among the productions of "the land of promise." Homer enumerates them among the fruits that were suspended over the head of Tantalus to tempt his appetite,[1] and Venus is fabled to have planted the first pomegranate tree. It must have been very anciently used in medicine. In the Hippocratic writings it is described chiefly as an astringent. Cato, the Censor, who flourished two hundred years B. C., is, perhaps, the earliest authority that can be cited in regard to its vermifuge properties. He prescribed an infusion made of unripe pomegranates bruised.[2] Celsus appears to be the first who alludes to its power of destroying the tapeworm.[3] Dioscorides describes it as a remedy for foul ulcers, and for dysentery, leucorrhœa, prolapsus ani, and especially tænia.[4] Pliny insists upon all of these particulars, and speaks of its use for worms generally, as well as for tænia.[5] All of the Arabian authors mention its astringency. Rhazes describes it as an anthelmintic, and recommends the powdered rind of the fruit.[6] Avicenna directs the bark of the root to be taken in substance or decoction for lumbrici and ascarides. Several European writers of the middle ages renew these statements, yet for a long time the medicine seems to have been forgotten, and was only restored to use by the English physicians in India. The first mention of it in modern writings is contained in a communication from Dr. Buchanan, of Calcutta, in 1805,[7] who gives the native formula for its use. Five years subsequently, Dr. Fleming published some cures of tænia by the pomegranate decoction in his Catalogue of Indian Medicinal Plants and Drugs, and in 1844, Dr. Burt,[8] and in 1820, Mr. Breton, cited cases of its success in India.[9] The latter concluded from the writhing, and rapid death of live tæniæ plunged in a decoction of pomegranate root, that its direct action upon them was poisonous. In 1822, a Portuguese physician, Gomez, published a memoir containing fourteen cases of the cure of

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[1] ADAMS, Comment. on Paul. Æginet., i. 134.
[2] BAYLE, Bibl. de Thérap., i. 313.
[3] Book iv. chap. xvii.
[4] Lib. i. cap. cxxvii.
[5] Lib. xxiii. cap. lviii. and lvix.
[6] EBN BAITHAR, i. 502.
[7] Edinb. Med. and Surg. Journ., iii. 22.
[8] Ibid., x. 419.
[9] Med.-Chir. Trans., xi. 301.

tænia by this substance.[1] The paper was translated in France by Mérat, and attracted general attention. The last named author published, in 1832, a valuable monograph on the subject. Subsequently, pomegranate was received into all the Pharmacopœias, and into that of the United States in 1842.

Action.—Mérat himself took the decoction of pomegranate prepared in the manner directed below. It produced nausea, borborygmi, some colic, occasional cramps in the calves of the legs, and three stools of a light-yellow color. The urine was rendered more abundant than usual; but within twenty-four hours all of these symptoms had passed away. When given as a vermifuge it occasions the same symptoms, essentially, but sometimes there is giddiness, dimness of vision, drowsiness, faintness, numbness of the limbs, and even convulsions. The fresh bark of the root is the only portion of the plant which produces these effects, and which can be relied upon for the expulsion of tænia.

Uses.—This medicine is chiefly valuable as a remedy for *tænia*. Ainslie tells us[2] that the Mahometan physicians in India (whither it was introduced from Persia) consider it a perfect specific in cases of tapeworm. They give it in decoction prepared with two ounces of fresh bark boiled in a pint and a half of water, until three-quarters of a pint remain. Of this, when cold, a wineglassful may be drunk every half hour, until the whole is taken. The most complete account of the curative effects of the medicine are contained in the memoir of Mérat, already referred to, and which contains a summary of *one hundred and ninety-two cases* cured by the bark of the root. M. Mérat asserts that it never fails if administered according to the following rules: It ought never to be given unless the patient has actually voided some joints of the worm, and then, if possible, on the following day. The decoction ought always to be made of the fresh bark of the root, and prepared as follows: Take two ounces of the bark and let it soak over night in a pint and a half of water, and then by gentle boiling reduce it to a pint; strain off the liquor, expressing the grounds, and give it lukewarm in three doses, at intervals of an hour, before the patient has broken his fast. No purgative or other treatment need precede or follow that which has been described. If the first dose is vomited, the others should still be administered, and they will generally be retained; but if all are rejected, the treatment must be renewed on a subsequent occasion.

For the purposes of an astringent medicine merely, the rind of the fruit is most frequently employed, as in the treatment of *chronic diar-*

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[1] Bayle, op. cit.

[2] Mat. Indica (1826), i. 523.

rhœa, *leucorrhœa*, and *passive hemorrhages*. Its decoction may be used as an injection in open *cancer of the uterus* and *ulcerous diseases of the rectum*, accompanied with a bloody discharge. It also forms an excellent *gargle* in relaxed states of the fauces.

ADMINISTRATION.—The dose of the rind or flowers in *powder* is from *twenty to thirty grains*. The officinal decoction of the rind (*Lond.*) is prepared by boiling two ounces in a pint and a half of water, to a pint. In preparing the decoction of the root, two pints of water are made use of. The preparation of the bark of the fresh root, as advised by Mérat, is more efficacious than either.

ABSINTHIUM.—WORMWOOD.

DESCRIPTION.—Absinth (*Artemisia absinthium*) is a perennial plant, which is native in all parts of Europe, except the extreme north, and grows wild in open places. It has been naturalized in the United States. The tops and leaves are officinal. They have a hoary look, a soft, silky feel, a strong aromatic odor, and a bitter and aromatic taste, qualities which are due to the presence of a green essential oil, and a bitter, resinous principle, called *absinthin*.

HISTORY.—Wormwood appears to have been very anciently and very extensively employed. In the Bible it is several times referred to as a type of bitterness. Hippocrates describes it as an emmenagogue. Pliny enumerates various cases in which its use is beneficial both internally and externally; among the former, he refers to its stomachic, carminative, tonic, emmenagogue, and anthelmintic qualities, and among the latter, he mentions its power of healing sores.[1] Dioscorides furnishes a similar account, and the Arabian writers add but little to the catalogue of its virtues.

PROPERTIES.—Wormwood tends to increase the appetite and promote the digestion. In small doses, it does not excite the circulation unless plethora or fever be already present. In larger quantities, it augments the general warmth of the body, and increases somewhat the activity of the pulse and of the secretions. Overdoses produce gastric pain, nausea, and vomiting. Occasionally, headache and giddiness, with dulness or confusion of ideas, have been observed after large doses, and are probably due to the essential oil which the plant contains. It gives a bitter taste to the milk and the flesh of animals that have eaten it, which proves that its bitter principle is absorbed.[2]

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[1] Hist. Nat., xxvii. 28.

[2] MITSCHERLICH, Lehrbuch, ii. 118.

Absinthin is a yellowish-white powder, of an offensive smell, and a penetrating and bitter taste. It is soluble in water and alcohol, acetic acid, and the alkalies, and has an acid reaction. Its effects are represented differently by Leonardi and by Righini, the former stating that in large doses it occasions faintness and insensibility, but the latter that it is a pure tonic bitter.[1] Of these statements the former is the more probable.

USES.—As a stomachic tonic, wormwood is one of the most common and useful among those employed in Europe. The union of its stimulant and bitter principles adapts it to a large class of cases in which the appetite is feeble and the digestion impaired, independently of an inflammatory or organic change of the stomach, and whether the *dyspepsia* exists as an independent affection or in connection with constitutional derangement. It has been highly recommended in *scrofula*, *chlorosis*, *jaundice*, *dropsy*, *chronic bowel complaints*, &c., in all of which it doubtless promotes the due assimilation of the food. In *flatulent dyspepsia*, an alcoholic tincture or cordial of absinth is much employed in Europe. Formerly, absinth was commonly and successfully prescribed for the cure of mild cases of *intermittent fever*, but chiefly as a domestic remedy. Like other tonics, it has been recommended in *epilepsy*.

The *anthelmintic* virtues of absinth are not very remarkable. Its long-continued use will doubtless cause the expulsion of lumbrici and ascarides, and prevent their reproduction, by giving tone to the digestive organs. M. Cazin recommends a preparation made by digesting equal parts of wormwood and garlic in a bottle of white wine, of which the dose is from one to three ounces every morning.

Externally the decoction of wormwood has been used as a dressing for *indolent* and other *unhealthy ulcers*.

ADMINISTRATION.—In *substance*, the dose of wormwood is *one or two scruples*. An *infusion*, made by macerating one ounce in a pint of boiling water, may be given in doses of *one or two fluidounces*. The dose of the essential *oil* is from *four to eight drops* in a sweetened mixture with ether or sweet spirit of nitre.

BRAYERA ANTHELMINTICA.—KOUSSO.

DESCRIPTION.—This vermifuge, which is not officinal, consists of the dried flowers of *Brayera anthelmintica*, a native tree of Abyssinia. On analysis, they are found to contain, as the apparently active com-

[1] REIL, op. cit., p. 21.

ponents, a fatty oil, an acrid resin, tannin, and a principle called koussine. As procured by Pavesi, and afterwards by Vée, it is represented to be yellow, bitter, insoluble in alcohol and in alkalies, and uncrystallizable. St. Martin had previously described it[1] as forming white, acicular crystals, soluble in alcohol, ether, and acids.

HISTORY.—The first mention of kousso appears to be that made by Godingus (1615), who states that the Abyssinians employ it annually to purge themselves of worms,[2] which appear to be singularly prevalent among these people. Subsequently (1790), the celebrated traveller, Bruce, confirmed this statement, and furnished a drawing of the tree from which the medicine is derived. In 1823, Brayer, a French physician, on his return to France from Constantinople, where he had resided for several years, brought with him some flowers of kousso, whose tænifuge powers he had tested.[3] Specimens of the plant and accounts of its use were afterwards sent from Abyssinia by Schimpfer, and it was employed with various success by Plieninger, Kurr, and Riecke.[4] In 1840, a memoir treating in part of this plant was read before the Parisian Academy of Medicine by Aubert, who had experienced its benefits in his own person during a residence in Abyssinia. Of its use in Africa, Mr. Vaughan, a surgeon of the East India Company stationed at Aden, on the Red Sea, says: "In Southern Arabia, on the seacoast, and along the shores of the Red Sea, it is well known and considered a most valuable medicine. In Northern and Southern Abyssinia it is universally used about once a month, the trees being numerous, and the medicine costing hardly anything. . . Bruce mentions that no Abyssinian will travel without it. The few Abyssinians who visit the port of Aden invariably bring with them a supply."[5]

In 1847, Mérat reported five cases of its efficacy observed by himself, Chomel, and Guéneau,[6] and others were published by Sandras.[7] In a paper by Dr. Budd, in 1850,[8] this gentleman says, nine doses of the medicine have been given by us, and not one of these has failed to kill and expel the worm. In several, the systematic use of other remedies had failed. Other successful examples of its use are reported by Inglis,[9] Oliari, and Masserotti,[10] Edmonds,[11] and Dane.[12] Dr. Dane

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[1] Bull. de Thérap., xxiv. 285.
[2] PEREIRA, Mat. Med. (3d Amer. ed.), ii. 804.
[3] Bullet. de l'Acad., vi. 492.
[4] RIECKE, Neue Arzneim., p. 101.
[5] Lancet, Sept. 1850, p. 305.
[6] Bull. de l'Acad. de Méd., xii. 690.
[7] Annuaire de Thérap., 1847, p. 256.
[8] Lancet, June 29, p. 773.
[9] Med. Times, July, 1850, p. 83.
[10] RANKING'S Abstract, 1852 (Am. ed.), p. 98.
[11] Times and Gazette, June, 1855, p. 541.
[12] Ibid., p. 608.

states that he treated fifteen cases, in all of which the worm, with the head, was removed. Richardson, Mitchell, Neville, and others, in Ireland, have also published examples of its success.[1] Dr. Barclay, it is true,[2] has referred to several instances in which only partial success was obtained. Some German writers, as Albers and Meyer-Ahrens, report similar results, which must be ascribed to the bad quality of drug employed, or to its imperfect administration.

Mr. Johnston, a traveller in Abyssinia, is quoted by Pereira as stating that the operation of kousso is dreadfully severe, that it produces miscarriages often fatal to the mother, and even death when large doses are taken. He adds that even in its native country it is but barely tolerated. Kuchenmeister states that it readily produces sickness and violent pains in the intestines, and that he generally was unsuccessful in its use. These statements cannot be fully accepted, for they are directly at variance with the ordinary results of European observation. Thus, Mérat says that in the cases reported by him it produced no colic nor other annoyance, nor restrained the patients from their ordinary occupations. Sandras observes that its taste sometimes excites a slight degree of nausea, and that, in the course of an hour or two, several stools succeed one another, generally without colic, and containing fragments of the worm. The first stools contain fæcal matter, and the last is composed of the infusion as it was swallowed. The worm is nearly always discharged dead.

Administration.—Aubert thus describes the native mode of employing the medicine. An infusion is made with water or beer, or the flowers are mixed with honey, to the amount of from four to six drachms. This dose is taken in the morning, fasting, and no other food is eaten during the day. Generally the worm is discharged in the course of twenty-four hours without purging. On the morrow the person resumes his usual pursuits, and as the head of the worm is generally retained, it grows anew, and in the course of a few months requires a repetition of the dose, which, however, is not disagreeable in smell or taste, and does not cause either pain or colic.[3] The same account is furnished by Engleman. In Europe, the usual method is to give *half an ounce* of the powdered flowers mixed with *water*, at a single dose. It is proper, as in the case of other vermifuges, for the patient to diet on the day before its administration.

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[1] Dublin Med. Press, Feb. and Mar. 1851. [2] Med. Times, Oct. 1851, p. 408.

[3] Loc. sup. cit.

SPIGELIA.—Pinkroot.

Description.—The root of *Spigelia Marilandica*. This plant is a native of the southern and southwestern States of the Union. It grows in dry, rich soils on the borders of woods. It has a quadrangular, smooth, and purplish stem; the leaves are opposite, sessile, ovate, glabrous in the centre and pubescent on the edges. The flowers form a terminal raceme. The corolla is funnel-shaped, red externally and orange within. The root consists of numerous slender, blackish fibres arising from a thick and knotty rhizome. Its odor is faint but peculiar, and its taste is sweetish and somewhat bitter. According to Feneulle, the root contains a fixed and a volatile oil, some resin, and a peculiar bitter substance, gallic acid, &c. It is said to lose its active properties by keeping.

Other species of spigelia possess anthelmintic powers, and *S. anthelmia* in even a greater degree than the officinal plant. This species grows in Jamaica, and is regarded as an infallible remedy for worms by the inhabitants. It displays very decided narcotic and stimulant properties.[1]

The officinal preparations of spigelia are the following:—

Extractum Spigeliæ et Sennæ Fluidum.—Fluid Extract of Spigelia and Senna.

This extract is prepared by forming first a tincture of spigelia and senna by percolation, inspissating sufficiently by evaporation, and adding carbonate of potassa, sugar, and oils of anise and caraway. Dose, for an adult, half a fluidounce, for a child, a fluidrachm.

Infusum Spigeliæ.—Infusion of Pinkroot.

Macerate half an ounce of pinkroot in a pint of boiling water for two hours in a covered vessel, and strain. Dose, for an adult, from four to eight fluidounces; for a child of three or four years old, from half a fluidounce to a fluidounce.

History.—Pinkroot appears to have been used medicinally by the aborigines, from whom Lining derived a knowledge of its virtues in 1754. It was also early recommended by Garden and Chalmers, of South Carolina.

Action.—Some authors ascribed purgative powers to this medicine.[2] Barton, on the contrary, recommended that its action should be quickened by the addition of a purgative medicine, and Chapman advises

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[1] Browne, Med. Museum, 2d ed., 1781, i. 221.

[2] Home, Clinical Experiments, p. 465.

the same combination, but with a view of counteracting its narcotic operation. Wright first pointed out its narcotic properties, and Barton attributed cases of death to its employment. Two fatal cases were published by Chalmers. Chapman attributes its efficacy as a vermifuge to its narcotic influence on the intestinal worms. Dr. Ives adopted a similar view, and believed that it first stupefies and then expels these entozoa. He further compared the action of the fresh root to that of digitalis and stramonium. Like the former, it quiets general nervous irritation, and, like the latter, it causes dilatation of the pupils and a sort of mental derangement with alternate fits of laughing and crying, and incoherent talking. Dr. Thompson took large doses of the root, and found it to produce acceleration of the pulse, flushed face, drowsiness, and stiffness of the eyelids.[1] The following is a more recent illustration: An infusion of three drachms of the root in three gills of boiling water, was ordered for a child four years of age, to be taken in eight equal doses at intervals of two hours. After the third dose, the skin became hot and dry, the pulse 110 and irregular; the face, especially about the eyes, including the lids, much swollen; and the pupils were widely dilated. There was strabismus of the right eye, and a wild, staring expression, giving the countenance a very singular, in fact, ludicrous appearance. Yet the intellect seemed to be unaffected. The tongue was very pointed and tremulous. On attempting to assume the erect position, the patient was seized with a general tremor, which passed off in a few seconds, and left her apparently quite exhausted.[2] The next morning, all the alarming symptoms, with the tumefaction of the eyelids, had disappeared. Although these effects may be admitted to arise occasionally, they must be extremely rare in comparison with the innumerable instances in which spigelia is used as a remedy by physicians and in domestic practice. Dewees says: "We have prescribed this remedy many hundred times, and we declare we have never, except in a single instance, witnessed any distressing symptoms to arise from it; in this exception, a slight squinting, with delirium, followed its exhibition."[3] Such, precisely, was Eberle's experience. It would seem highly probable that, as Chapman suggested, the purgative ingredients of "worm tea" counteract the narcotic action of the pinkroot contained in it.

Uses.—Barton long ago said, "It may be doubted whether there is in the whole series of anthelmintics yet known a more efficacious remedy

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[1] Eberle, Therapeutics, p. 155.

[2] Spalsbury, Boston Med. and Surg. Journ., April, 1855, p. 72.

[3] Diseases of Children, p. 495.

against worms, especially the common *round worm*."[1] Dewees styles it "*the* most decidedly efficacious remedy;" according to Eberle, "it seldom fails;" and the almost universal employment of it in this country attests its value.

There is a state of intestinal derangement presenting all the symptoms of lumbricoid ascarides, and which is most frequently observed among strumous, feeble, and precocious children. They have fever, a dry hot skin, furred tongue, tumid and confined bowels, capricious appetite, and nervous irritability. These symptoms are often dissipated by the influence of pinkroot, and without causing the discharge of any worms, to the presence of which they are most commonly attributed. It seems probable that the alterative and tonic effects of the medicine are not as fully appreciated and employed as they deserve to be. The fluid extract of spigelia and senna is well adapted to produce the results alluded to.

ADMINISTRATION.—Eberle proposes giving the decoction or infusion of pinkroot alone, and subsequently administering a strong mercurial purge. The most usual and the best form of the medicine is that commonly known as *worm tea;* viz., ℞.—Pinkroot half an ounce; senna two drachms; manna one ounce; fennel-seed two drachms; boiling water one pint.—Infuse. Half a wineglassful three times a day to a child two years old. The compound fluid extract is less disagreeable and nearly as efficient. The dose is from *one to four fluidrachms.*

AZEDARACH.

DESCRIPTION.—This medicine (which belongs to the secondary list of the U. S. Pharmacopœia) is the bark of the root of *Melia azedarach*, a tree which is a native of Asia, but is naturalized in Southern Europe, and the southern States of the Union. It is generally known under the name of *Pride of China* or *Pride of India*, and is remarkable for its beautiful foliage and flowers, which have caused it to be used as a shade tree in several southern cities. It grows to a height of thirty or forty feet. The leaves are large, bipinnate, with dark green leaflets disposed in pairs. The flowers are of a light violet color, arranged in clusters near the extremity of the branches. Their odor, according to some authorities, is "disagreeable," and according to others "delightfully fragrant." The fruit is an ovoid fleshy berry, about the size of

[1] BARTON'S Cullen, ii. 413.

a cherry, and containing a nut with five seeds. The bark of the root has a bitter and nauseous taste and a virose smell.

History.—The poisonous properties of azedarach were well known to the Arabian physicians, one of whom enumerates among the symptoms which an overdose of it produces—faintness, confusion of mind, giddiness, dimness of sight, and vomiting. No mention is made of its vermifuge properties, but diuretic qualities are ascribed to it.[1] It was chiefly used to promote the growth of the hair, and to cure eruptions of the scalp. A modern writer praises the virtues of an ointment made with the pulp of the fruit in tinea capitis and to destroy lice.[2] Thacher mentions its being thus employed in the United States, and Michaux refers to its use in Persia for similar purposes.

Action. *On Animals.*—Birds devour the berries greedily and without harm. Cows have sometimes eaten the leaves in large quantities with but trifling inconvenience. Dogs appear not to be affected by them;[3] horses eat them without harm, and the trees are sometimes planted around stables that these animals by eating the berries may be prevented from having the "bots."[4]

On Man.—The poisonous action of this medicine bears a close resemblance to that of spigelia. In a case described by Dr. Kollock,[5] the symptoms were stupor, dilated pupils, stertorous breathing, and subsultus. In another, mentioned by Tournon, there were convulsions, grinding of the teeth, cold sweat, vomiting and purging. Porcher. however, says that he has frequently seen the berries eaten by children in South Carolina, without bad consequences. The poisonous effects are said to be most conspicuous in the spring, when the sap is ascending.

Uses.—Ainslie tells us that in Cochin-China, the medical men consider azedarach as *anthelmintic*, but administer it cautiously, because in too large a dose it causes vertigo and convulsions.[6] In the southern States of the Union, its use is said to be general among the planters, and with many to supersede all other vermifuges. Like spigelia, it is employed to remove the *dyspeptic symptoms* so often attributed to intestinal worms.

A case of *hysteria* said to have been cured by this medicine is reported by Skipton, of Calcutta, but his narrative lacks sufficient details on which to base an opinion of its correctness.[7]

Administration.—Azedarach bark is usually given in *decoction*,

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[1] Ebn Baithar, ed. Sontheimer, i. 30.
[2] Coxe, Am. Dis., p. 128.
[3] Mérat and De Lens, Dict., iv. 290.
[4] Porcher, Trans. Am. Med. Assoc., ii. 723.
[5] Eberle, Therapeutics, p. 156.
[6] Materia Indica, ii. 455.
[7] Revue Méd., xxxii. 284.

made by boiling two ounces of it in a pint of water, until reduced one-half. The dose for a child is *a tablespoonful* every two or three hours, until it affects the stomach or bowels. Or a similar dose of the decoction may be administered night and morning, for several days, and followed by an active cathartic. The dose of the *powdered bark* is *twenty grains*.

CUCURBITA PEPO.—Pumpkin.

The striking effects of pumpkin seeds as a remedy for tapeworm, which have been published within a few years, call for some notice of them in this place, although these seeds do not enter into the officinal, nor even the usual, list of medicines.

The earliest mention we have met with of the anthelmintic powers of pumpkin seeds, is contained in the following passage from Andry:[1] "Pumpkin and cucumber seeds are a very effectual remedy for the tapeworm, a fact which also rests on the testimony of Tyson, who, in his dissertation on the tapeworm, says that he has a portion of one twenty-four feet long, voided by a young man after he had taken an emulsion prepared with these two kinds of seeds." This result was referred by Tyson to the doctrine of signatures, on account of the resemblance of the joints of the worm to these seeds.

In 1820, Mongény, a physician in Cuba, recommended a treatment for tænia, composed of three ounces of a paste made from fresh pumpkin seed pulp, to be followed for three successive hours with two ounces of honey. Within six or seven hours, the worm was discharged entire, even when other means had failed to dislodge it.[2] This method seems to have been introduced into Boston from Matanzas, by Dr. J. S. Jones, about 1850. The following formula was the one usually employed. Take two ounces of pumpkin seeds, from which the outer husk has been removed, pound them in a mortar with half a pint of water, until an emulsion is made, which may then be strained through a cloth. To be taken at one dose, fasting. If it does not operate within an hour and a half, take a dose of castor oil; and if unsuccessful, repeat the same on the following day. Cases of cure by these means began to multiply. The reader is referred to those of Dr. Cragin,[3] Rev. J. H. Hill,[4] Dr. Ely,[5] and Dr. De Forest,[6] who cured numerous

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[1] Génération des Vers (1741), ii. 536.

[2] Richter, Ausfürlich. Arzneim., i. 301.

[3] Boston Med. and Surg. Journ., Nov. 1851, p. 274.

[4] Ibid., April, 1852, p. 222.

[5] Ibid., July, 1852, p. 500, and Oct. 1852, p. 216.

[6] Ibid., Sept. 1852, p. 143.

cases in Syria. An interesting one was published by Dr. Patterson, of Philadelphia.[1] For six years the patient had been tormented by his disease, and the use of all known remedies, including male fern, calomel and jalap, iodide of potassium, iodide of iron, decoction of pomegranate, and kousso. During this period he had voided upwards of four hundred yards of the worm. Finally he took two ounces of powdered pumpkin seeds with two tablespoonfuls of white sugar, infused in half a pint of boiling water. Within an hour and a half, an ounce of castor oil was administered, and in less than an hour afterwards, the worm, with the head, was discharged.

In 1852, two French physicians, MM. Brunet and Lamothe, apparently without any knowledge of the above mentioned results, also cured patients of tænia by means of a paste or emulsion of pumpkin seeds.[2]

In 1854, Dr. Leasure, of Newcastle, Pennsylvania, reported a successful case, and in the following year a second occurring in the mother of his former patient.[3] Dr. Putnam, of Boston, also furnished another example of the tænifuge properties of pumpkin seeds,[4] and these cases were followed by those of Ely,[5] Carpenter,[6] Soule,[7] Hunt,[8] Cazin,[9] Reimonecq,[10] and others.

The fixed oil contained in the seeds is supposed to possess their anthelmintic virtues. It has been used with success by Mr. J. C. Lyons, of Philadelphia, in the dose of half an ounce repeated in two hours, and followed in two hours more by a dose of castor oil.[11] This oil may be obtained by cold expression from the seeds in the proportion of nearly an ounce to the pound. It is clear, transparent, of a light brownish-green color, with a slight oily odor, and a perfectly bland tas e, like that of the oil of sweet almonds.

The results which have been obtained from this medicine, it must be acknowledged, are worthy of serious attention. If they are confirmed by ulterior observation, the materia medica will be greatly enriched by the possession of a remedy which is at once so potent and so mild.

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[1] Med. Examiner, Oct. 1852, p. 630.
[2] Annuaire de Thérap., 1852, p. 301.
[3] Am. Journ. of Med. Sci., July, 1854, p. 281; and Ibid., June, 1855, p. 269.
[4] Ibid., Oct. 1854, p. 378.
[5] Boston Journ., Feb. 1856, p. 16.
[6] Ibid., Jan. 1858, p. 476.
[7] Ibid., March, 1859, p. 116.
[8] Am. Journ. of Med. Sci., April, 1859, p. 374.
[9] Bull. de Thérap., lv. 234.
[10] Lancet, March, 1859, p. 254.
[11] Philad. Med. Exam., Oct., 1853, p. 630.

KAMEELA.

DESCRIPTION.—Kameela, or *reroo*, is the Hindostanee name for a vermifuge which, after having been described and used by Dr. T. Anderson, a surgeon in the service of the East India Company, was introduced to the notice of western physicians by Dr. C. A. Gordon.[1] It was stated by him to be the pubescence on the stems and seed vessels of Rottlera tinctoria, a plant of the Nat. Ord. *Euphorbiaceæ*. Dr. Ramskill says it is a brick-red glandular powder collected from the capsules of the fruit, and compared it with lycopodium for the difficulty with which it is mixed with water. These glandules, he adds, are seen under the microscope to be mixed up with fine stellate hairs and remains of stalks, leaves, &c. It has little smell or taste, is insoluble in cold, and nearly so in boiling water, but dissolves readily in alcohol.[2] One drachm of the saturated tincture yields about four grains of a resinous extract, which is undoubtedly the active constituent of the medicine.[3]

ACTION.—Dr. Gordon, in his account of kameela, states, that beyond a trifling amount of nausea and griping, in some instances, no unpleasant effects are experienced from the remedy,[4] and the observations of Mr. Leared were to the same purpose.[5] These statements are substantially confirmed by other observers, who differ only as to the degree of nausea, vomiting, colic, or purging, produced. In no case, however, is it represented to have been excessive. Hence we may infer that kameela should be ranked with vermifuges which exert a specific poisonous action upon intestinal worms, or upon tapeworms at least.

USES.—It would appear that *tænia* is extremely prevalent in the Punjaub; but Dr. Gordon assures us that the treatment of it by kameela is so easy and certain, that there was seldom a necessity to admit a soldier into the Military Hospital for that purpose. The soldiers, he says, applied of their own accord for a dose of the medicine, "after which they invariably parted with the worm in the course of a few hours, and then went on with their military duty as if nothing had happened." If subsequent reporters of its effects have in some degree modified the belief in its uniform success, their account of its operation still shows that kameela is one of the best remedies of its class.

Respecting its action upon the worm there are different statements.

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[1] Times and Gaz., Nov. 1856, p. 538.
[2] Lancet, May, 1858, p. 476.
[3] LEARED, ib., p. 542.
[4] Times and Gaz., May, 1857, p. 429.
[5] Ibid., Dec. 1857, p. 628.

Mr. Leared mentions that the parasite is generally discharged in pieces, or in large masses, in a lifeless state; and Messrs. Hardy, Anderson, and Moore, always found it dead. Indeed, the last named gentleman is persuaded that in kameela we possess not only the vermifuge, but the tæniacide *par excellence*. On the other hand, the reporter of Dr. Peacock's cases states that the portions of the worm discharged under its influence were generally quite alive. This discrepancy may, perhaps, depend upon a difference in the doses administered by the several physicians referred to.

Mr. Leared claims that the medicine is efficacious against all sorts of worms, and as incomparably superior to all other remedies for *threadworms* and large *round worms*.[1] Dr. Moore thinks that it is also useful in *diseases of the skin*.

ADMINISTRATION.—The dose of the powder of kameela is *one drachm*. Dr. Gordon states that in India he employed a saturated *tincture* in the dose of *one, two, or three fluidrachms*, diluted with a little cinnamon water. The *alcoholic extract* is preferred by others; as above stated, about four grains of it are yielded by *one fluidrachm* of the tincture. Whatever preparation is used should be repeated, in the doses mentioned, every three hours until five or six doses are taken. As the powder of kameela is apt to gripe, it should be associated with a small quantity of hyoscyamus.

SAORIA.—This is the dried herb of *Mæsapicta*, an Abyssinian shrub. It is taken in powder mixed with porridge, and in the dose of *an ounce or an ounce and a half*. It gives a violet tint to the urine, and occasions some nausea, and also liquid stools. Dr. Strohl, from whom these particulars are derived, is of opinion that it is a more certain tænifuge and tæniacide than the remedies of the same class indigenous to France. Kuchenmeister regards its action as uncertain.[2]

ZATZE, or *Tatze*, is the fruit or undeveloped drupe of *Phytolacca dodecandra*, a native shrub of many parts of Africa and of the Azores. It has a persistently acrid and disagreeable taste, and is apt to produce vomiting and purging. Dr. Strohl found it partially successful in six cases of tænia. He administered from four to six drachms of the powder in a liquid vehicle.[3]

OLEUM TEREBINTHINÆ, vid. *General Stimulants*.

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[1] Times and Gaz., Jan. 1859, p. 56.

[2] Annuaire de Thérap., xv. 261; Brit. and For. Med.-Chir. Rev., July, 1858, p. 243; KUCHENMEISTER, Syd. Soc. ed., i. 154.

[3] Bull. de Thérap., xlvii. 17, 71.

CLASS XII.

ALTERATIVES.

ALTERATIVES are medicines which modify the nutrition of the body without producing any antecedent phenomena. This definition is not to be understood as absolute, but only as applying to certain doses of the medicines of the present class. So far, indeed, is it from being absolute that no other division of the materia medica contains more substances which, in large quantities, may become mischievous to the organization of the body, and even destructive to its life. They constitute some of the most powerful agents of the irritant class. Iodine, chlorine, the alkalies, mezereon, and colchicum are eminently of this nature, and some of the compounds of arsenic and mercury are violently poisonous; yet, in appropriate doses, they silently penetrate into the most covert recesses of the organism, and bring about such changes in its nutrition, or in the condition of its ultimate particles, as result in their renovation and the return of health.

The term alteratives (alterantia) was, it is believed, first introduced by Hoffmann, who used the name, however, in a very wide sense, applying it to medicines which tend to correct *all morbid qualities in the body*, as distinguished from evacuants, tonics, and sedatives, which exhibit different modes of action. Alteratives themselves he divided into absorbents, refrigerants, incisives or attenuants, and emollients or demulcents, but included only in the third division the alteratives of the present nomenclature, with many others which belong principally to the class of general stimulants, or, on the other hand, to diluent medicines. He distinguished between those which act chiefly on the humors, diluting and therefore rendering their movements more easy and unobstructed, and those which affect the solids, modifying their tone, contractility, elasticity, &c., and thus enabling them to circulate the fluids more rapidly and freely. These medicines, he remarks, are

appropriately called purifiers of the blood, because they promote the removal from it of substances upon whose excretion health itself depends.[1] The exclusively solidist views which are often attributed to this eminent physician are therefore not those which he maintained. He did, indeed, consider as alteratives many substances which exert a definite and active influence upon the secretions. Even mercury itself at that time was supposed to be curative in so far only as it increased the discharge of saliva; and probably he did not suspect the curative powers of this metal to be very great unless such an effect were produced by it. But it must be remembered that iodine, chlorine, colchicum, and arsenic, an observation of whose effects has chiefly led to the formation of the present alterative class of medicines, were unknown in Hoffmann's time, and the molecular changes which occur in nutrition were still undiscovered. Yet his doctrine, that alterative medicines promote the elimination of certain morbid matters from the body, is substantially in accordance with the conclusions of modern science.

Even now, physicians are not perfectly agreed what medicines to include in the class of alteratives. Some embrace under that denomination colchicum, guaiacum, mezereon, dulcamara, soda, potassa, sulphur, chlorine and its compounds with soda and lime, and others the vegetable acids, and the preparations of silver, zinc, copper, and lead. But all of these agents display properties which are more important than any which can be called alterative, and practical considerations, therefore, seem to determine their position elsewhere. Thus, colchicum acts upon the renal secretion chiefly, and hence belongs to the class of diuretics; guaiacum mainly on the skin, and therefore is ranked with diaphoretics, &c. Even chlorine, which has so strong a chemical and physiological analogy with iodine, differs from it entirely in those respects which render iodine so valuable a remedy. What has been urged in the introduction to this work, and repeated elsewhere, need not now be insisted upon—that the arrangement which is most convenient and useful in practice is the best in a practical treatise. Were the theory of medicinal agents perfected, its principles would of themselves constitute the most valuable practical precepts; but such a consummation, however desirable, is an utopian vision, if not an impossibility.

Throughout this work we have endeavored to keep prominently in view the principle that experience is the only safe guide in therapeutics. In attempting to elucidate the operation of many medicines, we

[1] Opera Omnia, i. 427 et seq.

have been enabled to seize with more or less confidence the link that connects their sensible operation with the cure which follows it. But in the present case that rational link is almost entirely wanting, and we are reduced to forming conjectures respecting its nature, derived from the effects of alterative medicines upon the economy when they are administered in excessive doses, and from our imperfect knowledge of the intimate nature of the diseases in which their curative power has been demonstrated by experience.

Now, it is a remarkable fact that mercury, arsenic, iodine, muriate of ammonia, soda, and potassa agree in this, that when given for a considerable period, which varies for them individually, they diminish the proportion of fibrin in the blood, or its crasis, or plasticity, as it is sometimes termed, and, at the same time, promote the waste of the solids. Yet the external phenomena which accompany this change are not the same in each case. Mercury causes a general disintegration of the solids, iodine a wasting of them, and especially of glandular organs, arsenic a flaccidity of the tissues, with a watery state of the blood, and the alkalies a dissolution of the corpuscles of this fluid, as well as an atonic condition of the solids, a state exactly represented by scurvy. It is certain, therefore, that while all of these medicines have the effect of impairing the normal constitution of the blood, they must do so by different processes, a conclusion which is fully supported by the fact that they are very far from possessing identical curative virtues. It is, indeed, quite impossible to substitute them for one another in the treatment of any disease, and sometimes, as in syphilis, the alterative remedy which cures the secondary is less efficient than another in curing the tertiary symptoms. This marked diversity of curative operation in two medicines so nearly related in many respects as mercury and iodine extends to other members of the same class, and proves that, although they all agree in diminishing the crasis of the blood, they evidently disagree in those more recondite influences and operations in which the true and intimate action of a medicine consists.

Such, briefly, are some of the elements out of which we may attempt to form a judgment respecting the manner in which alteratives cure disease, and their insufficiency is only too palpable. But if we attempt to push the inquiry further, we enter upon a boundless sea of conjecture where there is little else to guide us than more or less plausible hypotheses. We may assume that the affections which are cured by these medicines depend upon the presence of a specific morbid material in the blood, which alterative remedies are competent to neutralize or destroy, or simply to eliminate from the system. In favor of this

view it may be stated that nearly all of the medicines in question are separated from the body with the urine, the secretion charged with evacuating the greater proportion of effete matters which the body throws off, and therefore, in all probability, with removing the morbid principles which sustain the phenomena of the disease, if such principles actually exist in the blood, just as iodide of potassium eliminates with the urine lead which has acted as a poison in the system.

Or, again, as indeed it seems more probable, the morbid phenomena may be sustained by the inability of the system to reject, not an actual poison, but the partially disintegrated and imperfectly vitalized particles which the disease has left in all the organs to encumber and obstruct them; and alterative medicines may, by their direct stimulant action upon the ultimate organized particles, cause them to throw off their less vital portions, as a stimulant dressing applied to an indolent or sphacelating sore upon the skin quickens the vital movements of the part, and causes the separation of the sound from the unsound tissue. The influence of mercury on the absorption of false membrane, as it is evident to inspection in the case of iritis, renders it almost certain that one at least of the modes of cure by alteratives consists in the separation of the less from the more perfectly organized structures. And it is to be remembered that the greater number of alteratives, used as local applications, exert precisely the stimulant and conservative influence which is here referred to, and also that when administered internally, or outwardly applied in excessive quantities, their most prominent action is a destructive one. It makes greatly in favor of this view to consider that when the medicines in question are employed too lavishly, or too long, their destructive exceeds their curative operation; not only do they remove the particles whose discharge is essential to a cure, but they attack the sound tissues, and cause their separation also. In the case of several, this excessive activity is manifested by morbid phenomena of a definite character; mercury produces salivation, iodine a peculiar intoxication, and wasting of glandular structures, arsenic serous effusions, alkalies a scorbutic condition, &c.

There is a fact which is not without weight in determining which of the two preceding hypotheses preponderates on the side of probability. It is well known that for the cure of the primary phenomena of syphilis, mercury is almost useless, and, indeed, is usually mischievous whenever it is applied to the treatment of these symptoms in persons of a feeble or cachectic constitution. Secondary syphilis, on the other hand, affecting the mucous membranes and the skin, is treated with incomparably better results by mercury than by any other single medicine, while the tertiary forms of the disease, seated in the fibrous

tissues and the bones, yield to iodide of potassium much more readily than to mercury. Now, if mercury were the specific antagonist and antidote of the venereal poison, it should act as such in all cases and stages of the disease; but if, instead of regarding it as adapted to neutralize a material poison, as an alkali neutralizes an acid, we assume either that the tissues which admit mercury will not admit iodide of potassium into their minute recesses, or *vice versa*, or else that the affinity of the two medicines is different for the two sorts of structure involved in the disease, in a word, that the one is competent, and the other is not, to accomplish the due degree of waste and repair in the diseased tissues, we adopt an explanation which is consistent with the facts of the particular case, and with the analogies presented by alterative medicines in their action upon the skin and mucous membranes, when administered in large doses. The idea which Hoffman entertained of the operation of diluent alteratives was substantially that which is here set forth, and it is the same which we have elsewhere maintained as the most plausible explanation of the efficacy displayed by pure and slightly mineralized waters, and above all, by the water-cure, in the treatment of many chronic diseases.

It is a further argument in favor of this hypothesis, that alterative medicines act, to a great degree, in the same direction as the diseases which they cure; that mercury, for example, tends to produce lesions which bear a close resemblance to, if indeed they are not identical with, those caused by syphilis. Just as a caustic, which is capable of occasioning an ulcer, is the most appropriate agent for healing an ulcer which has fallen into an indolent condition, provided it be applied in a degree duly proportioned to the imperfect vitality of the affected part. If too slightly used it is inefficient, if too actively applied, it extends and deepens the original sore, just as alterative medicines in proper doses seem gently to remove the obstacles to recovery, but too profusely administered, undermine the strength of the system, and institute destructive instead of sanative processes.

HYDRARGYRUM.—Mercury.

In studying this medicine, so multifarious in its forms, powers, and uses, we propose, first of all, to present a concise description of its preparations, then to examine their operation upon man and animals, and, finally, to consider their application to the cure of diseases.

Hydrargyrum.—Mercury.

Mercury is a very widely distributed mineral. The principal mines

which furnish it to commerce are those of Idria, in Germany, of Rosenau and Niederland, in Hungary, of Almaden, in Spain (where it was obtained by the Greeks seven hundred years before Christ), of Guanuelica, in Peru, and of New Almaden, in California. It is also procured in Japan and Siberia. It is usually found in combination with sulphur in native cinnabar, which is a bisulphuret of mercury. From this it is extracted by distillation, the sulphurous vapors being made to combine with unslaked lime or iron slag.

At ordinary temperatures mercury is a grayish white, shining liquid, without taste or smell, and is not tarnished by exposure to the air. From these qualities it acquires its name, hydrargyrum, derived from ὑδωρ, water, and αργυρος, silver, and meaning liquid silver. It is the heaviest of all the metals except gold and platinum. At 39.2° F. its specific gravity is 13.5886. At —39° F. it congeals into a tough crystalline solid of octahedral or acicular structure, which emits a dull sound like lead when struck, is flexible and malleable, and by contact with the skin whitens it and produces a burning sensation. Its boiling point is about 662° F., but it volatilizes at ordinary temperatures. Mercury is susceptible of very minute division. It can be forced through the pores of leather, and by agitation with unctuous substances, with oil of turpentine, sulphur, alcohol, ether, &c., it loses its liquid character. In this manner it may be reduced to a gray powder, known as *Ethiops per se* (*Hydrargyri Oxidum Nigrum*). By union with other metals it forms *amalgams*.

Among acids the nitric acts upon metallic mercury the most readily and at ordinary temperatures. Boiling sulphuric acid combines with it, and muriatic acid unites with its oxides.

The officinal preparations of mercury are very numerous, and will be briefly described, beginning with those of the metal itself.

Emplastrum Hydrargyri.—Mercurial Plaster.

This plaster is made with mercury six ounces, olive oil and resin each two ounces, and lead plaster a pound.

Hydrargyrum cum Creta.—Mercury with Chalk.

Three ounces of mercury rubbed with five ounces of prepared chalk produce this useful medicine.

Pilulæ Hydrargyri.—Mercurial Pills; Blue Pills.

These pills are made from a mass composed of an ounce of mercury rubbed up with an ounce and a half of confection of roses, and then beaten with half an ounce of powdered liquorice root.

Unguentum Hydrargyri.—Mercurial Ointment.

The directions for making this ointment are to take two pounds of

mercury, twenty-three ounces of lard, and one ounce of suet; rub the mercury with the suet and a small portion of the lard until the globules disappear, then add the remainder of the lard, and mix.

Hydrargyri Oxidum Nigrum.—Black Oxide of Mercury.

This preparation is produced by decomposing the mild chloride of mercury (calomel) by means of a solution of potassa. The chlorine unites with potassium to form chloride of potassium which remains in solution, and the oxygen forms with the metal a protoxide of mercury which is precipitated. It contains in 100 parts 96.15 of mercury and 3.85 of oxygen. When first prepared the protoxide is of greenish black color, but by exposure to the air becomes olive green. It is inodorous and tasteless, and is insoluble in water, and in solutions of the alkalies. It dissolves in nitric and acetic acids, combining with them to form salts.

Hydrargyri Oxidum Rubrum.—Red Oxide of Mercury; Red Precipitate.

It is prepared by the action of nitric acid upon mercury. A portion of the nitric acid is decomposed, forming an oxide of mercury with which another portion of the acid unites. On the application of heat nearly all of the nitric acid is driven off, leaving a deutoxide of mercury mixed with a variable proportion of the nitrate. This oxide consists of one equivalent of mercury and two of oxygen, is orange red, occurs in shining scales, and has a disagreeable metallic taste. It is soluble in nitric and muriatic acids, but is very slightly so in water.

Unguentum Hydrargyri Oxidi Rubri.—Ointment of Red Oxide of Mercury; Red Precipitate Ointment.

This ointment consists of a drachm of the red oxide of mercury finely powdered to an ounce of simple ointment.

Hydrargyri Sulphuretum Nigrum.—Ethiops Mineral; Black Sulphuret of Mercury.

This compound is produced by the trituration of mercury with sulphur, in equal parts by weight. "It is a heavy, tasteless, insoluble, black powder," and is regarded as containing one equivalent of bisulphuret of mercury mixed with about ten and a half equivalents of sulphur in excess.

Hydrargyri Sulphuretum Rubrum.—Red Sulphuret of Mercury; Bisulphuret of Mercury; Cinnabar.

One part of melted sulphur to five of mercury, by weight, are mixed over the fire. When cold the mass is reduced to powder and sublimed. Cinnabar is composed of one equivalent of mercury and

two of sulphur. It is usually in the form of dark red crystalline masses, of brilliant aspect and fibrous texture. Reduced to powder it forms the pigment *vermilion*. It is inodorous and tasteless, and is insoluble in water, alcohol, or ether. Its sp. gr. is 8.1.

Hydrargyri Chloridum Mite.—Mild Chloride of Mercury; Calomel.

"Take of Mercury, *four pounds;* Sulphuric Acid, *three pounds;* Chloride of Sodium, *a pound and a half;* Distilled Water, *a sufficient quantity*. Boil two pounds of the Mercury with the Sulphuric Acid, until a dry, white mass is left. Rub this, when cold, with the remainder of the Mercury, in an earthenware mortar, until they are thoroughly mixed. Then add the Chloride of Sodium and rub it with the other ingredients till all the globules disappear; afterwards sublime. Reduce the sublimed matter to a very fine powder, and wash it frequently with boiling Distilled Water, till the washings afford no precipitate upon the addition of solution of Ammonia; then dry it." *U. S. P.* By the first step in this process, a bisulphate of the deutoxide of mercury is formed, which by trituration with the mercury, is converted into the sulphate of the protoxide. By the trituration and sublimation of the latter with the chloride of sodium, calomel or protochloride of mercury is sublimed, and the residuum is sulphate of soda. The calomel is then finely powdered and washed, to free it from the bichloride, which is known to be entirely removed when ammonia ceases to give any precipitate with the washings. Although commonly called a chloride of mercury, it appears to be more correctly a subchloride, its composition being represented by two atoms of mercury and one of chlorine.

Sublimed calomel is usually in the form of a semitransparent, white, fibrous cake, studded upon its surface with crystals, which are four-sided prisms. When scratched, it displays a characteristic yellow streak. As commonly sold, calomel is in the state of a heavy powder, snow-white when obtained by direct condensation, but slightly yellowish when procured by levigation of the sublimed masses. Its sp. gr. is 7.2. It has neither smell nor taste, is insoluble in water, alcohol, or ether, and blackens by long exposure to the light. By the addition of lime-water, a partial decomposition takes place, chloride of calcium remains in solution, and black protoxide of mercury is precipitated, and remains mixed with undecomposed calomel. The preparation so procured is known as *lotio nigra*, or *black wash*.

Pilulæ Catharticæ Compositæ.—Compound Cathartic Pills.

"Take of Compound Extract of Colocynth, in powder, *half an ounce;* Extract of Jalap, Calomel, each *three drachms;* Gamboge, in powder,

two scruples. Mix them together; then with water form a mass, to be divided into one hundred and eighty pills." Dose, from *two* to *four pills.*

Pilulæ Hydrargyri Chloridi Mitis.—Pills of Mild Chloride of Mercury; Calomel Pills.

These pills consist merely of calomel made into a pilular mass with gum and syrup. Each pill contains a grain of calomel.

Hydrargyri Chloridum Corrosivum.—Corrosive Chloride of Mercury; Bichloride of Mercury; Corrosive Sublimate.

"Take of Mercury, *two pounds;* Sulphuric Acid, *three pounds;* Chloride of Sodium, *a pound and a half.* Boil the Mercury with the Sulphuric Acid until a white dry mass is left. Rub this, when cold, with the Chloride of Sodium, in an earthenware mortar; then sublime with a gradually increasing heat." *U. S. P.*

By boiling sulphuric acid in excess with mercury to dryness, a bisulphate of the deutoxide of mercury is formed. When this is mixed with chloride of sodium, and the mixture is duly heated, the chlorine combines with the mercury, and forms a sublimate, while sulphate of soda remains behind. The sublimate is generally regarded as a bichloride of mercury, but the most correct view probably is that it consists of one atom each of mercury and chlorine, and hence that it is a chloride, or, relatively to calomel, a perchloride of mercury.

Corrosive sublimate is usually kept in white, semitransparant, crystalline masses, or as a white powder. It is inodorous, but has an extremely acrid, styptic, metallic and persistent taste. It is permanent in the air, is soluble in sixteen parts of cold and three of boiling water, in two and a third parts of cold alcohol, in one and a half of boiling alcohol, and in three parts of cold ether which, also, by agitation, removes it from its solution with water. Its solubility is much increased by the addition of hydrochloric acid, or of the alkaline chlorides.

Incompatibles.—A solution of corrosive sublimate gives a yellow or red precipitate with hydrates of potassa, soda, or lime; a white one with ammonia; a scarlet one with the iodide of potassium; and a black one with sulphuretted hydrogen. It is decomposed by tartar emetic, nitrate of silver, acetate of lead, soaps, almond emulsion, solutions of tannin, &c., and forms compounds with albumen and fibrin, which, unless recent, are little affected by acid or alkaline solutions, or by those of the alkaline chlorides.

Hydrargyrum Ammoniatum.—Ammoniated Mercury; White Precipitate.

This compound is procured by precipitation with ammonia from a

solution of corrosive sublimate, and is described as an ammonio-chloride of mercury, or, according to Kane, a chloro-amidide of mercury.

Ammoniated mercury is in the form of a coarse snow-white powder of a styptic metallic taste, but without smell. It is insoluble in water and alcohol, but is decomposed by boiling water, and is dissipated by a strong heat. White precipitate may be distinguished from calomel by a solution of ammonia, which does not alter the former, but blackens the latter.

Unguentum Hydrargyri Ammoniati.—MERCURIAL OINTMENT.

Mercurial ointment is made by rubbing together two pounds of mercury, twenty-three ounces of lard, and an ounce of suet.

Unguentum Sulphuris Compositum.—COMPOUND SULPHUR OINTMENT.

This ointment is prepared with an ounce of sulphur, a drachm each of ammoniated mercury and benzoic acid, a fluidrachm each of oil of bergamot and sulphuric acid, two drachms of nitrate of potassa, and half a pound of lard.

Hydrargyri Iodidum.—IODIDE OF MERCURY; GREEN IODIDE OF MERCURY; PROTIODIDE OF MERCURY.

When mercury is triturated with iodine reduced to a paste by means of alcohol, direct combination between the two bodies ensues. As prepared for use, iodide of mercury is a powder of a dull greenish-yellow color, insoluble in water and alcohol, but soluble in ether. It is without smell or taste.

Hydrargyri Iodidum Rubrum.—RED IODIDE OF MERCURY; BINIODIDE OF MERCURY; DEUTIODIDE OF MERCURY.

This preparation is procured by precipitation from a solution of bichloride of mercury by means of iodide of potassium, the chloride of potassium remaining in solution.

Deutiodide of mercury may be obtained in rhomboidal crystals by sublimation, but is usually in the form of a brilliant scarlet powder, of a slight metallic taste, but without odor. It is very sparingly soluble in water, but is soluble in alcohol and acids with the aid of heat; also in a boiling solution of chloride of sodium, and in a solution of iodide of potassium.

Liquor Arsenici et Hydrargyri Iodidi.—SOLUTION OF IODIDE OF ARSENIC AND MERCURY; DONOVAN'S SOLUTION.

This is a solution in half a pint of distilled water of iodide of arsenic and red iodide of mercury, each thirty-five grains.

Hydrargyri Cyanuretum.—CYANURET OF MERCURY; CYANIDE OF MERCURY.

This compound is produced by the reaction of ferrocyanuret of iron

with red oxide of mercury in boiling water. A double decomposition takes place, resulting in the formation of a cyanide, or, according to others, a bicyanide, of mercury and oxide of iron.

Cyanuret of mercury crystallizes in rectangular prisms, which are sometimes transparent, but usually opaque, and of a white color. It has an unpleasant metallic taste. It is unaffected by exposure to the air, and dissolves in eight parts of water at 60°, and more readily in hot water. It is very sparingly soluble in alcohol.

Hydrargyri Sulphas Flavus.—Yellow Sulphate of Mercury; Turpeth Mineral.

This salt is produced when sulphuric acid and mercury are boiled to dryness in a glass vessel. The mass which remains is reduced to powder and mixed with boiling water. The precipitate is then washed with hot water and dried. In chemical composition, it is a bisulphate of the deutoxide of mercury.

Turpeth mineral is a powder of a lemon-yellow color and of an acrid taste, but inodorous. It is nearly insoluble in water.

Hydrargyri Pernitratis Liquor. *Dub.*—Solution of Pernitrate of Mercury; Acid Nitrate of Mercury.

By dissolving two ounces of mercury in a fluidounce and a half of nitric acid and an equal quantity of distilled water with the application of heat, and subsequently evaporating the solution to two ounces and a half, this preparation is obtained.

History.—The first distinct account of quicksilver is that contained in Pliny's *Natural History*.[1] This writer describes a method of obtaining it from minium by sublimation, and says that it resembles silver in color and water in fluidity. He further remarks that it may, perhaps, be used externally as an astringent or hæmostatic, but care must be taken to prevent its entrance into the body by wounds or otherwise, for, as he says, it is a poison, and to employ it as a medicine would be rash. Dioscorides furnishes a still more meagre description.[2] Galen professes that he knows nothing about its internal or its external operation, and least of all whether, as had been asserted, it sometimes produces fatal effects. The Arabians employed mercurial preparations in the treatment of itch and other cutaneous affections. Ebn Baithar quotes Aristotle as stating that it is poisonous to mice; that its vapors occasion paralysis, trembling, loss of hearing, fainting, paleness, and a tottering gait; and also that it wastes the limbs and causes ulcers of the mouth. He further remarks that birds and reptiles shun the place where mercury is manufactured, and that it preserves peltry

[1] Lib. xxxiii. cap. 41.

[2] Lib. v. cap. 70.

from the moths.[1] Rhazes describes its passing unchanged through the intestines, particularly if exercise be taken, and its causing no mischief beyond pain in the stomach and bowels. Serapion states that its fumes occasion nervous affections and paralysis, and Alsaharavius is said[2] to be the only ancient author who has mentioned swelling and ulceration of the mouth as effects of its being rubbed upon the skin. Ainslie remarks that it may be doubted whether the natives of India were not before the Arabians in the use of mercury.[3] Klein, in a work on the treatment of syphilis in the East, alleges that this disease was known and treated with mercury by the Malabar physicians as early as the ninth century;[4] and Capt. Sykes states that the Hindoos claim to have induced salivation by the inhalation of mercurial vapor from time immemorial.[5]

The employment of mercury in Europe was borrowed from the Moors in Spain, and from the Saracens during the Crusades; but as yet it was only applied externally in the form of inunction or fumigation. In the thirteenth century its effects were described by Theodoric, a friar, and afterwards Bishop of Cervia, and in the following century, its operation upon the mouth was mentioned by Guy de Chauliac.[6] After the development of syphilis, in the fifteenth century, the virtues of this medicine became more generally known. Friend states that it was first recommended by Johannes de Vigo for confirmed syphilis. According to Astruc, the internal as well as the external use of mercury for this disease was proposed by Clowes, an English surgeon, who wrote in 1535, but the innovation is also attributed by Alston to Paracelsus, who died A. D. 1541.[7] It is probable that neither of these statements is strictly accurate, for in 1540, the pills of Barbarossa, a native of Mitylene, and a famous corsair, became celebrated from their having cured Francis I. of syphilis. Barbarossa, who had obtained the receipt for these pills from a Jewish mountebank, sold it to the French monarch.[8] According to various accounts they contained, besides mercury, musk, flour, rhubarb, turpentine, &c. It is, however, certain that the introduction of mercurials as internal medicines is chiefly to be attributed to Paracelsus and his followers. Matthiolus, who was nearly contemporary with him, speaks of its preparations being used internally as antisyphilitic remedies.[9] In 1667,

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[1] Ed. Sontheimer, i. 554. [2] Paulus Ægineta (Syd. Soc. ed.), ii. 239.
[3] Materia Indica, i. 545.
[4] Rosenbaum, Geschichte der Lustseuche, p. 67.
[5] Lond. Med. and Phys. Journ., March, 1827.
[6] Friend, Hist. of Physic, ii. 361. [7] Alston, Mat. Med., i. 83.
[8] Voigtel, Arzneimittellehre, ii. 277. Richter, op. cit., v. 300.
[9] Comment., lib. v. cap. lxx.

corrosive sublimate was first used internally. Still the method by inunction continued to be regarded with preference, as the practice of Wiseman, Sydenham, Astruc, and even Hunter, sufficiently proves.[1]

Gradually the employment of mercury in other diseases than syphilis was introduced. Zacutus Lusitanus (Ob. 1642) used it in a great variety of affections; Fabricius von Hilden wrote of its employment in gout and rheumatism, but not favorably. Van Helmont first published its anthelmintic virtues, and Bertini prescribed it in exanthematous fevers and in inflammations. Belloste, who styled it "one of nature's miracles, and a most rare gift of Providence," published an account of its remarkable effects in secondary syphilis, scrofula, and indurations.[2] The preparation of *calomel* was long a secret, but one of the methods of procuring it was made known by Béguin in 1608. Its present name, which signifies "beautiful black," was applied to it by Sir Theodore Mayerne, in compliment to a negro who assisted him in preparing it. In opposition to corrosive sublimate, which was also called *draco ferox*, calomel was named *draco mitigatus*. *Manna metallorum*, *sublimatum dulce*, *mercurius dulcis sublimatus*, are other names which it bore expressive of the comparative mildness of its operation. Richter has remarked truly that the gradual extension of the use of mercury depended far more upon a direct experience of its virtues, than upon the scientific and often plausible theories invented to explain its operation, and which, not unfrequently, led to gross errors in practice. Such, indeed, is always the case, when theory ceases to be contented with its legitimate office of gathering into sheaves the harvest of facts reaped by independent laborers in the field of science.

In the further elucidation of the medical history of mercury, we shall begin by setting forth, as concisely as the materials at hand will permit, the operation of this substance, and of its chief preparations, upon the animal economy.

Action of Metallic Mercury. *On Animals.*—The ancients, as already intimated, were aware that mercury was destructive of lice, intestinal worms, and many *insects*. They employed it for ridding sheep, and other animals, of cutaneous parasites. Even now, as is well known, mercurial ointment is the surest agent for destroying pediculi pubis.[3] It is equally fatal to the larvæ of insects, and the unhatched young of birds. Gaspard hung a piece of fly-blown meat

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[1] Lane, Lect. on Syphilis, Lancet, 1841–42, i. 286.

[2] Traité du Mercure, 1695.

[3] Giacomini, Mat. Med., p. 424.

over mercury, at a favorable temperature, but not a single egg matured. He obtained similar results with the eggs of crickets.[1] The same experimenter proved that hen's eggs put to hatch over mercury remained undeveloped, and that in such of them as already contained a chick, the latter perished.

When rubbed upon the skin of quadrupeds, mercurial ointment induces salivation, with the usual accompaniments of this process witnessed in man. If metallic mercury is injected into the veins it is carried to the right side of the heart and into the lungs, where it occasions the formation of small abscesses, each one of which contains within it a globule of mercury, and is surrounded by a portion of hepatized lung tissue. In none of these experiments does the mercury appear to have reached the left side of the heart. Mr. Ancell quotes an experiment in which metallic mercury was thrown into the jugular vein of a dog. Within twenty-four hours, great difficulty of breathing ensued, and death on the fourth day. The pulmonary pleura was raised in many places in the form of blisters, containing bloody pus, and globules of mercury. Magendie's experiments are to the same effect.[2] When injected into the arteries, in like manner, it does not visibly proceed further than the capillary network of these vessels. It there, however, as in the lungs, deranges the functions of the part, and excites suppurative inflammation.

On Man.—Wibmer has collected a number of cases in which metallic mercury was taken without serious harm, in doses of from several ounces to two pounds. In one case, however, ascribed to Albano, death is attributed to the effects of the medicine; and in others more or less salivation ensued. At one time in England crude mercury was taken by ladies to beautify the complexion, and the name of Dr. Dover is familiarly associated with this extravagant custom. Mr. Bradley gives the history of an old gentleman who daily, for nine months, took an ounce of quicksilver, without its doing him either good or harm; and out of sixteen pounds he had thus taken, all but an ounce and a half was recovered from the fæces.[3] In the greater number of cases, as in this one, the mercury appears to have been voided, without doing any injury to the patient; but sometimes, besides causing rupture of a diseased bowel, it has occasioned salivation. Two such cases are related by Mead, and one of them proved fatal.[4]

Considering that the phenomena of mercurialism are so familiar to every medical observer, it seems almost incredible that a doubt should

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[1] Journ. de Physiol. Exper., i. 165.

[2] Lancet, June, 1840, p. 443.

[3] Sigmond, Mercury, Blue Pill, &c., p. 16.

[4] Medical Works, p. 76.

have been entertained at any time of the absorption of mercury into the system. Yet the influence of a medical theory has availed to discredit so evident a truth. In this country, we find that one of the few contributions of Dr. Physick to medical literature is an experimental essay to prove that mercury is not absorbed, because with his reagents he was unable to find traces of it in the blood or saliva of persons who had been treated by it. He was disposed to believe that mercury acted "sympathetically."[1] Yet numerous cases were then on record proving the sensible presence of mercury in the dead bodies of persons who, in their lifetime, had used preparations of this medicine. Even in 1767, Barry had described the circulation of the mercurial globules through the bloodvessels, acting there as a deobstruent, and referred to cases related by Fernel and by Fallopius, where the metal was found in the bones, &c., of venereal patients.[2] Other analogous cases are collected by Wibmer and by Richter, and are also given by Bonetus and Lieutaud.

The following experiments and observations are, perhaps, sufficiently convincing. Schubarth for twenty-nine days had a horse anointed with mercurial ointment to the extent of eighty ounces. By the destructive distillation of blood obtained from the animal before and after death, metallic mercury was obtained.[3] Zeller performed a similar experiment. In cats that had for some time been rubbed with mercurial ointment, Oesterlen found minute globules of mercury in the pancreas, liver, spleen, lungs, heart, mesenteric glands, kidneys, &c., and also in the urine, bile, milk, and saliva; but none could be detected in the nervous centres, nor in the salivary glands, although salivation had taken place.[4] So Van Hasselt has proved the absorption into the blood of pure, metallic quicksilver,[5] and has met the objection that the oxide only is absorbed, and afterwards reduced in the system, by showing that gold leaf forms an amalgam with mercury when suspended over this metal in vacuo. Dumeril obtained mercury by scraping the walls of hospital wards where venereal patients were treated with this medicine. Colson, also, states that (in 1821–23) he and several other *internes* and *externes* of the venereal wards of the Hôpital de la Pitié were salivated by the mercurial atmosphere, nor did they get rid of the affection while they continued to frequent those wards.[6] Similar examples had previously been given by Goulard.[7]

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[1] Med. Repository, v. 288.
[2] Trans. Lond. Coll. Phys., i. 158.
[3] Wibmer, Wirkung, &c., iii. 91.
[4] Archiv. für Physiol. Heilkunde, 1843.
[5] Oesterlen, Heilmittellehre, p. 101.
[6] Réchérches sur l'Action du Mercure; Arch. Gén., xii. 68.
[7] Van Swieten's Comment., xvii. 261.

Among the proofs of mercurial absorption by man, the following may be selected: In 1810 Brückmann published an account of a lady who, a year after being salivated, having become heated by violent dancing, dark mercurial stains appeared upon her breast, and metallic mercury was found in her linen. In 1813, Jourda collected a quantity of mercury from the urine of a syphilitic patient who was taking this remedy.[1] Fourcroy refers to a gilder of metals affected with phlyctenæ of the thighs, the serum from which gave distinct evidence of the presence of mercury.[2] Cantu, in 1823, announced his having detected mercury in the urine of a patient treated by mercurial frictions. Elk and Buchner obtained it from the blood of persons who had been salivated, and Engelhard from the pus of an ulcer in like circumstances.[3] In 1824, Colson found that a brass plate, after lying for some time in the blood of a person treated by mercury, became covered with a coating of this metal.[4] Walter Pope mentions a workman who, for six months, had not handled mercury, yet he rendered a piece of copper as white as silver by rubbing it between his fingers. Biett obtained mercury from the axillary glands of a mercurialized syphilitic patient, after his prolonged use of the warm bath. By very careful manipulation, Gmelin detected mercury in the saliva of a person salivated by mercurial frictions.[5] Oesterlen, in pursuing the experiments above referred to, likewise obtained mercury from the saliva. Andouard detected it in the same secretion, and also in the urine;[6] Gorup Besanez extracted it from the liver,[7] and Lehmann, by numerous and conclusive experiments, has confirmed all of these results. In this connection, it would be improper to overlook the fact that when mercury has been taken so as to produce its constitutional effects, and these have entirely disappeared, they may long afterwards be re-excited by the action of medicines which are decomposed in the system, and form soluble compounds with mercury. One of these is the iodide of potassium. Melsens has, therefore, proposed it as a cure for symptoms which depend upon mercury retained in the economy. (Vid. *Iodide of Potassium.*) Dr. Budd relates a case in support of this view. A young man had secondary syphilis with partial paraplegia, and, about five months before, had had primary symptoms which were treated with mercury. In the interval he had taken none. For

[1] Journ. de Méd., xxvii. 244.

[2] Trad. de Ramazzini, Chapter II., note.

[3] Richter, op. cit.

[4] Archives Gén., xii. 86.

[5] Bull. de Thérap., xiii. 348.

[6] Am. Journ. of Med. Sci., Jan. 1844, p. 235. For other illustrations, see Bumstead's edition of Hunter and Ricord on the Venereal Disease, p. 441.

[7] Times and Gaz., July, 1857, p. 34.

the constitutional symptoms iodide of potassium was freely administered, and, in a few days, the patient was profusely salivated, presenting all the symptoms of mercurial ptyalism, including the characteristic fetor of the breath. Complete recovery followed.[1] This subject has also been illustrated by Lorinser, who considers iodide of potassium as useful in those cases only of constitutional syphilis in which the body has been impregnated with mercury.[2] Some examples, tending to show the power of iodide of potassium to revive mercury in the system, have been related by Dr. Lyman[3] and others.

If now we recall the cases which illustrate the influence of mercurial emanations, the evidence will become complete. One of these has frequently been quoted, but is too striking to be omitted here. In April of the year 1810, the *Triumph*, man-of-war, and the *Phipps*, schooner, saved from the wreck of a Spanish ship off Cadiz, a large quantity of quicksilver. The *Triumph* took on board thirty tons, contained in leathern bags of fifty pounds each; these bags were picked up on the shore, and although saturated with sea-water, they were collected and stowed below. In about a fortnight, many of them decayed and burst, and the mercury escaped into the recesses of the ship, where it became mixed with bilge water, the emanations from which speedily coated every metal with quicksilver. Nearly all of the crew were salivated. The quantity on board the *Phipps* was not so great, but she was sent to Lisbon to be cleared by boring a hole in her bottom to allow the quicksilver to run out. Every rat, mouse, and cockroach on board was destroyed, and the symptoms of salivation appeared among the crew in a high degree.[4]

A narrative is published by M. Grapin, concerning four persons, members of the same family, and occupying the same ill-ventilated room, who were profusely salivated by the fumes of a piece of a wooden bowl that had been used to collect the sweepings from the floor of a looking-glass manufactory. The stove in which the bowl was burned and its pipe also were not close, and during the combustion a mercurial smell pervaded the room.[5]

The effects of mercurial vapors upon a large scale are illustrated by the condition of the inhabitants of districts where the ores of mercury are smelted. The whole population of Idria, we are told, is subjected to their influence. The annual mortality is more than one in forty. Premature births and abortions are very common; even the cows which

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[1] Brit. and For. Med.-Chir. Rev., xi. 202. [2] Archives Gén., 5ème sér., xiii. 346.

[3] Boston Med. and Surg. Journ., March, 1859, p. 142.

[4] Phil. Trans., Pt. II., p. 402; Sigmond, on Mercury, p. 11.

[5] Archives Gén., 4ème sér., viii. 327.

feed near the furnaces are often salivated, become cachectic, and are subject to abortions. Besides the nervous affections described below, the workmen are subject to congestion and swelling of the liver, salivation, neuralgia of the fifth pair, various eruptions and ulcers of the skin, swellings, &c., of the lymphatic glands, periosteum, and bones.[1]

Among the older writers, Camerarius, Fernel, Forestus, Fallopius, Etmuller, and De Haen, record examples of trembling and chronic poisoning caused by mercurial emanations, and Ramazzini and others describe their disastrous effects upon miners, gilders, mirror manufacturers, barometer makers, &c. Of these, the best description is furnished by Mérat, under the name of *mercurial trembling*.[2] In general it is gradual in its approach, beginning with formication of the hands, and less frequently of the feet, and with more or less pain in the thumbs, elbows, knees, and feet, which also renders the movements of these parts imperfect. After a time the hands begin to tremble, and then the arms and lower limbs, the muscles of the lower jaw and the tongue, and, indeed, all the muscles of animal life. The muscular contractions take place very rapidly, but by starts, so that great embarrassment is experienced in carrying food, and especially liquids, to the mouth. Walking is performed with difficulty, owing to the irregular spasms of the muscles, and in going up or down stairs, the patient is often obliged to creep. Articulation is indistinct, and mastication difficult from a similar cause. As in chorea, all of these phenomena are augmented by mental emotion, while they generally cease if the patient lies down quietly or sleeps. In like manner, they are appeased by alcoholic stimulants. In some cases, paralysis affects one or more groups of muscles. The phenomena of mercurial cachexia often co-exist with those just described; and in many advanced cases, the respiration becomes labored, or mania, epilepsy, or other nervous diseases display themselves. Mercurial trembling is rarely cured when once fully developed.[3] The affection just described, although a striking illustration of the absorption of mercury by the system is not, in reality, a more conclusive proof of this operation than the more customary effects of the medicine which will next be considered, or those other forms of mercurial cachexia which will afterwards be described.

Effects of Medicinal Doses.—When blue mass, calomel, or either of the mild mercurial preparations, is taken in small but repeated doses,

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[1] Times and Gaz., June, 1859, p. 616. [2] Dict. des Sciences Méd., lv. 521.

[3] An interesting case of the disease treated by Sandras, with sulphurous baths and iron internally, is reported, Abeille Méd., x. 131. Others were treated by Dr. Barlow, Times and Gaz., Dec. 1853, p. 578; and by Dr. Goolden, Lancet, Sept. 1853, p. 231.

with a view of affecting the system, peculiar phenomena are developed. The first appreciable effect is usually an increased activity of the secretions, particularly of the intestinal canal, the discharges from which become liquid and bilious. The mucous membrane of the respiratory apparatus, and sometimes, also, of the genito-urinary organs, displays a similarly augmented secretion. If there happen to be anywhere an interstitial deposit of fibrin, or a collection of serum, its absorption is promoted. If the administration of the medicine is persisted in after the occurrence of these symptoms, others are developed of a more decidedly morbid character. The appetite fails, digestion is impaired, the secretions become still thinner and more copious, the firmness of the tissues diminishes, newly-formed callus is dissolved, and recently-healed wounds open afresh; the muscles waste, the skin has an earthy paleness, the eyelids and ankles become œdematous, and even general dropsy may ensue. These symptoms appear to depend upon the radical change which the blood has undergone by losing a large proportion of its normal solid constituents, and, perhaps, a portion of that vitality on which its coagulability in part depends. The unwonted fluidity of the blood predisposes to hemorrhage, which may become dangerous. Serious results from this cause are, it is true, of rare occurrence, yet one case is mentioned by Trousseau in which a man, who had been leeched and soon afterwards was salivated, experienced dangerous hemorrhage from the reopening of the leech-bites.[1] Not only do the secretions, as already stated, become thinner, but they also acquire new qualities; the breath is fetid, a peculiar metallic taste is perceived in the mouth, the saliva, as elsewhere shown, contains mercury, and traces of this substance exist also in the milk, and, in that case, is very apt to derange the digestion of healthy children.[2] This mercurialization of the milk has been used therapeutically in cases of infantile syphilis.

Of all the usual effects of the full mercurial operation, salivation is the most striking. Immediately preceding it there is often an erethism of the system, in which, besides the increase of the secretions already noticed, or even before this takes place, the patient experiences loss of appetite, has a quick and frequent pulse, and manifests unwonted nervous excitability. If the salivation is profuse, this state may become strongly marked. The first evidence that the system is becoming mercurialized is shown by a metallic or copperish taste in the mouth and some soreness when the teeth are smartly struck

[1] Traité de Thérapeutique, 5ème éd., i. 192.

[2] Richter, op. cit., v. 314.

together. The breath has, at the same time, a characteristic fetor. A red line may also be observed along the attachment of the gums to the teeth of the lower jaw. The redness extends gradually to the whole gingival surface and more or less to the cheeks, lips, tongue, and fauces; the tongue is coated with a whitish slime, has a sodden look, and bears upon its edge the imprint of the teeth. The salivary glands also become swollen and tender, and their secretion is augmented and of a ropy consistence, usually alkaline in its reaction, and of a penetrating taste and smell. Several pints of it may be discharged in the course of twenty-four hours. When mercurial salivation is excessive, these symptoms sometimes reach a distressing degree. The swelling of the mouth and tongue renders deglutition and speech difficult, if not impossible; extensive ulcers, sometimes coated with false membrane, attack the gums, cheeks, and fauces, and, in healing, may cause permanent adhesions of contiguous parts; œdema of the glottis may occur, the breath becomes insufferably fetid, the teeth loosen and fall out, and caries may attack the remaining teeth, and even the maxillary bones.

In some rare instances salivation recurs at remote periods from the original affection. Dr. Strong, of Boston, relates the case of a lady who, eighteen years before his report, was salivated in the month of October. The following February, while using Fowler's solution, she was again salivated, and thenceforth, although she took no more mercury except once by mistake, she had annually a recurrence of salivation in the same months as at first, but with gradually decreasing severity. In each attack the symptoms were perfectly well characterized.[1]

Although infants and young children are seldom salivated, certain exceptions to this rule must be admitted. Dr. J. B. Beck[2] has collected a number of cases which prove the truth of this statement incontestably. Dr. Beck saw a child, five years of age, profusely salivated by five grains of calomel; Clarke met with three cases in children under three years of age; and Percival one, in which the effect was produced, in a child seven months old, by mercurial inunction. Canstatt refers to a boy ten years old, who was salivated by working at the trade of mirror silvering. Dr. Rush refers to seven instances of death from mercury given as a sialagogue to children between three and eight years of age.[3] Dr. S. Jackson (formerly of Northumberland) states that he has seen three cases of children under

[1] Boston Med. and Surg. Journ., August, 1856, p. 439.

[2] Infant Therapeutics, p. 47. [3] Med. Obs. and Inquiries, 5th ed., ii. 143.

seven years of age, in each of whom there was a loss of several teeth with their alveoli in consequence of calomel being given as a purge in remittent fever. In a fourth case, that of a child three years old, salivation was caused by the application of mercurial ointment to the face to prevent the pitting of confluent smallpox.[1]

It has been made a question whether mercurial salivation is not dependent upon the irritation of the gums and mucous membrane of the mouth. No doubt, salivation usually follows various irritations of this membrane, such as arise from dentition, decayed teeth, and variolous pustules within the cavity of the mouth. It is, perhaps, also true that a portion of the quickening influence of mercury upon the secretion of the liver and the pancreas may be due to its mechanical irritation of the stomach and duodenum. But that salivation is not necessarily dependent on any such reflected irritation is proved by the fact that medicines which do not affect the mouth sometimes occasion salivation, such, for example, as iodine, iodide of potassium, tartar emetic, arsenic, nitric acid, digitalis, and the preparations of copper. Indeed, mercury itself occasionally salivates without previously causing inflammation of the mouth. And when to this consideration it is added that mercury can be obtained from the saliva, bile, and pancreatic juice of persons or animals that have been salivated, no doubt can be entertained that salivation is due, in a great measure, to the direct operation of the metal conveyed by the blood to these glands, or that the blood itself is so changed by its action as to produce the unwonted secretion referred to.

Besides salivation, other evidences of the constitutional action of mercury call for notice. Some of these are usual and, so to speak, normal effects, while others are more or less uncommon. Among the former, it is desirable to note the following: The *digestive apparatus* is affected; the appetite is generally impaired; the tongue is coated; there is nausea with oppression, and sometimes pain or tenderness at the epigastrium; the bowels are loose, and occasionally the stools contain blood. These symptoms may follow mercurial inunction, as well as the internal use of mercury. Indeed, Oesterlen found metallic mercury in the intestine of a person who had used the medicine only by inunction.[2]

The *pancreas* would appear, in an especial manner, to be affected by mercury. Dieterich attributed the diarrhœa, which it usually causes, to an excessive secretion of this organ. Dr. Copland relates

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[1] Phila. Med. Exam., March, 1854, p. 131.

[2] Clarus, Arzneimittellehre, p. 806.

the case of a female who was excessively salivated for syphilis, after which she experienced deep-seated pain and heat at the epigastrium, with nausea, inappetence, thirst and fever, and voided thin stools containing a fluid resembling saliva. After her death the pancreas, which weighed eight ounces, was red and congested, and its duct dilated.[1]

The power of mercury to increase the discharge of *bile* cannot well be questioned, although the mode in which it operates upon the liver is still open to discussion. According so some it renders the bile more liquid and thus facilitates its secretion, and according to others it directly stimulates the secernent apparatus of the liver. The latter would seem to express the truth, but not the whole truth. As in the case of other organic stimulants it sometimes exceeds due limits, and may even cause the affection which it generally and with most certainty cures. Thus Chapman regarded it as probably that "the inordinate use of this mineral may, in various ways, derange the primæ viæ and liver so as to produce icterose affections;"[2] and Cheyne states in as many words that mercurials actually produce jaundice.[3] Enlargement of the liver is a more familiar effect. The green color of the stools after mercurial purges is generally attributed to the presence of bile, and the correctness of this opinion has been demonstrated by Michéa.[4] But it does not follow that all green stools are bilious. The dejections of infants often acquire this color from excessive acidity, as in ordinary cholera infantum. Dr. Golding Bird attributed this greenness to an altered condition of the coloring matter of the blood.

On the *nervous system* the action of mercurials is decided. Few medicines produce such a marked sense of depression both mental and bodily as mercury even in ordinary purgative doses, but when the system is brought thoroughly under its influence, these effects may become distressing. The susceptibility to external impressions, and particularly to that of cold, is augmented, pains in the limbs are felt, slight annoyances disturb the equanimity, and sometimes, it is said, mental debility and even loss of reason ensue. It is alleged that these effects are traceable to a direct action of mercurials upon the nervous centres by means of which their fatty constituents are removed. This result is said to be most apt to proceed from mercurial inhalations. The latter statement appears probable; for all the more serious and permanent constitutional effects of mercury are found among those who are exposed to its vapors during its extraction from the ore or in its manufacture. This fact has been elsewhere illustrated.

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[1] Am. Journ. of Med. Sci., April, 1846, p. 468. [2] Ibid., i. 476.
[3] Dublin Hosp. Rep., 1818. [4] Monthly Retrospect, Dec., 1848.

Colson drew attention to the action of mercury upon the *uterus*.[1] In not a few instances it has occasioned menorrhagia or amenorrhœa, and in pregnant females miscarriage.

Among the *circumstances modifying mercurial action* the following may be referred to: Some persons are so very susceptible to it that even the least dose of a mercurial medicine, or its application to the denuded cutis, will suffice to excite ptyalism. Canstatt met with a case in which it was produced by three grains of calomel. We have seen this effect occasioned by the application of nitrate of mercury to an ulcer upon the arm. On the other hand, numerous cases have occurred of persons who appear to be quite insusceptible of mercurial salivation. Trousseau refers to a female affected with constitutional syphilis, and who was treated by various preparations of mercury, including frictions with the ointment, baths containing corrosive sublimate, and the internal use of the iodide of mercury, and who nevertheless experienced no sensible effects from them, except a diarrhœa. In general, females are more susceptible than males to the constitutional influence of mercury, and as has already been shown, adults are more so than children. All diseases or stages of disease in which the powers of life are greatly prostrated, lessen or prevent this action of the medicine. This is strikingly illustrated in malignant cholera. In that affection mercurials given during the stage of collapse appear to remain in the primæ viæ wholly unchanged, and sometimes, when reaction has taken place, alarming and even fatal mercurialism has ensued. In typhus and typhoid fever of a grave type, in typhoid forms of disease, generally, in meningeal affections and in apoplexy, it is difficult to establish mercurialism. A very common, but mischievous error, is to suppose that the revival of the functions from their state of embarrassment and oppression is due to the salivation which occurs at the same time. Much more frequently the course of the disease, in liberating the system from its lethargy of function, permits the absorption of the medicine and the development of its specific effects, which then become superfluous, if not actually hurtful.

The more unusual and strictly morbid effects of mercury, or such, at least, as are the most important, will next be considered. And here it may be mentioned that of the several modes by which mercury is made to enter the body, inhalation most speedily produces the specific influence of the medicine, and next in order, inunction is most prompt

[1] Archives Gén., xviii. 24.

in its effects; but the stomach is the most appropriate channel of introduction for the dry and liquid mercurial preparations.

1. *Mercurial Fever.*—This febrile condition usually arises between the fifteenth and the twentieth days of the treatment by inunction, and commonly precedes salivation, and the specific eruption on the skin. It has the characters of an irritative oftener than of a continued fever. There is a complaint of weariness and chilliness; the pulse is frequent, the tongue coated, the tendency to perspire very great, and sometimes the sensibility of the skin is such that the patient is readily chilled, and may thus perish from nervous apoplexy. Simultaneously with these symptoms there is usually an intolerable sense of constriction in the stomach, nausea, sometimes vomiting, but not frequently, colic, and either diarrhœa or constipation. The duration of this fever is generally from three to seven days, but it may last for several weeks. It terminates on the occurrence of salivation, by the specific rash, presently to be described, or by sweating.[1]

2. *Morbid Action on the Skin. Eczema Mercuriale.*—The continued use of mercurial frictions irritates the skin, inducing at first redness and tenderness, and afterwards, in some cases, a peculiar eruption, erysipelas, or even fatal gangrene. The cutaneous eruption excited by mercury was first, it is believed, mentioned by Benjamin Bell, who says: "It is not an uncommon effect of mercury to excite an eruption upon the surface of the body. In some this appears as a miliary rash, somewhat resembling measles; while, in others, it is considerably elevated, and seems to be produced by a serous effusion between the cutis and the scarf skin. In some the eruption is partial, while in others, it prevails generally over the whole body." It was also described by Dr. Speers, of Edinburgh,[2] by Dr. Moriarty, and by Mr. Alley, of Dublin, who has given the fullest account of its course and varieties.[3] In its mildest form this affection consists of innumerable minute and transparent vesicles, on a light rose-colored efflorescence, occupying a large portion of the skin. It is accompanied with a prickling sensation and itching, but not with fever. A severer and febrile form presents an efflorescence somewhat like that of rubeola, and in a third form, which Mr. Alley styled malignant, there is fever, an intense burning heat of the skin, and extreme soreness of the fauces; the vesicles are of a large size, and the spots of a dark and even purplish color. In this form, when the vesicles burst, crusts are formed of a very unsightly and disgusting appearance. The second form here

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[1] CANSTATT, Med. Klinik., 2te Aufl., ii. 794.

[2] Edinb. Med. and Surg. Journ., 1805, i. 7.

[3] Observations on the Hydrargyria, 1810.

alluded to has been observed by Baron at the Children's Hospital of Paris, and was produced by mercurial frictions. The eruption was most abundant everywhere else than upon the places where the frictions had been made; it occasioned neither itching nor smarting, nor was it accompanied by ptyalism. A slight degree of fever was observed during a period of from three to six days, during which the eruption lasted.[1]

In some cases of mercurial cachexia, an eruption of rupia and also of pustules (ecthyma?) has been met with.

3. *Ulceration.*—Besides the tendency of ulcers, on any part of the body, to assume an unhealthy appearance, and even to become gangrenous, and of contiguous portions of the cutis, *e. g.*, of the buttocks, the thighs, &c., to suffer excoriation, the constitutional action of mercury may develop ulcers in the buccal cavity, upon the gums, the inner surface of the lips and cheeks, and the tongue, generally attended with salivation. These ulcers usually advance from within outwards, raising and then casting off the epithelium, and exposing a red and irritable surface which secretes an acrid fluid. They are irregular in shape, without defined edges, bleed readily, have a dirty whitish surface, are surrounded with a dark halo, and are apt to run together. Syphilitic ulcers, on the contrary, are more frequently circular, attack the posterior rather than the anterior portion of the mouth, present defined margins, with a copperish hue of the surrounding membrane, and are not apt to extend from the primary seat. It is true that under the action of mercury syphilitic ulcers may lose their characteristic appearance, and render the diagnosis doubtful, but in that case fresh ulcers form, with all the peculiarities of the mercurial sort.[2] These may be also attributed to a scorbutic taint, but the circumstances of their origin should prevent this error, and also the mercurial fetor exhaled from the breath. It occasionally happens that hemorrhage, which, indeed, has in some instances proved fatal, is produced by mercurial ulceration of the fauces.[3] Death may also result from a destruction of the soft parts. A case is reported by Drs. Graves and Stokes[4] of a child, eleven years of age, who, for an inflammation of the trachea, took eight grains of calomel in divided doses. Salivation followed, with excessive swelling of the face and neck; ulcers beginning at the corners of the mouth, spread to the lips and cheeks, causing an extensive destruction of both; a sloughing ulcer formed on the palate, and

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[1] Bull. de Thérap., xxxviii. 184.

[2] Handbuch der Speciel. Pathol. u. Therap., by Falck, Virchow, and Simon, ii. 123.

[3] Lancet, 1834–44, i. 277.

[4] Dublin, Hosp. Reports, iv. 299.

the fetor of the breath was excessive. Treatment was unavailing, and death took place on the eighth day. That form of ulceration of the mouth known as *gangrœnopsis*, usually arises during a state of exhaustion of the system following disease, especially eruptive fevers and dysentery; the ulcers are of a circumscribed character, generally of the cheek, and following tumefaction and hardness of the part. The affection known as *cancrum oris*, and proceeding from the same causes as the one last mentioned, begins in the gums, and presents symptoms closely resembling mercurial sore mouth, including salivation, swelling of the submaxillary glands, swollen, spongy, bleeding, and ulcerated gums, covered with a pultaceous deposit, with a loosening and even loss of the teeth.[1] If such a state ensues upon the administration of mercury, there appears to be nothing by which it can be distinguished from the effects of this medicine, unless it be the existence of a fetid odor, which is different from that occasioned by mercury.

4. *Salivation.*—The principal morbid phenomena of this process have already been described.

5. *Mercurial Purging.*—This is not the direct effect of purgative doses of mercury, but is an affection in which, during the constitutional operation of the medicine, the alvine evacuations become at first feculent, thin, and greenish, and afterwards watery or frothy, and pale in color. There may be ten or fifteen of such stools in the course of twenty-four hours. At the same time there is a sense of fulness in the abdomen, tenderness on pressure in the epigastrium, and a dull, tensive pain in the same region. The thirst is great, the mouth and skin dry, and the urine scanty. As the diarrhœa augments, vomiting may be superadded, while the skin grows cool and the eyes are sunken and dark. The affection may terminate in gastric inflammation. Its symptoms are by some attributed to an excessive action of the pancreas, which, as elsewhere stated, is sometimes diseased.[2]

6. *Affections of the Bones.*—It has long been a question, and is one not yet fully determined, how far mercury may operate to produce disease of the bones. The tendency of syphilis to develop these affections is well known, and also the great frequency of their occurrence in syphilitic cases treated by mercury, yet it is certain that they sometimes follow the administration of this medicine in cases wholly free from a syphilitic taint. Mercurial nodes, it is said, precede the ulcers, and the destruction of tissue proceeds from without inwards. They

[1] West, Dis. of Infancy and Childhood, 3d ed., p. 431. [2] Falck, loc. cit.

most frequently are seated in the spongy bones of the base of the cranium, or in the ends of the long bones. (*Canstatt.*)

7. *Affections of the Nervous System.*—Pains in the head and limbs, which partake both of a rheumatic and a neuralgic character, are frequently produced by mercurial saturation of the economy, particularly in cases of trembling due to this agent. In other cases, the senses are morbidly excited, or the perceptions are perverted; a moody melancholy and fear of death may overtake the patient, who may sink into dementia; or, more rarely, insanity of a maniacal form may be developed. In a few cases, epilepsy results. The trembling palsy due to mercury has been already described. In connection with, or independently of it, paralysis may affect the limbs, involving only the upper or the lower limbs, or both at once, and affecting the flexor as well as the extensor muscles. The same affection sometimes involves the laryngeal muscles, producing aphonia.

8. *Mercurial Spanæmia* (*Erethismus Mercurialis*).—This affection is generally independent of salivation. It is distinguished by the chlorotic aspect of the patient, the sense of oppressed breathing, tumultuous palpitation of the heart, a small, frequent, and sometimes intermitting pulse, a tendency to syncope, general susceptibility to cold, and great debility. Death is often owing to syncope on the patient's making a sudden or unusual exertion.

9. *Mercurial Cachexia.*— The action of mercury on the blood, by which it tends to reduce the proportion of solid materials in this fluid, and thus to impair the nutrition of the organs, is capable, when carried beyond moderate bounds, of occasioning a form of artificial scurvy, some of the elements of which have previously been described. The muscles lose their firmness, fulness, and power, the complexion assumes a pallid or an earthy hue, the breath becomes fetid, the urine is readily decomposed, and diarrhœa is usually present. The gums grow spongy, the hair falls out, dull pains in the bones and joints are felt; œdema of the ankles, or even general dropsy, may form; hemorrhage from the nose, bowels, kidneys, or reopened wounds takes place, and hectic fever, with tubercular consumption, may terminate life.

Treatment of the Effects of Mercury.—Whatever may be the form of disease engendered, the patient should immediately abstain from the further use of mercury, and an attempt should be made by means of saline laxatives, by diaphoretics, and by iodide of potassium, to hasten the elimination of the poison from his system. According to his febrile or his cachectic state, a cooling vegetable regimen, or a tonic and nutritious one, with iron as a medicine, should be prescribed. Great care should be exercised in protecting him from cold and damp-

ness. The mercurial inflammation of the mouth may be treated by a great variety of local applications, such as mucilaginous washes with the addition of some preparation of opium, and, when its intensity is to some extent abated, astringent decoctions and infusions may be employed, or a solution of gallic acid. A more efficient application is hydrochloric acid applied with a camel's hair brush to the ulcerated surfaces, and immediately removed by washing the mouth with water in order to save the teeth from harm. Iodine in solution, creasote, alum, and nitrate of silver have been used in the same way. Internally acetate of lead and opium, iodide of potassium, and chlorate of potassa have been given, and of these the last is the most efficacious.

ACTION OF CALOMEL. *On Animals.*—Its operation on animals does not differ from its action upon man. In large doses it occasions some depression and debility with copious purging. Some further details are given below.

On Man.—Ledelius saw a case in which death resulted within twenty-four hours after half an ounce of calomel had been taken. The symptoms were vomiting and purging. In another instance, a female took fourteen drachms of calomel at a dose. Cholera morbus ensued, but subsided under the use of oily and mucilaginous liquids. Two days afterwards salivation occurred, but by the end of three weeks the effects of the medicine had ceased.[1] Besides these, enough fatal cases are on record to prove that this preparation of mercury sometimes acts as an irritant poison. Many also demonstrate the peculiar virulence of salivation induced by its means.

The variable effects which are produced by calomel are explained by the variable quantity of alkaline chlorides existing in the stomach, upon which the solubility and absorption of the medicine are supposed to depend. However the fact may be explained, it is fully established that both of the poisonous effects described, occasionally result from doses of calomel which ordinarily are innocuous. Sometimes this peculiarity appears to arise from the action upon the calomel of common salt (chloride of sodium), taken with the food, and here, doubtless, the long continuance of the compound in the bowels would tend to develop its poisonous qualities. Hence, probably, the ordinary caution against using salt with the food after mercury, and the usual prescription of a laxative to be taken a few hours after calomel, when the constitutional action of the latter is not desired. Sometimes the muriate (hydrochlorate) of ammonia appears to have been the agent in converting the medicine into a poison. A case is recorded in

[1] WIBMER, op. cit., iii. 72.

which a child was killed by taking several powders which contained this salt mixed with calomel.[1] Some further remarks upon this subject will be found below.

Chota Ram, a delicate lad of fourteen, affected with malarial fever, took *three* grains of calomel with eight of colocynth, and the next morning a drachm of compound jalap powder, by which he was freely purged. Two days afterwards the same doses were repeated, and, after a similar interval, the patient was attacked with all the symptoms of mercurial sore mouth, except salivation; these were followed by ulceration, gangrene, and death fifteen days after the first dose of mercury was administered.[2]

Mr. Spence reports the case of an old woman who had never been affected with syphilis, but had taken large quantities of mercury. After suffering from pains in the head, ulceration began in the soft parts over the os frontis, involving the bone and dura mater, and ultimately exposing the brain. After death an abscess was found in the substance of the brain.[3]

In contrast to the more or less mischievous effects of calomel in large and in small doses, might be mentioned a number in which enormous quantities have been swallowed without producing serious symptoms. The most familiar illustration of this statement is the custom, not long since prevalent in certain portions of the United States, of administering the medicine by teaspoonfuls. It was, for the most part, passed by stool and without salivating. In such cases may it not be possible that the undissolved portions of the calomel absorb and retain the greater part of what is rendered soluble by the gastric acids? The fact that large doses of calomel are given in cholera without effect, at least until reaction occurs, seems to be explicable on the supposition, partly, that the stomach contains but little acid, and partly that its absorbent faculty is suspended during the excessive aqueous secretion from the gastric mucous membrane.

The views which, for the last twenty or thirty years have prevailed respecting the action of calomel and the indications for its use, are clearly traceable to the writings of Johnson and of Ainslie. The latter endeavored to prove that when the use of calomel is indicated, it is most beneficial in large doses, and, in maintaining this theory and practice, he sheltered himself, in part, by the authority of Horstius, Sylvius, Wepfer, Freind, Geoffroy, and others.[4] He, however, insisted that such doses should not be repeated at short intervals, and he combated the doctrine that the object in view is to make the

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[1] Journ. de Pharm., Feb. 1840.

[2] Campbell, Lond. Med. Gaz., xviii. 484.

[3] Edinb. Med. Journ., ii. 855.

[4] Diseases of India, p. 378.

mouth sore. He maintained that while small doses of from two to six grains will purge, and keep up an irritation of the stomach and bowels, twenty grains will do neither, but, on the contrary, allay the intestinal irritability which may be present as an effect of inflammation of the bowels or the liver. In order, as he supposed, to base his practice securely, in 1823 he gave large doses (ʒj to ʒiij) of calomel to dogs, and concluded, from his experiments, that the medicine had the effect of *diminishing* the vascularity of the intestinal mucous membrane, and thus became antiphlogistic in its operation. From other experiments upon the dead human subject, he inferred that an effect of the medicine is also to dilute the tenacious mucous covering of the gastro-intestinal surface. The latter operation he conceived to be an efficient cause of the cholagogue action of mercury; for he supposed the medicine to dissolve the inspissated mucus which (hypothetically) obstructed the gall-ducts, and thus come into more immediate contact with the mucous membrane of the duodenum, and exert upon it an influence which "was propagated thence along the canals of the ducts to the gall-bladder and the liver itself." Small doses of mercury, on the other hand, he held to be absorbed and to promote the secretion of bile, causing thereby, distension of the gall-bladder with accumulated bile, unless the inspissated mucus were at the same time removed by purgative doses of the medicine.

This view of the cholagogue action of mercury has been generally accepted and become as thoroughly a part of the current medical doctrine as if it were a demonstrable physical result. Yet a portion of it appears to be hypothetical, and the remainder untrue. The latter term applies to the results of Ainslie's experiments, which have been completely set aside by the more thorough investigations of Mr. Murray, in 1841.[1] He found that calomel, given to dogs in doses of from five to thirty grains, and thence to two or three drachms, produces *increased* gastro-intestinal vascularity, and the larger doses sanguineous effusion. At the same time, however, an increased flow of bile, mucus, and serum takes place. It is proper to add that Dr. George Scott regarded his own experiments upon dogs as throwing considerable doubt upon the generally received opinion, that calomel in large and purgative doses increases the flow of bile.[2]

Calomel, even in small doses, will sometimes occasion symptoms resembling those already ascribed to the prolonged and toxical action of the medicine. It has been described as a state of morbid sensibility; a hysteric feeling which, with the shedding of tears, the yawning, and

[1] Morehead, Disease in India, i. 222. [2] Archives of Medicine, No. iii. p. 224.

the sensation of cold that accompanies it, is singularly distressing. But cheerfulness and the accustomed serenity are restored the moment the action of the medicine has ceased.[1]

The systematic use of minute doses of calomel, for the purpose of producing its constitutional effects, was brought to notice by Dr. Law, of Dublin,[2] in 1839. By giving one-twelfth of a grain every hour, he found that salivation was frequently produced before two or three grains of the medicine had been taken, and that four grains were seldom required to produce that effect. These experiments were repeated at the Hôpital Necker, in Paris, by Trousseau, and with identical results.[3] It is stated that the influence of the remedy was generally manifested in from twenty-four to sixty hours, and in some cases the gums became distinctly affected after eight doses containing one twenty-fourth of a grain each. When its administration was suspended, and after an interval renewed, the effects were less decided, or did not manifest themselves at all. The subdivision of the medicine manifestly quickened its operation. For example, a given quantity divided into twelve doses, and administered at intervals of two hours, produced less effect than when divided into twenty-four parts, and given every hour. The earliest signs of its operation were usually nausea, colic, borborygmi, and greenish liquid stools, which, however, did not impair the constitutional action of the medicine. Its operation on the mouth consisted of the usual metallic taste and pasty sensation, soreness when the teeth were struck together, a white line along the dental attachment of the gums, and the redness and swelling of these parts. The flow of saliva was rarely profuse.

These facts lend some color to the more recent theory that blue mass or calomel is operative in so far only as it is susceptible of solution by the acid contents of the stomach. Cases have repeatedly presented themselves in which salivation has ensued upon the administration of a very small dose of mercury, and Dr. Snow first suggested that this might be owing to an accidental excess of acid in the stomach. He several times observed that salivation followed when a small quantity of blue pill or calomel was taken at the same time with a mixture containing sulphuric acid; and he supposed that if the stomach held an excess of hydrochloric acid, it might convert the milder preparation of mercury into a bichloride.[4] An analogous view has more recently been put forth by Mialhe.[5] He maintains that all of the medical pro-

[1] Journ. of Psychological Med., i. 295.
[2] Dublin Quart. Journ., xiv. 393.
[3] Duclos, Bull. de Thérap., xxxi. 17, 85.
[4] Lancet, Jan. 1840, p. 625.
[5] Chimie Appliquée, p. 407.

perties of calomel are owing to its partial transformation into corrosive sublimate in the stomach. He admits, however, that the chlorides contained in the gastric juice, and to which he attributes this transformation, are never abundant enough to generate a poisonous dose of the bichloride, however large a quantity of calomel may be present. Even at a higher temperature than that of the stomach he was unable to procure more than one-sixteenth of a grain (15 milligrammes, or 0.06310 Troy gr.). Indeed, Bucheim, Oetingen, and Winckler have shown that the transformation in question does not occur at all at the temperature of the body.[1] In addition to all of the considerations growing out of these facts, it should not be forgotten that of the three preparations of mercury especially referred to in this paragraph, corrosive sublimate is that one precisely which is least apt to produce salivation. It is stated by Mr. Clay, of Manchester, that after a long and very extensive experience of its use, both in adults and children, he "scarcely, *if ever*, saw a decided case of ptyalism from the exhibition of the bichloride alone."[2]

Action of Corrosive Sublimate. *On Plants and Animals.*—Bouchardat found that plants are poisoned by solutions containing a thousandth part of the bichloride of mercury, and that leeches and fish are immediately affected and die in a few minutes when immersed in such a solution. He dissolved one-sixth of a grain of the iodide of mercury in a quart (1000 grammes) of water, and placed in it four small fish. Within two hours two of them died, and the others also perished by the close of the day. Yet the proportion of the salt was so small that it could not be detected by the usual chemical reagents.[3]

A solution of the former salt injected into the veins of a dog produces signs of extreme suffering, followed speedily by death. When introduced freely into the cellular tissue of the thigh, the animal was affected with dulness, loss of appetite, and sometimes vomiting or bloody diarrhœa, with general depression and ultimately death. Congestion and even inflammation of the gastro-intestinal mucous membrane were frequently, although not always, found on dissection, and there was general fluidity of the blood. When a smaller quantity of the salt is used, symptoms of the same nature, but of less severity, occur, with salivation and intense thirst. After death, besides the lesions mentioned, the lungs and other vascular organs are deeply congested, and are sometimes the seat of a bloody extravasation.[4]

When introduced into the stomach of dogs, corrosive sublimate

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[1] Oesterlen, Heilmittellehre, p. 102.
[2] Lancet, Aug. 1841, p. 752.
[3] Annuaire de Thérap., 1846, p. 266.
[4] Wibmer, op. cit.

occasions pain, thirst, violent straining, and vomiting of mucous and bloody matters. If the dose has been large, death takes place speedily, and in most cases with convulsions; under opposite circumstances, the animal perishes gradually by exhaustion. The resulting lesions depend upon the quantity of the poison employed, and the duration of life after it has been administered, and hence may vary from a trifling vascular injection to a state of softening of the gastric mucous membrane. These alterations may also, to some extent, involve the intestine, and the rectum in particular. Many years ago, Brodie inferred from his experiments that corrosive sublimate, when taken internally in large quantities, occasions death by acting chemically on the mucous membrane of the stomach so as to destroy its texture.[1] Orfila came to a like conclusion, adding, however, that the poison acts upon the heart.[2] These conclusions are accepted almost universally as true; yet it is proper to state that Giacomini declares he never saw, in his experiments upon rabbits and dogs, the mucous membrane of the stomach inflamed or ulcerated by this substance; but, on the contrary, pale. If any alteration of tissue is found, it is, he asserts, cadaveric.[3] There is reason to believe that attachment to a system blinded this eminent physician to lesions which were very visible to other observers.

On Man.—Externally. Examples are numerous of poisoning by the external application of corrosive sublimate. Many are collected by Wibmer. In one of these a lady applied a solution of the salt to a swelling on the leg, resulting from a bruise. It inflamed the part violently, and produced salivation, vomiting, swelling of the throat, and pain along the œsophagus. In four other cases death resulted from applying a solution of corrosive sublimate to denuded or ulcerated surfaces. Similar examples are furnished by Orfila and others. One of these is striking. Jules Cloquet, the eminent surgeon and obstetrician, in removing some anatomical specimens from a solution of corrosive sublimate in which they were preserved, wet his hands several times with the liquid, and neglected washing them afterwards. In about eight hours, in the middle of the night, he awoke with violent pains at the pit of the stomach, which was also very tender. The pain extended to the back, with constriction of the chest, a small, irregular pulse, thirst, retching, and vomiting of acrid fluid with a metallic taste. Although these symptoms subsided in the course of the day, the epigastrium remained tender for a week.[4] An extraordinary instance of

[1] Physiological Researches, p. 102.
[2] Toxicologie, i. 677.
[3] Mat. Méd., p. 427.
[4] Toxicologie, i. 671.

the absorption of this substance is the following. A gentleman rubbed five grains of corrosive sublimate mixed with butter upon the integuments of his genital organs and the neighboring parts. Violent inflammation ensued, which, however, subsided by the next day. Several days afterwards a gold ring upon the gentleman's hand, several gold coins in his pocket, and other articles of gold in contact with his skin, were found to be plated with quicksilver. There was, however, no swelling of the gums, nor other sign of mercurialization.[1] Two children, affected with favus of the scalp, were treated with an ointment containing two drachms of corrosive sublimate to an ounce of fat. Extreme suffering ensued, with delirium, vomiting, and bloody stools, and both patients died, the one in seven, the other in nine days.[2] In another case all the symptoms of poisoning by corrosive sublimate, and subsequently mercurial salivation, were produced by the injection into the vagina of twenty grains of this substance dissolved in an ounce of lime-water.[3] For other cases analogous to these the reader is referred to "Taylor on Poisons."

When small doses of corrosive sublimate are continued until their poisonous action is developed, the following symptoms are observed: Burning and colicky pains in the stomach and bowels, nausea, vomiting, diarrhœa, and in some cases, but not as the usual effect of this salt, salivation, and the evidences of general mercurial poisoning already described. Larger and directly poisonous doses produce constriction, and a severe burning pain in the fauces, œsophagus, and stomach, with retching and the vomiting first of mucus and then of bile and blood. The pain diffuses itself throughout the abdomen, which is very sensitive to pressure, and sometimes bloody stools are voided, with tenesmus. At the same time there is great restlessness, an injected countenance, and intense thirst, and subsequently a quick, frequent, and small pulse, with labored breathing, cold sweating, a clammy skin, and suppression or scantiness of urine. In fatal cases death may occur within a few hours after the ingestion of the poison, or may be delayed for several weeks. Should recovery take place, the stomach and bowels may still remain morbidly irritable for a long time. The lesions produced by this poison are these: The stomach is contracted, its mucous membrane, that of the œsophagus, and even of the small intestine, is generally but not always reddened in patches, or is the seat of ulcers of a dark color, and with ragged edges. A large dose sometimes converts the gastric mucous membrane into a soft, grayish pulp. The bladder contains but little urine.

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[1] Lancet, Oct. 1830, p. 137.

[2] Dublin Quart. Journ., Aug. 1854.

[3] Ibid., Feb. 1856, p. 242.

Action of Red Precipitate. *On Animals.*—Ten grains of this substance were given by Hillefeld to a young rabbit. No violent symptoms ensued, but the animal was purged, seemed exhausted, and died within twenty-four hours. Vascular injection and ulcers of the stomach were found on dissection. Orfila's experiments furnished very similar results. In both instances the depressing effects of the poison were remarkable.

On Man.—In many cases the constitutional effects of mercury have been produced by the external application of this compound. Several of these are furnished by Hunter in his Treatise on the Cure of Lues Venerea. In one, an ointment of red precipitate was applied to a granulating stump, in another, to an ulcer of the leg, and in a third, to a sore on the trunk resulting from a burn. Internally, this mercurial acts as an irritant, occasioning cramps and burning pain in the stomach and bowels, with vomiting and purging, cold sweats, general weakness, and death. The lesions of the gastro-intestinal mucous membrane are inflammation and even corrosion.

Action of the Red Sulphuret.—Applied to a wound in a dog's thigh, it proved fatal after several days, and the stomach was ulcerated. (*Smith.*) Orfila, however, found no effects from large doses of it administered to animals. Its vapor appears to be capable of salivating.

Action of White Precipitate.—The operation of the ammoniochloride is analogous to that of the bichloride, but is less energetic. It would seem to have produced death by salivation in one case quoted by Taylor.

Action of the Iodides of Mercury.—These preparations resemble corrosive sublimate in their effects, but are less powerful. The biniodide is more active than the protiodide. (*Orfila.*)

Action of Cyanide of Mercury. *On Animals.*—Ollivier d'Angers gave seven grains of this compound to a bitch. Within five minutes retching occurred, with debility, spasms, insensibility, and slowness of the pulse and respiration. Ten grains occasioned death in seven minutes, with like symptoms. In some experiments, the blood found in the heart was liquid, in others firmly coagulated. No special lesions of the stomach were noted, unless the animal survived the experiment for several days, and then it was evidently inflamed.

On Man.—In a case where about twenty grains of this preparation were taken, vomiting, purging, and excruciating pain in the bowels were experienced. Death did not occur until the tenth day. Meanwhile the patient was prostrated, the action of the heart slow but strong; salivation occurred, with ulceration of the mouth; nausea,

vomiting, and bloody stools, with tenesmus, were frequent; and the urine was very scanty. Partial erection of the penis and a purplish hue of the scrotum were observed, and death resulted from progressive exhaustion, interrupted occasionally by spasms. On post-mortem inspection, no ulcers of the stomach were found, but its lining membrane was swollen, discolored and softened, and a like change existed in several parts of the intestine.[1]

Action of Turpeth Mineral. *On Animals.*—Hillefeld gave forty grains of this substance to a kitten, causing emesis followed by retching, debility and death.

On Man.—Hoffmann states that it occasions anxiety, colic, violent emesis, diarrhœa, and internal cramps, and a similar account is given by Hellwich. There appears to be but a single case on record in which it produced fatal effects. The patient was a boy sixteen years of age. He took about one drachm, which produced a burning sensation in the mouth and fauces, with vomiting, purging, cramps, and general sinking. The stomach remained very irritable, and great salivation ensued. Death took place in a week. The œsophagus was inflamed, and the stomach ecchymosed.[2]

Action of Solution of Pernitrate of Mercury.—This preparation, when applied to ulcerated surfaces, has sometimes occasioned symptoms of mercurial poisoning. The same effect has been observed to follow its use as a remedy for the itch. Of its internal effects, the following illustration is furnished by Dr. Bigsley.[3] A butcher's boy swallowed about a teaspoonful of the solution which is used for curing the "foot halt" in sheep. He was in great agony with severe burning pain in his mouth, throat, and abdomen, which was tense and sore; he retched violently, had feculent stools, cold extremities, and a small, frequent pulse. He died within three hours. On examination, the fauces were vesicated, the pharynx inflamed and discolored by purplish blotches; the stomach presented a similar appearance, and in its greater curvature a space several inches in extent abounded in brown eschars.

Mode of Operation.—The ingenuity of man has been largely taxed to discover, or to invent, an explanation for the effects of mercury. No other medicine, except cinchona, is so palpably curative of disease, and yet none so perfectly conceals the secret of its operation. Of the hypotheses which have been framed to explain its action, each one, no doubt, contains some portions of the truth, and, taken together, they may, perhaps, include all the material elements for the solution of the

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[1] Orfila, Toxicologie, i. 735.
[2] Ward, Lond. Med. Gaz., xxxix. 474.
[3] Ibid., vii. 329.

problem. But as the diseases which mercury cures are various, we may infer that its operation is complex, and also in this fact, discern the obstacle that hinders a more perfect discovery of its mode of action. The theories which, at various periods, have been proposed in reference to this question, appear to have been formed from too exclusive a consideration of the operation of mercury in syphilis, in inflammations, and in gastro-hepatic affections. It was supposed by very high authorities, to cure syphilis by means of its weight, divisibility, motility, &c., these properties enabling it to penetrate the finest blood-vessels, to break up the blood-globules, and thus diminish the crasis of the blood. Others imagined that it acted chemically, neutralizing the poison of syphilis; and others still sought refuge in the use of words without knowledge, and maintained it to be now a stimulant, and now a sedative, according to the exigencies of the case. It would be a profitless task to follow the advocates of these and other hypotheses, in their wide circuit of reasoning and illustration, and we shall here endeavor merely to express summarily the conclusions to which it is believed the considerations already set forth conduct.

It is certain that mercury, in all its modes of administration, is absorbed; that, like all other substances foreign to the organism, it acts as an irritant; and that it tends to impair the normal energy of all the nutritive operations, by hindering the conversion of blood into living tissue, on the one hand, and on the other, by promoting the dissolution of the latter and its elimination, along with unorganized materials, with all the secretions, especially those of the salivary glands, the pancreas, the liver, and the intestinal follicles. By promoting absorption and secretion, it hastens destruction, as all the phenomena of mercurialism make clearly manifest. It may be questioned whether this deterioration of the solids is the cause or the effect of those changes in the blood which consist in the diminution of its fibrin, and the disintegration of its red corpuscles. The latter opinion appears to be the more probable of the two. This solvent influence is most manifestly exerted upon all imperfectly organized structures, and particularly upon those which result from inflammation. Hence the aplastic power of mercury has always ranked as its most important quality. While carrying on the destructive process, it, indirectly at least, augments the excitability of the nervous system, and renders the whole organism peculiarly susceptible to external impressions, and, therefore, to the influence of the greater number of morbid causes.[1]

[1] The mode of action of mercury has recently been examined by HEADLAND, Lancet, March, 1858, p. 309; and BARENSPRUNG, Annalen des Charité-Krankenhaus, Berlin, 1856, see Journ. f. Pharmacodynamik, i. 418.

Remedial Employment.—In the following pages will be considered the application of mercury to the cure of diseases, first, of those which are general, and afterwards of those which are local in their character. The several preparations will not be referred to separately, except in so far as they are inappropriate to the treatment of the same form of disease. It is hoped by this means to present a practical view of the subject, and to avoid those repetitions which any other method would render unavoidable.

Syphilis.—For two hundred years before the beginning of the present century, it was universally believed, not only that mercury is a specific for syphilis, but also that it is essential to the cure of that disease. But during the Peninsular war a number of British army surgeons, among whom were Fergusson, Rose, Hennen, and Guthrie, and in civil practice Drs. John Thomson, Abernethy, and others, proved conclusively that primary syphilis generally tends to a spontaneous cure. Some even took the ground that the remoter (secondary and tertiary) forms of the disease are really produced by mercury, and that "the mercurial disease attacks all those parts which are the seat of syphilis, that it attacks them in nearly the same order, and assumes very nearly the same external appearance."[1] So M. Bretonneau, by experiments upon animals, discovered that by an excessive use of various mercurials, it is possible to produce in them symptoms having a perfect resemblance to those of constitutional syphilis, such as affections of the bones, and of the periosteum, and ulcers of the mucous membranes.[2] These facts are not, indeed, adverse to the administration of mercury in syphilis, but an argument rather in its favor as a mode of treatment for the secondary and tertiary symptoms. As to primary syphilis, abundant evidence exists of its curability without mercury. At different times it has been successfully treated with sarsaparilla, opium, ammonia, &c. Sir B. Brodie, in his lectures, relates the success which attended the treatment, by Mr. Rose, of primary syphilis among the British regiments of Guards without mercurial medicines. But he is solicitous that no application should be made of this fact to the management of the diseased in private practice; for, as he remarks, "the soldiers were picked men, and perfectly under control in respect to diet, exercise, &c., and he adds that to treat syphilitic patients in civil hospitals or in private practice without mercury would be altogether a failure."[3] So Hocken[4] remarks: Be-

[1] Matthias, Lond. Month. Rev., Feb. 1811. [2] Annuaire de Thérap., 1848, p. 263.

[3] Clinical Lectures on Surgery (Am. ed.), p. 225.

[4] De la valeur comparative des préparations de mercure et d'iode dans le traitement de la syphilis. Annales des Mal. de la Peau, i. 341.

cause syphilis can be cured without mercury it does not follow that such a plan of treatment is the best, or that we should proscribe so useful a remedy. And Wallace, of Dublin,[1] expresses the same idea, when he says, "Not that mercury is indispensable for procuring cicatrization of the primary ulcer, but because it hastens the process of healing, and diminishes the chance of secondary symptoms." What these citations indicate, a longer experience has proved, that the non-mercurial plan is more tedious in effecting a cure, and is more apt to be followed by constitutional disease than the mercurial method, particularly when the primary sore is of the indurated sort; and also that mercury, when used prudently, is not chargeable with any of those accidents which led to its temporary exclusion from the catalogue of anti-syphilitic remedies. In 1857 Dr. Cahill, of London, stated that most of the Irish surgeons who originally had adopted the non-mercurial plan of treatment for primary syphilis had since changed their opinions respecting it.[2] At the present time, the mischiefs which were once set to its account, are known to be, with few exceptions, attributable to the false theories which governed its administration, or to the inveteracy of the disease, or the constitutional peculiarities of the patients it was employed to cure; and it is restored to its commanding position as one of the few medicines which, even in a qualified sense, deserve the name of specifics.

But, it must be confessed, the influence of a mercurial treatment of the primary sore upon the development of constitutional symptoms is not yet definitely ascertained. On the one hand may be cited such a positive declaration as that of Chomel, who was in the habit of requiring his syphilitic patients to continue the use of mercurials for five or six months after the cure of the primary symptoms, always, however, avoiding the production of salivation. During a period of fifteen or twenty years in which he had used this method not one of his patients became affected with secondary symptoms.[3] On the other hand, Ricord (and in this he follows the principles of Hunter) refrains as much as possible from giving mercury during the primary affection, upon the ground that it does not prevent the occurrence, although it may postpone the development of the constitutional disease, and thus prolong the patient's anxiety in regard to its appearance.[4] In this judgment the greater number of writers on syphilis coincide. When secondary symptoms occur it is generally within six months after an indurated chancre, and within eighteen months after a simple one.

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[1] A Treatise on the Venereal Disease, p. 100. [2] Lancet, Dec. 1857, p. 581.
[3] Annuaire de Thérap., 1845, p. 159. [4] Annuaire de Thérap., 1848, p. 267.

Now it is alleged that mercurials administered during the primary symptoms are unnecessary for their cure and may postpone, but will not prevent, the occurrence of constitutional infection. Hence, according to Ricord, it is unnecessary and useless to administer them for the primary disease. But it is to be observed that this eminent physician regards induration of the chancre as the first step towards infection of the system, of which inguinal glandular enlargements, and characteristic cutaneous eruptions are further and more complete evidences. Whenever, then, either of these conditions presents itself he advises the administration of mercury, and, on the whole, it is pretty generally agreed by competent authorities that *induration of the primary sore* calls imperatively for this treatment.

There are certain *contraindications* to the use of mercury which ought never to be lost sight of. It should not be prescribed when the skin around the sore is very red, swollen, tense, and painful, or shows a tendency to gangrene; nor if the digestive organs are deranged, nor if any febrile or other marked constitutional disturbance exists. Such conditions should first be rectified, whether in the primary or in the consecutive forms of the disease. When, too, either form of syphilis occurs in a person affected with spanæmia, scrofula, tuberculosis, or scurvy, or in one suffering from the consequences of intemperance in alcoholic drinks, the use of mercurials demands the utmost circumspection, and is indeed generally contraindicated until a better state of health is obtained by the use of other remedies. If the dyscrasia arise from syphilis itself, this condition is not, according to Colles, a contraindication for the use of mercury. In regard to its employment during pregnancy, and especially during the latter months of this state, opinions are not uniform. Some allege that it may cause the death of the fœtus and abortion. But, on the other hand, it is maintained, and with more probability, that a moderate mercurial course, without salivation, tends to prevent or to cure the infection of the fœtus. In such cases it is said that inunction is preferable to the other modes of exhibiting mercury.

The method of mercurial treatment which prevailed until comparatively recent times may be judged of from the following aphorisms of Boerhaave.[1]

"When pustules spread all over the body, when pains seize the joints, when there are nocturnal pains, large buboes, racking pains of the bones, repeated gonorrhœas, it is then certain that the patient is poxed, and that a salivation is required.

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[1] VAN SWIETEN'S Commentaries, xvii. 230.

"To raise a salivation with greater success, let the patient for some days be filled with ptisan.

"Then, every two hours, administer a suitable dose of mercurius dulcis.

"As soon as the breath begins to be offensive, the gums to be painful, the teeth to loosen, then ought the physician to consider whether salivation should go on, remain in its present state, or be lowered.

"If three or four pounds of saliva are spit every twenty-four hours, it is sufficient.

"If the patient spits less, the salivation is to be increased, by giving a dose or two of the same medicine.

"If the salivation should be greater than the strength of the patient can bear, it is to be checked by mild clysters, purges, or sudorifics.

"If the mercury runs off by stool, an opiate and a diaphoretic will be necessary.

"When the mouth, gums, and fauces swell too much, or grow very painful, a soft, lenient gargle or lotion is to be used, &c.

"The salivation is to be continued until all the symptoms of the disease vanish, which generally takes up about thirty-six days.

"Then a small dose of mercury must be now and then taken for thirty-six days more, to keep up a very gentle salivation."

Although the celebrated commentator Van Swieten, has graphically described what he very aptly calls "the tortures of salivation," still he echoes the directions of Boerhaave, and of Astruc who preceded him, that, "if the patients spit three or four pints of saliva every twenty-four hours, it is thought sufficient." Nor is this prescription so antiquated as to find no acceptance at the present day, for, in the opinion of MM. Trousseau and Pidoux, physicians, in spite of themselves, relax the severity of a treatment which they believe to be the best, and by this unfortunate leniency certainly become chargeable with occasioning the present deplorable frequency and gravity of constitutional syphilis.[1] Ricord, on the other hand, says emphatically, "It is very certain that syphilis is never cured by the exaggeration of any of the effects of mercury, as fever, increase of the urinary secretion, alvine evacuations, cutaneous irritation, or salivation;"[2] Canstatt, comparing the harsher and the milder methods, says: "To the latter I give my unqualified adhesion;"[3] and Sigmund, in charge of the great venereal wards of the Vienna Hospital, reports as follows:

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[1] Traité de Therapeutique, 5ème éd., i. 215.

[2] Hunter and Ricord on Syphilis, by Bumstead, p. 466.

[3] Med. Klinik., ii. 858.

"Of 8983 syphilitic patients treated with mercury, 8463 exhibited no salivation, and yet were just as permanently cured as those in which this occurrence took place."[1] This gentler plan of treating syphilis is not, however, novel and modern. Its superiority was asserted even during the supremacy of the humoralistic doctrines, which have to answer for the incalculable evils resulting from the abuse of mercury. In 1516, Almenar, a Spaniard, recommended mercury for syphilis, "but not to promote a salivation."[2] In a treatise published in 1718, Chycoineau, the king's physician in the University of Montpelier, advocated the method *per extinctionem*, in which all possible care was taken to prevent a salivation.[3] So Plenck (1766) maintained that salivation, so far from being attended with any advantage, constantly retards a cure, and subjects the patient to many inconveniencies: "It is," he continues, "very inconvenient and dangerous, and does not give a certain cure, is not critical, nor can it be excited in every subject, *nor is it necessary in any*."[4] The observation of physicians of the nineteenth century has led to no more definite conclusion than this.

It may be inferred from the preceding statements that the rules for the administration of mercury in constitutional syphilis should all be subordinated to the fact that salivation is a morbid process, and is, therefore, to be avoided. The doses of the medicine which are required to duly affect the system will depend upon the preparation used, and upon the age, constitution, and individual peculiarities of the patient. They should, at the beginning of the treatment, however, always be very small. They may afterwards be gradually and cautiously increased, to be again diminished or suspended if they produce morbid effects. The progressive increase of the dose ought generally to be interrupted whenever the symptoms begin to decline, to be again resumed, however, if the disease tends to revive. An important practical question here presents itself, and one most difficult of solution, viz., for how long a time the mercurial treatment must be continued? To this question no positive answer can be given, for it must be confessed that no term of mercurialization, however long, can infallibly secure the patient against ulterior outbreaks of syphilis. All that can be said is, that the most competent authorities agree to recommend a period of about six months, during which the system should be kept under the influence of the medicine.

Forms of Mercurial Treatment used in Syphilis.—Inunction. This, oldest of the methods employed, is not without its partisans at the

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[1] Brit. and For. Med.-Chir. Rev., July, 1858, p. 266.
[2] Alston, Mat. Med., i. 82.
[3] Van Swieten, op. cit., xvii. 263.
[4] Plenck, on Mercury.

present day, although it is very generally abandoned. Sir B. Brodie remarks, "It is dirty, laborious, and troublesome, and makes the case public to the family in which the patient lives, but it is much less liable to gripe and purge than mercury taken by the mouth; it cures the disease a great deal better, and does not damage the constitution half so much." But it must be properly applied, and continued until the hardness of the primary sore disappears, and for some time afterwards, or until the mouth becomes slightly affected. In secondary syphilis, it should not be desisted from until after the disappearance of all the symptoms. Before commencing the treatment the patient should live for some days upon simple food, take a laxative medicine, and cleanse the skin thoroughly by warm bathing. The frictions with mercurial ointment should generally be made in the evening, and near the fire. If possible, they should be performed by the patient himself, or if by an attendant, he should have his hand protected by a caoutchouc glove, or by a pig's bladder previously softened with warm water. The places selected for friction should be used alternately or in succession, as for instance the thighs, the armpits, the legs, the arms, &c., and if the part is hairy, it should be shaven, and the frictions made in the direction of the hairs. The stronger ointment of mercury is to be preferred, and of this one or two drachms may be rubbed in daily. The patient should be clothed in flannel, and every two or three days renew the cleansing of the skin by means of a warm bath. If salivation ensues, the treatment must be temporarily suspended.

In cases of infantile syphilis, Sir B. Brodie recommended the application of a flannel roller, smeared with mercurial ointment, to the child's body, as preferable to "the cruel practice" of giving the medicine to the nurse, or to running the risk of deranging the digestive organs of the child by its internal administration. The two methods are used conjointly by Mr. Wormald, of St. Bartholomew's Hospital.[1] In 1785, Colombier, of Paris, described the mercurial treatment of syphilitic infants by means of the inunction of their nurses. He alludes to its tendency to derange the bowels of the infants if not used in great moderation.[2]

Calomel and *Blue Pill* are the two forms of mercury most frequently employed in Great Britain and the United States. They both salivate with facility, but in this respect calomel is most objectionable, at least in doses of half a grain to a grain three times a day, united with opium to prevent its acting upon the bowels. Dany[3] prescribed one

[1] Times and Gazette, Nov. 1853, p. 502.
[2] Duncan's Commentaries, xi. 270.
[3] Journ. de Méd. (1846), iv. 203.

grain of calomel with fifteen grains of sugar, divided into six parts, of which one was given every two hours. The cases treated by him were seventy-two soldiers, of whom twenty-eight had primitive chancres, ten secondary syphilis, and thirty-four gonorrhœa. On the last the treatment had no effect, but it cured the others. Simple chancres healed in from twenty-five to thirty-five days, and the indurated and inflamed, in from forty-five to sixty days. The secondary forms of the disease for the most part disappeared in from twenty-five to thirty-five days. In these experiments of M. Dany, which were not exactly according to Law's plan, salivation sometimes occurred. On the whole, the duration of the chancres appears to have equalled that observed in the use of a purely local treatment.

The remoter forms of syphilitic infection are sometimes, but not generally, treated by calomel. Thus Graves,[1] in syphilitic periostitis of the cranium, recommended this preparation to be given in doses of a scruple to a drachm in the course of the day, and to be persisted in, despite of salivation, and the dose even to be increased, until the pains disappeared. It must be confessed that this plan does not commend itself by its apparent safety.

Protiodide of Mercury. The combination of iodine with mercury was first proposed and executed by Odier, of Geneva, in 1814, but was first employed by Biett as an external remedy for syphilis in 1821, and internally in 1826.[2] He thought it was recommended by its comparatively slight action upon the bowels. It has since that time continued to be the favorite antisyphilitic mercurial employed by Cullerier, Ricord, and others, especially in secondary ulcerations of the mucous membrane, cutaneous tubercles, exostoses, and chronic affections of the joints. The following is the mode of administration adopted by Ricord. The protiodide is made into pills of one grain each, and one of these is given daily during the first two or three days of the treatment, and then the dose is gradually increased until it reaches three, four, five, or more pills a day, or until some effect upon the symptoms is discovered. If the medicine does not derange the digestive organs or induce soreness of the mouth, it is continued at the same dose; or if such effects occur, its quantity is diminished. Ricord maintains that the efficacy of the medicine is impaired in the exact proportion of the derangement of system which it causes. The appropriate dose in each case must be determined by its peculiarities. According to Ricord, the requisite duration of the treatment varies between three and six months. In persons of good constitution the former period

[1] Clinical Med., p. 628.

[2] Bull. de Thérap., i. 369.

may suffice, but under opposite circumstances the longer time is required. When the constitution is impaired, however, the action of this as of other mercurial preparations is often pernicious if unmodified by other remedies, such as iron and vegetable tonics, with nutritious food and favorable hygienic influences.

In 1826 Biett extolled the use of the *biniodide* of mercury as an external application. It had still earlier (1822) been employed by Brera, of Padua, as an internal remedy, in doses of one-sixteenth of a grain. In 1836 Gibert claimed for it superior advantages, which, however, he does not appear to have realized.

Corrosive Sublimate. This preparation was first used in syphilis by Matthiolus, and afterwards by the celebrated Sanchez, from whom the mode of administering it was borrowed by Van Swieten. The account given by the latter of the certainty and ease with which it cured, when compared with the revolting and mischievous operation of metallic mercury, mercurial ointment, and other salivant preparations, is highly interesting.[1] In general, it is not found to salivate unless given in doses of at least half a grain twice a day, a fact which, we think, refutes the ingenious chemical hypothesis that has been framed to account for this effect of mercury, and which has been explained in another part of the present article. Van Swieten generally gave a quarter of a grain in spirituous solution twice a day, and found that if the double of this dose was exceeded it was apt to salivate or to excite pain and purging. In England the most favorable accounts of its operation were published by Gordon,[2] Pringle, and Whytt,[3] and more recently it became the favorite remedy of Lagneau and Dupuytren. Gibert, among late writers, gives it the preference over other mercurial preparations,[4] but he regards it as important that it shall be so administered as to moderate its local action upon the stomach, and for this purpose he employs it dissolved in syrups, or, preferably, prescribes it in pilular form with some bitter extract, and always with opium. In London we are told that the daily experience of the Hospital for Diseases of the Skin proves that small doses of the bichloride may be given, without risk of any evil consequences, even at the most tender age. The dose habitually prescribed for an infant of from one to two months is about one-ninetieth of a grain, in solution, three times daily, and it is usually combined with as much laudanum as may be necessary to relieve the extreme restlessness which often attends the disease.[5]

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[1] Commentaries, xvii. 292.
[2] Med. Obs. and Inq., i. 365.
[3] Ibid., ii. 213.
[4] Maladies de la Peau, p. 695.
[5] Times and Gazette, Nov. 1853, p. 502.

Baths of the bichloride have been employed successfully and highly recommended by Wedekind. He used from a drachm to an ounce of the salt in a bath at from 82° to 96° F., for half an hour, or from that to an hour. Meanwhile the affected parts were diligently rubbed with the hand. After the bath the patient was kept warm in bed for an hour, and his sweating encouraged. The effect upon the skin was to produce a general prickling, with redness, and when the baths had been used for some time it grew harsh, the cuticle exfoliated, and the nails assumed a grayish color. In no instance was salivation produced.[1]

Fevers.—Typhoid Fever. The advantages of a purgative treatment in this disease appear now to be well established by the concurrent testimony of physicians in various countries. It reduces the abdominal distension, calms the delirium, and allays the fever; the tongue under its influence grows soft and moist, and very probably it tends to eliminate by the bowels the poisonous cause of the symptoms. Among those who have sought to produce these effects by calomel since the diagnosis of typhoid fever has been sufficiently understood, may be mentioned Ross, Sicherer, Taufflieb, Schoenlein, Fauconnet, Lombard, Serres, Becquerel, and Canstatt. Mr. Ross, indeed, somewhat anticipated the knowledge of this diagnosis in Great Britain. In an article treating of the disease under the name of *typhus hecticus*,[2] he strongly recommends calomel, not as an alterative, which he considered dangerous, nor yet as a purgative, but solely "as a sedative," *i. e.*, in doses of from one to two scruples, repeated three times during the first three or four days of the attack. Administered in this way, it neither salivates, nor purges beyond procuring two or three stools. It is advised, however, that if it do not purge, as it sometimes does not, an aperient should be given, as, for instance, twenty-five grains of jalap with a like quantity of calomel. Mr. R. states his belief that this remedy promotes the healing of the intestinal ulcers, and he states that he employed it nearly one hundred times, and always with perfect safety to the patient. Sicherer, of Heilbronn, treated 640 cases of the disease by full doses of calomel, and lost but 19 of the number. He gave an emetic the first day; on the second, fifteen grains of calomel, producing from seven to twelve stools; and on the third day, the same dose, which occasioned four or five stools only. On the fourth day no medicine was administered, but on the fifth day a dose like the former produced from one to three stools. In this way the typhoid or nervous stage of the disease is said to have been

[1] Beiträge zur Erforschung, &c., p. 103.

[2] Lancet, 1842–3, i. 888, 891.

prevented.[1] Taufflieb has examined this method of treatment very thoroughly, and arrived at important conclusions. These were drawn from a comparative study of 518 cases of typhoid fever occurring during a period of fifteen years. He inferred from his observations that mercurial purges have a peculiar and, as it were, specific power of arresting the progress of the disease. The mercurial action may be primitive or secondary, purgative or sialagogue, but either is curative when established near the commencement of the attack. Out of the 518 cases, 305 were subjected to the calomel treatment before the tenth day of the disease, which was then arrested within two or three days after the administration of the medicine. Its first effect was generally to produce several brown or green, slimy stools, followed by a decided sense of relief. In 230 of the 305 cases, convalescence immediately followed the purgative operation, and in only 12 of them did salivation occur. In 75 other cases, the purging produced no permanent benefit, but salivation took place, and subsequently convalescence set in. Large were more successful than small doses. In 331 cases, the average amount of calomel taken by each patient did not exceed fifteen grains, and in this group the mortality was one in six, while in 187 other cases, where the average doses were five or six grains three times a day, so that each patient took in all from fifteen to sixty grains, the mortality was only one in fifteen. Of the 213 cases which ran their course without either purging or salivation, 165 were, for the most part, mild. In 22, characterized by nervous derangement, and in 26 of an adynamic type, the symptoms were aggravated by the medicine. A portion of the cases used mercury only by inunction, and the salivant action in these, as the purgative action in the others, seemed immediately to precede an improvement in the symptoms. When neither effect was produced the medicine appeared to be injurious.[2] It is impossible, on weighing these results, not to doubt the correctness of the diagnosis in many of the cases, and especially in all of those which are said to have been cut short by the treatment. Typhoid fever cannot be arrested in its course by any medicine or mode of treatment. In all probability, the cases reported to have thus terminated were examples of simple continued fever without intestinal lesion.

Canstatt gives a favorable opinion of calomel in this disease; at least, it procured for him more satisfactory results than other remedies during the epidemics in which he employed it. He says, and here he agrees with Mr. Ross, cited above, and all others who have treated of

[1] Bull. de Thérap., xl. 119.

[2] Bull. de Thérap., xl. 117, 149, 250.

purgatives in typhoid fever, that calomel is only useful when given during the first days of the attack; in the nervous or ataxic stage it is clearly mischievous. He directs from ten to twenty grains for adults and five grains for children and nervous girls, to be repeated twice, thrice, or four times, according to circumstances, and so as to produce two or three stools daily. By the third or fourth day, the stools become browner and more feculent, and then the calomel should be discontinued.[1]

Clarus gives the following as his conclusions from clinical observations of the treatment by calomel in purgative doses. It is useful in the first stage of typhoid fever before the spleen is enlarged, or the intestinal ulcers are formed, and in patients of good constitution with evidences of plethora. It allays the cerebral symptoms, the fever, and the heat of skin, and rather diminishes than augments intestinal irritation.[2] M. Serres combined the use of mercurial friction with the internal administration every second day, of three or four pills each containing four grains of black sulphuret of mercury. Six or seven days usually elapsed before any signs of salivation appeared, upon which the frictions were suspended, and the internal doses diminished one-half. The effect of this treatment is said to have been apparent within three or four days, in the subsidence of the fever, and convalescence was decidedly entered upon between the eighth and the fourteenth days. The patients remained in the hospital from thirty-five to fifty days.[3] The general results here given have been confirmed by Becquerel, who employed the same preparation of mercury;[4] but they do not appear to be as favorable as those obtained by an expectant treatment alone. It cannot be too often repeated, that typhoid fever is a disease remarkably liable to variation of type, so that the treatment which succeeds best in one year is not always the most successful in the following year.

In reference to the specific action of mercury, Dr. Nathan Smith informs us that in many instances he has seen very serious evils arise from it, and he recommends the medicine to be only occasionally used and with opium, for the purpose of checking a colliquative diarrhœa.[5] Dr. James Jackson concluded that mercurials have probably no great influence on the results of typhoid fever.[6] Dr. G. B. Wood, on the other hand, entertains an opinion that mercury given so as slightly to affect the gums, is a very effectual remedy for the dryness of the

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[1] Handbuch der Med. Klin., ii. 577.
[2] Handbuch der Arzneim., p. 818.
[3] Annuaire de Thérap., 1848, p. 172.
[4] Ibid., 1851, p. 187.
[5] A Practical Essay on Typhous Fever, p. 68.
[6] Report on Typhoid Fever, 1838, p. 87.

skin and tongue, with scantiness of the urine, tympanitis, and stupor, which are apt to occur about the ninth day; *i. e.* about the height of the disease.[1] The natural tendency to cure, of many cases of typhoid fever at this stage, is not to be lost sight of. It is the period, we are disposed to think, at which gentle diffusible stimulants and nutriment are best adapted to remove the condition referred to; the period at which that condition is beginning to be established, when the oil of turpentine, proposed by Dr. Wood, finds its earliest, though still a very slight, indication.

Yellow Fever.—Mercury has been exhibited in this disease in two modes, as a cathartic and as a sialagogue. For its former operation, after having been used by Chisholm and other physicians in the West Indies, calomel was adopted by Dr. Rush, of Philadelphia, who employed it more or less during the successive epidemics of yellow fever that he witnessed. During that of 1793, he prescribed it in doses of ten grains with fifteen grains of jalap, to be repeated every six hours until the medicine procured from four to six large evacuations. The effects of this combination, he remarks, "not only answered, but far exceeded my expectations." During the epidemic of 1794, he increased the dose, so that we read of one patient taking one hundred and fifty grains of calomel in six days. In the subsequent epidemics of 1797, '98, and '99, he appears to have confined the administration of calomel to the beginning of the attack, substituting milder purgatives for it afterwards. The modification which Dr. Rush made in his own practice, appears to have been gradually adopted by his imitators, and, at the present day, few can be found to uphold a method which had nothing to recommend it but the authority of a name.

The use of mercurials for their constitutional operation in yellow fever first prevailed in the West Indies, as appears by a reference to the works of Warren, Lind, Maclean, and Chisholm;[2] but it was mainly commended to professional notice by the example and the writings of Dr. Rush. This writer, setting out from a false analogy between yellow fever and bilious remittent fever, concluded that as the method by mercury was—in his opinion—useful in the latter disease, it must necessarily be so in the former. If mercury, as a salivant, were really curative, or generally advantageous, in yellow fever as it exists at present, the fact would form an exception to all those upon which the best considered views of the operation of mercury are taken. The disease is one which, like typhus, tends to produce a dissolution of the blood, whence proceed the gastric and other hemorrhages which mark the

[1] Practice of Medicine, 4th ed., i. 345.

[2] La Roche, Yellow Fever, ii. 660.

grave and fatal cases of the affection. Such a state must, of necessity, be aggravated by mercurials absorbed into the system, and therefore, before adopting them in its treatment, we ought to possess the most direct and positive demonstration of their utility. But no such evidence exists. In cities where the disease frequently occurs, practitioners have long ago, with few exceptions, abandoned the method as worse than useless, and there is now a general tendency manifested to acquiesce in the opinion formerly expressed by Dr. Robert Jackson. He arrived at "the conclusion that mercurial action manifested by an increased discharge of saliva, instead of being a cause which arrests or suspends the disease by its own proper power, is no more than an indication that such suspension has taken place, either by a process inherent in the constitution, or by forcible means of art. Mercury does not act while the disease exists in force, that is, it does not counteract the progress of the morbid cause while action produced by that cause is in progressive activity."[1] This author also denies the assertion made by the advocates of the mercurial plan of treatment, that no one dies from fever after salivation is fully established (p. 289), and subsequent writers have confirmed his observation. Yet it must be admitted that, in the great majority of cases treated by mercury, recovery and the occurrence of salivation have coincided; and, could we be sure, on the one hand, that these cases did not recover, in spite of salivation, and, on the other, that some patients did not succumb in consequence of the mercurial operation on the blood, we might be encouraged to employ the medicine. In the midst of doubts suggested by considerations like these, the part of prudence is probably to abstain from mercurialization in yellow fever, as a general rule. At the same time, this disease is singularly prone to assume a variety of types in different localities and seasons, and it is certainly possible, that among these types, a marked inflammatory one may sometimes occur. Such must certainly have been the cases which endured, and apparently were cured by, the profuse depletions of Rush, Jackson, Moseley, &c. In other epidemics, and especially of late years, depletion has not been tolerated, and the symptoms of the disease have justified one of the names imposed upon it—*typhus icterodes*. In so far as the elements of a typhoid condition are predominant, the utility of mercurials may be, with confidence, denied; but if a sthenic inflammatory state prevail, they will undoubtedly be tolerated, and may, perhaps, be useful.

Bilious Remittent Fever.—The cholagogue action of mercury is in-

[1] A Sketch of the History and Cure of Febrile Diseases, &c., 2d ed., 1820, ii. 288.

voked in this affection to relieve the overloaded liver, as it is in yellow fever to stimulate the non-secreting liver. Leaving unattempted here the task of reconciling these apparent contradictions, let us endeavor to learn whether or not experience has proved mercurials to be useful in bilious remittent fever. In reference to their *purgative* action, it may be remarked that this is generally sought for at the beginning of an attack, by the administration of ten grains of calomel at bedtime, and some saline laxative, or else jalap, on the following morning. But even at this stage such treatment is unnecessary, unless the abdomen is full and hard, the tongue much coated, and the alvine evacuations sensibly disordered. In this disease the real remedy is quinia, and it is much better to obtain its specific operation as soon as possible, feeling assured that then the associated local derangements will be all the more readily removed.

It may be presumed that the employment of calomel as a constitutional remedy in this disease, whether by the daily repetition of slightly laxative doses, or the more frequent administration of still smaller quantities, is still the general practice in some portions of the United States.[1] So far as those forms of the disease are concerned which originate in the Middle States of the Union, we have never found it necessary to prescribe mercurials except as purgatives, relying, for the cure of the disease, upon quinia alone. It is possible that the more inflammatory form of remittent fever met with in southern latitudes may call for a different management. But the excellent reports of Dr. Boling, and several other southern physicians, render this supposition improbable. Moreover, if we turn to the East Indies, whence the calomel treatment first emanated, we shall find that it no longer holds its original place in the medical creed of that country. One of the most eminent of the East Indian practitioners, Dr. Charles Morehead, says:[2] "The practice, at one time too common, of exhibiting calomel in doses of four or five grains three or four times in the course of the day, without any very definite object in view, and continuing it for a succession of days, cannot be too strongly discouraged. Not only is it unnecessary, but, for the following reasons, often positively injurious. In watching the progress of cases thus treated, it is not difficult to detect a train of symptoms much more fairly attributable to the treatment than to the disease, because it is in cases thus treated that this has been chiefly observed. The symptoms

[1] Compare Boling, On Remittent Fever, Am. Journ. of Med. Sci., July, 1846, p. 29; and Dickson, Elements of Medicine, p. 243.

[2] Clinical Researches on Disease in India, i. 202, 206.

to which I allude are uneasy feelings, sometimes amounting to pain, with a sense of oppression or sinking at the epigastrium, and occasionally griping of the abdomen, for which leeches are not unfrequently applied, and purgatives unnecessarily given. The frequent repetition of the calomel keeps up also a foul state of the tongue, nausea and irritability of stomach, aggravates the febrile excitement, and produces an irritable state of the bowels, marked by frequent watery discharges. The convalescence of cases thus treated is always tedious, and frequently complicated with diarrhœa and clay-colored dejections." . . . . "I am of opinion that an endeavor to induce mercurial influence in remittent fever is erroneous in theory and of no value in practice;" not only so but "it is opposed to all rational theory, and very injurious in practice. If it be true that prostration of vital actions and a deteriorated condition of the blood are pathological states to be much dreaded in remittent fever, and if mercury deteriorates the blood and favors prostration, on what principle of reasoning can it be supposed that induced mercurial influence can have any other than an injurious effect on remittent fever?" The author further attributes to the mercurial treatment so long prevalent in that country, the frequent occurrence of a cachexia marked by asthenia, dyspepsia, injured teeth, pains in the sides and loins, foul tongue, constipation, pale fæces, and depressed spirits.

In Inflammations.—For the introduction of mercury into the treatment of inflammations we are indebted chiefly to Dr. Robert Hamilton, of Lynn Regis,[1] who, however, derived it from the East Indian practice of treating acute hepatitis. From observing its effects in this disease, in ophthalmia, and in syphilis, he inferred that it would also be efficacious in the cure of all inflammatory affections. He accordingly employed calomel and opium in the treatment of pneumonia, pleurisy, inflammation of the brain and of the abdominal viscera, and also in puerperal fever and rheumatism. He used depletion at the commencement of the attack, followed by a purgative, and then prescribed from one to five grains of calomel, with from one-quarter of a grain to one grain of opium, every six, eight, or twelve hours, according to the degree of inflammation. At the same time the patient was to take copious draughts of barley-water. It was not until after eighteen years' experience with the remedy that Hamilton published his convictions of its utility, and established a practice which to the present day has scarcely lost ground in the esteem of British and American physicians, although it has been much less generally adopted on the

[1] DUNCAN'S Commentaries, ix. 191. 1764.

continent of Europe. M. Trousseau, after citing illustrations of the antiphlogistic virtues of mercury, remarks: "We have but little reason for surprise at the faith which our insular neighbors have in the treatment of inflammation by calomel. There must certainly be some good ground for the confidence with which so large a number of physicians—English, East Indian, and American—agree in according antiphlogistic powers to mercury, and it is really lamentable that in France so many prejudices should be aroused against this heroic remedy."[1] In Germany, likewise, although of more common use than in France, mercury is still employed with comparatively less frequency than in England and the United States; and, indeed, an occasional disposition is shown to banter the British and American physicians for their mercurial fetichism.[2]

It is not, indeed, very easy to furnish demonstrative evidence of its antiphlogistic virtues; but in therapeutical questions the convictions of competent judges must be allowed, to some extent at least, to acquire the authority which belongs to demonstration in the exact sciences. The convictions entertained of the efficacy of mercury as a remedy for inflammation are very decided and deeply rooted. Dr. Latham thus expresses his own opinion, which may be taken as representing the general sentiment of the profession on this subject. Referring more particularly to phrenitis, peritonitis, pneumonia, and pleurisy, he concludes with these remarks: "The sum of my experience is this, that the acutest forms of these inflammations are arrested more surely and more speedily by bleeding and mercury conjointly than by bleeding alone; and not only more surely and speedily, but by a less loss of blood; in short, that mercury does not supersede bloodletting, but that it aids its antiphlogistic power, and yet spares its amount." It is, then, as an aid to the lancet when bloodletting is called for, and as a substitute for depletion when this cannot be borne, or when the proper stage for its employment has passed away, that mercury becomes useful in the treatment of inflammation.

The question *how* it operates in this form of disease is usually answered by a reference to its aplastic power. The great physical phenomenon of inflammation is an increase of the fibrin of the blood, and the tendency to form fibrinous effusions upon membranes, especially serous membranes, and in the parenchyma of the solid organs. Mercury cures these morbid effects of the inflammatory process, removing effusions, preventing adhesions, contractions, obstructions, &c., which tend to impair the activity and hinder the free play of the

[1] Thérapeutique, 5ème éd., i. 223.

[2] Neumann, Heilmittellehre, p. 285.

organs. We have seen how in animals and men subjected to the prolonged action of mercury the solids of the body lose their firmness and the blood its coagulability, and hence there is every reason to believe that a moderate action of the same substance will tend to remove the unorganized or imperfectly organized products of inflammation. It has been objected to this explanation that the constitutional mercurial action sometimes gives rise to the very plastic formations for which it is alleged to be an appropriate cure. And undoubtedly such is the case. Plastic exudations tend to occur whenever the proportion of fibrin in the blood is increased, whether it exceed the normal average while the proportion of red globules remains unchanged, or whether it is only relatively increased in consequence of the diminished proportion of red globules contained in the blood. Now, it is highly probable, judging from the pallid, anemic aspect of persons who have been thoroughly mercurialized, that their blood has undergone a diminution of its red corpuscles, and consequently there is a reason why such blood should present a buffy coat, like that which is observed under an analogous condition of the blood in pregnant females, and also why the effusion upon inflamed surfaces should assume a plastic form. Again, there are instances in which the primary constitutional action of mercury is to produce a decided erethism, a state of fever which very possibly may augment the proportion of fibrin in the blood. But such an effect is most probably an exceptional one in the degree alluded to, and the more ordinary form of this erethism partakes more of the nature of a nervous than of a true febrile affection. It is very much to be regretted that no analyses of the blood have been made which will permit us to distinguish between the operation of mercury and of disease upon this fluid. These alone would enable us to decide the question what changes the former occasions in the blood. Its defibrinizing power appears to be established by all the phenomena above enumerated. And yet when, in the absence of direct experiment, we invoke the light of analogical reasoning, we are obliged to confess that the operation of mercury, as of all other specific medicines, is involved in obscurity. Scurvy is a disease which bears a very close resemblance in its symptoms to the constitutional effects of this medicine; nevertheless, in its acute form, with hemorrhage beneath the skin and from the mucous membranes, the proportion of red globules, of albumen, and of fibrin does not vary from the healthy standard.[1] To explain the phenomena of scurvy, and those also of mercurialization, it would seem probable that other causes

[1] Becquerel and Rodier, Chimie Pathologique, p. 141.

besides the one referred to must be admitted. Is it a change that takes place in the vital properties of the blood? or one that affects the texture of the solids independently of the condition of the circulating fluid? or do both of these alterations concur to produce the phenomena which result from the administration of the medicine? But, leaving these obscure inquiries, let us endeavor to learn in the treatment of what inflammatory diseases mercury has been found advantageous.

Inflammations of the Serous and Fibrous Tissues.—Meningitis and Acute Hydrocephalus. In cerebral disorders which occur as complications or as sequelæ of febrile, and especially of eruptive diseases, and which commence with the impairment or speedy abolition of the mental faculties, and of the senses of sight and hearing, or in which this condition follows rapidly upon a stage of febrile or nervous excitement, the disease is probably *hydrocephalus internus* produced by a serous condition of the blood, or by tubercles of the pia mater. In such cases, as well as in those more decided ones of tuberculous meningitis which are subacute and gradually developed, mercury can afford but little hope of permanent advantage, and might be suspected of tending to hasten the fatal termination. Yet the diagnosis of these forms of cerebral disease is not so well settled that we should be induced by any supposed accuracy of our conclusions to withhold the only medicine which appears to be materially useful in their management. Two of the earliest cases of the successful treatment of such affections by mercury were recorded by Dr. Leib, of Philadelphia, in 1788,[1] and another, in which the affection was of a less acute type, was soon afterwards cured by Dr. Rush.[2] A very similar instance occurred under the care of Dr. Chambers, of London, who has rendered it probable that even meningitis produced by tubercles may be cured by mercurial medicines.[3] But whenever a febrile affection, apparently of cerebral origin, is marked by convulsions in the forming stage, by severe pain in the head, by morbid susceptibility of the senses, and injection of the face and eyes, there is reason to suppose that *simple meningitis* exists. In cases of this description, mercury is generally employed both as a purgative and for the purpose of producing its constitutional effects. With these objects in view, a full dose of calomel, followed by a saline or other purge fitted to produce copious stools, should be administered; subsequently divided doses of calomel should be given, and at the same time mercurial ointment rubbed into the thighs. Gölis, who has

[1] Trans. Coll. Phys. of Phil., 1793, p. 49. [2] Ibid., p. 147.
[3] Lancet, April, 1858, p. 386.

written very clearly upon this disease,[1] depended chiefly for its treatment upon calomel, given to children of from one to five months old in doses of one-quarter of a grain, and to those of from six months to two years of age, in doses of one grain every two hours, until it produced from four to six greenish, slimy stools. This treatment is not less appropriate to the disease when it occurs in adults. Mercurial purges may be used with great advantage in the first stage; and subsequently, when the excitement has declined, and there is a tendency rather to oppression of the faculties and coma, fractional doses of calomel should be administered, so as to produce, if possible, the characteristic effects of the medicine upon the gums.

Pericarditis. "If," says Graves, "a person is seized with very acute pericarditis, how unavailing will be our best directed efforts unless they be succeeded by a speedy mercurialization of the system," and Dr. Stokes subscribes to this doctrine, advocating the exhibition of scruple doses of calomel, once or twice daily.[2] On the other hand, Dr. Markham, one of the most recent and intelligent writers on diseases of the heart, concludes from his experience that "the actual influence which the remedy possesses over the disease has yet to be shown."[3] There can be no doubt that acute, primary, and idiopathic pericarditis tends generally to cure without the intervention of any active remedies, and hence the practice of prescribing mercurials in such cases can hardly be justified. How far they are required in the rheumatic form of the disease, and in those subacute and chronic varieties of the affection which either do not tend spontaneously to cure, or are likely to terminate in adhesion of the heart and pericardium together, is still an open question, but one in which we are disposed to adopt the affirmative, upon theoretical, however, rather than upon clinical grounds, and under the conviction that whatever temporary inconvenience may ensue from mercurialization, still greater must result from the adhesions referred to, and, therefore, that so grave a consequence should be averted by every available means. If, then, the attack be one of rheumatic origin and a sthenic type, or if, in other cases, the physical signs denote a persistence of the effusion despite of other local and general remedies, mercury should be prescribed, and persisted in until its constitutional effects are developed, and have been sustained for a reasonable time. In *endocarditis*, although the real value of mercury remains to be demonstrated, the wiser, because probably the safer, course is to prescribe it, and that

[1] A Treatise on Hydrocephalus Acutus, Trans. by Gooch, p. 110.

[2] Diseases of the Heart and Aorta, p. 86. [3] Diseases of the Heart, p. 98.

so soon as the existence of the disease is determined. In acute *pleurisy* mercurials are, we think, unnecessary as a general rule, and we can hardly appreciate the propriety of using them. It is right to say, however, that some physicians of high authority are of the contrary opinion. Thus, Dr. Walshe, considers them as not inferior in importance to bloodletting, and uses them both internally and by inunction until a slight amount of mercurialization is produced. In the subacute and chronic forms, a gentle action upon the gums is often attended with a simultaneous subsidence of the effusion, and is generally called for when the patient's feebleness is not a contra-indication.

Peritonitis. In the primary forms of this affection, when general and local depletion have been carried as far as the strength of the patient will permit, and the disease still continues to advance, mercurials both internally and externally should be freely used. This is one of the diseases in which it is difficult to induce salivation, but where it is accomplished the patient usually recovers. In *puerperal peritonitis* mercury has been highly lauded by Chaussier, Laennec, Baudelocque, Velpeau, Gooch, Churchill, and others. Velpeau used inunctions upon the abdomen with two or three drachms of mercurial ointment every two hours, and at like intervals administered two grains of calomel. By this treatment combined with moderate bloodletting, we are assured that he saved fourteen out of the nineteen cases in which it was tried, whereas he cured but four out of sixty cases treated by bloodletting alone.[1] Dr. Meigs, on the other hand, refuses it all confidence, and puts his sole trust in the lancet.[2] Canstatt declares that mercurials are of *as little use as depletion* in this disease;[3] he adds, however, this qualifying statement, that if our expectations of their curative powers are not extravagant, we may place them in the first rank of those few remedies upon which some dependence is to be placed. The probability is that the cases of puerperal peritonitis adapted to the use of mercurials are the same that can bear depletion, while those which more properly belong to the category of puerperal *fever*, and which involve a greater or less diminution of the coagulability of the blood, are with still more certainty unfit either for depletion or mercurialization.

Rheumatism. Of all the remedies which can be used in *acute* rheumatism, none is entitled to less confidence than this. It exerts no control over the disease itself, and if pushed to the extent of making

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[1] Archives Gén., xix. 535.

[2] On Childbed Fevers, p. 289.

[3] Klinik, iv. 1003.

the mouth sore, is apt to occasion great debility and exhaustion. It does not prevent the occurrence of the serous inflammations which are apt to complicate rheumatism, but it does, by prematurely occupying the ground, deprive the physician of his best resource against these inflammations when they are actually developed. Yet it is proper to state that Hamilton, Hope, and J. Johnson, advocate the mercurial practice in this disease, while Dr. Copland's opinion resembles that which we have above expressed. In the subacute and chronic forms of the affection a very gentle and sustained mercurial action will sometimes put an end to the lingering stiffness of the joints, the persistent thickening of the ligaments, the periosteal swellings, and the muscular and neuralgic pains which become particularly severe during damp weather. For this purpose very minute doses of the bichloride, in syrup of sarsaparilla, will be found most appropriate.

Inflammations of the Parenchymatous Organs.—Pneumonia. Since it has been ascertained that in the great majority of cases simple acute pneumonia does not require active treatment, the use of mercurials in this affection has greatly diminished. Dr. Walshe says, "mercurials appear to me to be desirable in those cases of pneumonia only, where, for some cause or other, antimony is inadmissible;"[1] and Grisolle, in his classical work on this disease, describes its treatment by calomel and opium as a method employed by English physicians, but adds that he has never seen it used, or resorted to it himself, and, indeed, would not venture to employ it.[2] In France, generally, and also in Germany, mercury is seldom used in the cure of pneumonia except as a purgative. Among English and American physicians it is more commonly employed, but of late less extensively than in former times. Dr. West recommends it in those cases among children where the symptoms are not violent enough to require very large doses of antimony, or where the stage for administering this medicine advantageously has passed by. In graver cases, attended with bronchial respiration he advises it in addition to depletion and tartar emetic.[3] Dr. J. F. Meigs uses it sparingly and seldom;[4] and Rilliet and Barthez look upon it as unnecessary, in the primary as well as in the secondary forms of the disease, as it occurs in children.

Acute Hepatitis. According to Annesley,[5] next to local and general depletion calomel should be employed, but only as a purgative and with anxious care to avoid its constitutional effects, the latter tending

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[1] Diseases of the Lungs, &c., 2d ed., p. 436.

[2] Traité Pratique de la Pneumonie, p. 678.

[3] Diseases of Infants, &c., p. 270.

[4] Diseases of Children, 2d ed., p. 171.

[5] Diseases of India, p. 423.

to impair the vital energies and to keep up the excitement and irritative action in the inflamed parts. Twining's precept agrees with this in substance. He recommends ten grains of calomel with six of the compound extract of colocynth and four of extract of hyoscyamus to be given every night, followed the next morning by the compound powder of jalap or the infusion of senna with salts, and the daily inunction of half a drachm of camphorated mercurial ointment upon the right hypochondrium.[1] Mr. J. R. Martin[2] thus explains the virtues which he attributes to mercury "in all the more acute hepatic affections of India." "It is, in fact, by this very double action of purging and increasing secretion at the same time that calomel relieves the loaded and inactive vessels of the diseased gland, not to speak of the other acknowledged physiological influences of the mineral, such as its increase of all the secretions and excretions of the body; its influence on the capillary circulation; its febrifuge effect; the peculiar specific power attributed to it by physicians and surgeons as an antagonist to inflammations, whether general or local; its stimulant power over the absorbent functions; its power of unloading at the same time that it gives a new impulse to the vascular system; its peculiar power in removing viscid and tenacious intestinal secretions; its antiphlogistic, solvent, and alterative effects on the blood—these are the actions and uses ascribed to mercury by the ablest British practitioners and authors, and they are such as to place this remedy second only in order of importance to bloodletting in all the more acute hepatic affections of India." Dr. Morehead, taking a similar view of the action of the medicine, advises it to be given essentially after the manner of Annesley and Twining.[3] He says: "Its usefulness and the propriety of repeating it once or twice will be in proportion to the sthenic state of the constitution, the recency of the attack, and the evidence of coexisting sluggish movement of the portal blood, with a deranged state of the biliary secretion. And what are the evidences of these derangements? 1st. A yellow-coated state of the tongue, there being no irritation of the mucous lining of the mouth to account for it. 2d. Scanty alvine discharges, whether dark or pale. 3d. General fulness of the upper part of the abdomen, with, it may be, the physical signs of liver enlargement. 4th. A dingy state of the skin and scanty, high-colored urine." These indications are likely to be present only during the early stages of the disease and in systems

[1] Diseases of the Liver and Spleen, i. 251–2.

[2] See his edition of Johnson's work on The Influence of Tropical Climates, 1856, p. 267.

[3] General Researches on Diseases in India, ii. 74.

well supplied with blood. In advanced stages and in cachectic constitutions the means recommended are no longer applicable; among the objections to them is their tendency to excite dysentery, and, as a further consequence, abscess of the liver. The caution required in the administration of mercury with a view to its constitutional action in hepatitis is shown by all experience to be very great, at least in warm climates. The repeated use of this medicine is known to induce a permanent derangement of the hepatic function, with disordered digestion and impaired general health, and, in the opinion of many, promotes the development of hepatic abscess;[1] hence it appears now to be established as a rule of practice to administer no more of it than is necessary to produce slight ptyalism, during the early stages of the disease alone, and provided that depletion and purgation have failed to subdue the symptoms. If abscess of the liver should occur, or seem to be threatening, the further use of mercury in any form is contra-indicated. When the abscess exists, most writers agree that it is a matter of great difficulty to bring the system under the mercurial influence.

Chronic Hepatitis. In this affection, when the liver is enlarged, tender upon pressure, sometimes indurated, and its secretion scanty, it is usual to administer mercury both as a purgative and for its constitutional effects. But such treatment will only aggravate the disease, unless it be purely of inflammatory origin. Supposing this to be determined, great circumspection must be observed in the use of the remedy, and, if persisted in, other appropriate means should be conjoined with it to sustain the strength and give activity to the functions of the skin, intestine, and kidneys.

Chronic Functional Derangements of the Liver, attended with "a muddy or yellowish cast of countenance, a heavy expression of the eye, and a dirty yellow tinge of the tunica albuginea, pale or dark and offensive stools, epigastric oppression and fulness, loss of flesh and strength, a feeble pulse, and depressed spirits," were treated by Annesley and by his numerous imitators with calomel at night and a purgative draught in the morning until the stools assumed a healthy appearance, when blue pill at night and a laxative in the morning were substituted for the stronger medicines, to be in their turn followed by tonics. So far as the symptoms above detailed denote functional disorder of the liver, it may be asked whether the repeated administration of mercurial purges was necessary for their removal? Their treatment by these agents is almost exclusively confined to

[1] WARING, On Abscess in the Liver, Trevandrum, 1854, p. 200.

British physicians and their imitators in this country, with too many of whom derangement of the liver, whether by excess or deficiency of secretion, is habitually treated with mercury, as if this medicine were endowed with a special power of righting all the wrongs that can afflict the biliary organs. This irrational system has been reprobated in terms of just severity by several writers, among whom Saunders, Abercrombie, Holland, and Thomson may be mentioned. Even Mr. Twining pointed out the absurdity, in cases of jaundice supposed to depend upon obstruction of the common duct of the liver, of giving a medicine whose operation is presumed to consist in exciting the secretion of bile. Dr. Prout compares the habit of taking mercury for supposed torpor of the liver to the habit of dram drinking. As the stomach accustomed to ardent spirits will scarcely tolerate any weaker beverage, so the liver accustomed to the stimulus of mercury will hardly respond to any other influence.[1] The habit of taking mercury occasions biliary attacks or hepatic congestions, renders liable to catching cold on slight exposure, and sometimes is the immediate cause of developing phthisis. Dr. Prout goes so far as to say that a large proportion of the most inveterate dyspeptic and urinary diseases which he had seen were distinctly referable to the abuse of mercury. In the greater number of chronic affections of the assimilating organs, if the patient has not been accustomed to mercury, he will recover quite as well without it. These affections are cured, at the least, as perfectly in France and Germany without mercury as they are in England and America by its means, or in spite of it.

Among the functional hepatic derangements to which the preceding remarks apply, is that disorder known as a *bilious attack*, and which presents more or less of the following symptoms, viz: nausea, headache, foul tongue, a bitter taste in the mouth, bilious diarrhœa, a muddy or even yellowish complexion, and some fever. For these symptoms it is customary to prescribe brisk purging with calomel and salts, but it is probable that the latter medicine alone would be amply sufficient. The same may be said of that *increased secretion of bile* which is apt to occur in those who are becoming acclimated in warm latitudes, and which is also met with, to some extent, during the hot summers of even the middle portions of the United States. *Defective secretion or excretion of bile* is a more frequent derangement, which, besides depending upon various organic diseases of the liver and adjacent organs, may arise from functional derangement. But, so far as hepatic secretion is concerned, this is much more generally diminished

[1] Stomach and Renal Diseases, 4th ed., p. 54.

under the influence of general than of local causes, and very often in consequence of the double operation of an anemic condition of the system, and such abstinence from nutritious food as leaves the liver without its normal stimulus to secretion. Under such circumstances, mercury is contraindicated. But even when general constitutional defects cannot explain the absence of bile in the dejections, the use of mercury is still to be sparingly resorted to for its restoration. "Its frequent use, in any case, may lead to much mischief. When the liver has been accustomed to the stimulus of mercury, no other medicine will sufficiently excite its action. The person is thus led to the habitual use of the medicine, and, after a time, the constitution is undermined by it. . . . It increases the activity of the liver, at first, but seems to leave it weaker than before, and, if frequently resorted to, the nutrition of the patient, impaired by the original disease, is still further impaired by the drug."[1] In all such cases, the best medicine of its class is taraxacum, alone, or in conjunction with nitro-muriatic acid.

Jaundice. It is to be supposed, in the present state of our knowledge, that jaundice depends either upon some impediment to the flow of the bile into the duodenum, or to its defective secretion. Over the latter, mercury is not proved to exert a favorable influence. The former condition, in so far as the obstacle is purely mechanical, such as a gall-stone, a tumor, closure of the duct, or the like, is equally beyond the power of this medicine, but where it is produced by a congested state of the liver, and the object is to unload the portal circulation, depletion and saline purgatives are preferable to calomel. But if, in spite of these remedies, the symptoms are not wholly removed, mercurial purges should be added to the treatment, and small doses of blue pill with aloes or rhubarb, given so as very gently to maintain an action upon the bowels.

Chronic Enlargement of the Spleen. Twining noticed that patients who are suffering from this affection are generally liable to be affected in the most unfavorable manner by mercury; the immediate effects being profuse salivation and destruction of the soft tissues of the mouth followed by caries, and the remoter consequences being permanently injured health, or a broken and ruined constitution.[2] This singular susceptibility renders the duty imperative to abstain from the administration of mercury in cases of hepatic disease complicated with enlargement of the spleen. The same evil influence had been noticed by earlier observers. Dr. Crane, who practised in the fens of

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[1] Budd, Diseases of the Liver, p. 266.

[2] Diseases of Bengal, i. 452.

Lincolnshire, says: "Mercury does not appear to be at all beneficial in enlargement of the spleen."[1] Dr. Vetch, also, speaking of this affection, remarks that any continued course of mercury renders the patient less capable of regaining that general tone of the system, the want of which forms the principal obstacle to his recovery.[2] Leue, of Berlin, called attention to this peculiarity in 1825; and, just before, Abercrombie remarked that attempts to reduce chronic enlargements of the spleen by mercury are generally followed by the worst consequences.[3] Mr. Henderson, in his observations on the diseases of natives of Hindostan, says that in enlargement of the spleen, mercury easily produces ptyalism to an alarming extent, and so readily that gangrene and death have been the result of a few doses of blue pill.[4] Finally, Mr. Martin remarks that mercurial remedies in enlargement of the spleen and its coexisting cachexia, are distinctly and grievously injurious, and that they should never be used.[5] This cachectic and anæmic condition of the system should be treated by tonics, and particularly cinchona and iron.

A curious statement has been made respecting the virtues of biniodide of mercury in *goitre*. It appears that this affection is extremely prevalent in Bengal, and not less than 60,000 persons are said to have been treated according to the method of Captain Cunningham, and with scarcely a case of ill success. An ointment prepared with three pounds of lard, and nine drachms of biniodide of mercury, is applied to the goitre, and rubbed in for about ten minutes. This operation is performed early in the morning, and the patient is obliged to remain with his goitre exposed to the sun the whole of the day, if he can bear it so long. About two o'clock in the afternoon, a second application of the ointment is made very tenderly, and the patient is dismissed with the injunction on no account to remove any of it until after the third day. This treatment is stated to be quite sufficient for an ordinary cure.[6]

In *nephritis* there is no especial indication for mercurials. They are used as other laxatives are to keep the bowels free, but with no particular advantage except over the neutral salts, which render the urine more irritating. Mercurial inunctions of the loins has been recommended, but its value is not determined. In *albuminuria* and *diabetes* the use of mercury is sedulously to be avoided. In *metritis*,

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[1] Edinb. Med. and Surg. Journ., April, 1823, p. 245.
[2] Lond. Med. and Phys. Journ., li. 445.
[3] Edinb. Med. and Surg. Journ., April, 1824, p. 9.
[4] Ibid., July, 1825, p. 34.
[5] Op. cit., i. 71.
[6] Dublin Quart. Journ., Nov. 1857, p. 500.

both of the acute and chronic forms, but in the latter more especially, calomel and opium are sometimes resorted to with advantage. Allusion is not here made to the puerperal form of the disease, which is usually complicated with peritonitis, and which has been elsewhere discussed in reference to the mercurial treatment.

Iritis. This disease is usually taken to illustrate the antiplastic effects of mercury. The fibrinous effusion is often visible in the affected eye, and its rapid subsidence under the action of mercury can be distinctly traced. This is strikingly the case in the rheumatic and syphilitic forms of iritis. A caution is to be given as to the former, that the mercurial impression, directly favorable as it is, exposes the patient to relapse by increasing his susceptibility to cold, already exalted by the rheumatism. The dose usually prescribed is from one to two grains of calomel, with a quarter of a grain of opium, every six hours, until some slight impression is made upon the mouth. In syphilitic iritis it is generally necessary to carry the mercurial action further. At the same time mercurial ointment, with extract of belladonna, may be rubbed around the orbit, morning and evening. In gouty and in scrofulous iritis, mercury must be more cautiously employed, and generally in conjunction with other remedies, tending, in the former case to eliminate the gouty matter from the system, and in the other, to fortify the constitution by tonics, and especially by bark an iron. Owing to the favorable influence of mercury on iritis being so plainly manifested, the medicine has come to be regarded as a specific without which iritis cannot be cured. But some proof of the contrary has recently been produced by Dr. H. W. Williams, of Boston, who reports sixty-four cases, including idiopathic, traumatic, rheumatic, and syphilitic iritis, cured without mercury.[1] A review of the report, while it shows that iritis may in the majority of cases get well without mercury, leaves also upon the mind a distinct impression that in nearly all the cure would be hastened and perfected by this medicine.

Inflammation of the Mucous Membranes.—Whether or not it be owing to the belief, so generally entertained, that the antiphlogistic powers of mercury depend upon its antiplastic operation, and hence that it is inappropriate to the cure of all inflammations which do not tend to fibrinous effusion, the fact is that in practice it is seldom employed, except as a purge, in inflammations of the mucous membrane which are not of the pseudomembranous form. To these the following remarks will be chiefly applied.

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[1] Boston Med. and Surg. Journ., Aug. 1856, pp. 49, 69, 92.

Croup, or Pseudomembranous Laryngitis. According to Cadwalader Colden,[1] "dulcified mercury" was used as early as 1736, by Dr. Douglas, of Boston, in a "throat distemper," which, from the description, appears to have been pseudomembranous inflammation of the pharynx and larynx. But this physician does not seem to have attached much importance to it in comparison with gentle diaphoretics. Dr. Bard, of New York, was the first to use *calomel* in croup, during an epidemic of the disease in 1771. Currie states that it was employed by Dr. Thomas Bond, and several other American physicians, as early as the year 1772, in the malignant sore-throat.[2] A few years afterwards (1781), Dr. Bayley, of New York, used it with advantage in the same disease, although he depended more upon bloodletting and emetics. Currie, who wrote in 1811, remarks that he conceives the mercury to act by causing the false membrane to be detached, so that it is more readily expelled by coughing, or by means of emetics, which he recommends to be given for this purpose. And thus, in a few words, he expressed, as we believe, the whole doctrine of the utility of mercurials in croup. The remedy was also strongly recommended by Kuhn, Redman, Stearns,[3] Hosack,[4] and Physick.[5] From America the use of the remedy speedily extended to England, where it was particularly advised by Hamilton and Cheyne,[6] and to the continent of Europe, where it sustains its reputation even to the present time. In Germany its value was recognized by Albers,[7] Goelis,[8] Schenck,[9] Hufeland,[10] Autenrieth, &c., and in France, by Bretonneau,[11] Billard, and, more recently, by Guersent.[12] Too generally the real indication for the use of this medicine in croup has been lost sight of, and it has been applied when the advanced stage of the disease has rendered it, at the least, unavailing. Even at the present day this method, which we believe erroneous, is the one generally recommended. Canstatt[13] refers to mercury as a remedy of only doubtful efficacy, and prescribes it after the failure of other means; and Dr. West remarks, it is "after the severity of the disease has been subdued by antimony, that the

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[1] Med. Obs. and Inq., i. 211.
[2] A View of the Diseases, &c., p. 109.
[3] Coxe's Med. Museum, v. 195.
[4] Essays, ii. 159.
[5] Rush's Works, ii. 227.
[6] Pathol. of the Membrane of the Larynx and Trachea, p. 46.
[7] Comment. de Tracheitide, p. 129; Path. u. Ther. der Kehlkopfkrankheiten, p. 86.
[8] Tractatus de Angin. Memb. (1813), p. 114.
[9] Valentin, Récherches sur le Croup, p. 607.
[10] Enchiridion Med., art. Croup.
[11] Rilliet and Barthez, Mal. des Enfants, i. 352.
[12] Dict. de Méd., ix. 374.
[13] Med. Klinik., iii. 2, p. 78.

time has come for the administration of calomel." It is true that he also says, mercurial inunction may be had recourse to from the very commencement of the attack, but he adds, "The action of mercurials is far too slow to overtake a disease which tends so rapidly to a fatal issue."[1] We are persuaded that, however slow, it is still the most efficient auxiliary to the true remedies in this disease, viz., mechanical emetics, because, as Currie remarked, it alone can promote the loosening of the false membrane on which the danger mainly depends, and thus favor its rejection by the operation of emetics, or by coughing. This view of its mode of action was also entertained by Bretonneau and by Albers. It is, moreover, highly probable that the defibrinizing action of the remedy upon the blood may limit, and even arrest, the formation of false membrane. On every ground, therefore, it appears to be urgent that the system should be brought under the mercurial influence as early as possible, both by inunction and by the internal use of calomel. Certainly, it must not be concealed that in feeble and cachectic children, there is danger of producing ulceration of the mouth, and general debility, if too large doses are employed. In these cases, therefore, it should be withheld. It would also, perhaps, be prudent not usually to exceed the dose of half a grain of calomel every hour, for children under two years of age, nor of one grain every hour, for those beyond this age, until twenty or thirty grains are taken. This was the method of Albers. A scruple of mercurial ointment may also be rubbed into the thighs, or the sides of the chest, two or three times a day. Bretonneau employed much larger doses of mercury than these, viz., four grains of calomel every hour, and half a drachm of mercurial ointment, by friction, every three hours.

The *subsulphate of mercury*, or *turpeth mineral*, which is employed in France as an emetic for quadrupeds, has been recommended by Dr. Hubbard as a remedy for *spasmodic croup*. He advised that two or three grains of the powder be given to a child two years old, and repeated every ten or fifteen minutes until emesis takes place. It acts promptly and maintains its action for an hour or longer. Dr. H. thought that it was more active than ipecacuanha, and safer than antimony, inasmuch as it does not produce as great prostration as the latter, and seldom acts upon the bowels. He never knew it to operate violently or to produce salivation.[2] It is nevertheless capable of producing poisonous and even fatal effects.[3]

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[1] Diseases of Infants, &c., 3d ed., p. 299.

[2] BRAITHWAITE'S Retros., xiv. 134.

[3] Vid. supra, p. 802; also GMELIN, Apparat. Med., Part II. vol. ii. p. 177.

In cases of *simple acute laryngitis*, when the symptoms are of a high grade, it may be prudent to administer mercurials, first as purgatives, but afterwards in divided doses, and in combination with tartar emetic and opium. But the chief resource in this case is bloodletting. Mercury is a highly important remedy in *ulcerative laryngitis* of syphilitic origin. Theoretically, it would also appear to be indicated in *plastic bronchitis;* but there is no evidence of its utility in this affection.

Dysentery. The benefits of mercurials in this affection are said to have been first pointed out by Pringle, in 1768, since which time they have been highly esteemed by McGrigor, J. Johnson, Fergusson, Bampfield, Annesley, Latham, and other British practitioners, some of whom practised at home, but the others had met with the disease in tropical climates. The latter employed very large and repeated purgative doses of calomel, while the former, for the most part, relied upon the alterative operation of the medicine. The treatment of dysentery by large and repeated doses of calomel appears to have originated with Annesley.[1] In the first stage of the disease he gave scruple doses of it at night, and a cathartic draught on the following morning. His *theory* was that the restoration of the bile to the fæcal discharges tended to remove the disease. Whether the practice in itself did more harm or good, cannot be inferred from his statements, since along with this already active treatment, he often exhibited, three or four times a day, three grains of calomel with as much ipecacuanha, and one grain of opium, besides using general and topical bleeding, warm hip-baths, poultices to the abdomen, and small anodyne and emollient enemata. This treatment, we are told, does not at present find much acceptance in practice in any part of India, but has fallen into disuse,[2] but we learn from the same authority, that the proper treatment of acute dysentery during the first two or three days of the disease, and in persons of good constitution, consists—after bloodletting—in giving, at bedtime, ten grains of calomel with one or two grains of ipecacuanha, and the same quantity of opium, to be followed the next morning by one or two tablespoonfuls of castor oil. These medicines are to be repeated twice or thrice if necessary. Essentially the same rules are laid down by Mr. Martin, as they had originally been by Dr. Johnson.[3] Dr. Morehead and Mr. Martin both deprecate the induction of the mercurial influence in dysentery, and inform us that, "as a rule of practice in India, it has been generally and certainly most properly abandoned." It is possible that time may work a still fur-

[1] Diseases of India, p. 434 et seq.
[2] Morehead, op. cit., i. 556.
[3] The Influence of Tropical Climates, 1856, p. 234 et seq.

ther revolution in the views of East Indian practitioners upon this subject. This change of sentiment was foreshadowed long ago by Mr. Twining, who used the following language: "Notwithstanding all that has been written in praise of the general employment of large and repeated doses of calomel, in the dysentery of India, whether that medicine be used to the extent of producing salivation or not; it will be easy to show that calomel is often not only useless, but that in many cases of the dysentery of Bengal, it is exceedingly injurious. I speak without hesitation on this subject, from having too often seen the fallacy of trusting generally to the effects of calomel, for the cure of the severe forms of acute dysentery; and having tried that medicine extensively in every stage of the disease."[1]

In the more temperate climates of the West the treatment by large and repeated doses of calomel at one time found numerous imitators, but among recent writers few of note are to be found as its advocates. An exception, perhaps, occurs in the case of Canstatt, who asserts, upon the ground of direct experience, that mercury is one of the most powerful remedies for dysentery, often rapidly ameliorating or notably shortening its attack. He prefers giving doses of ten or twenty grains once or twice a day, repeated two or three times if the tenesmus and bloody stools continue.[2] A French army physician, Dr. Cambay, furnishes an interesting account of his experience with this treatment in Algeria, and concludes by stating that he employed it successfully in about two hundred cases, reposes great confidence in it, and advises practitioners in hot climates to adopt it.[3]

In reference to the use of fractional or small doses of mercury in the treatment of dysentery, we find that Mr. Fergusson, in the Peninsular campaigns of 1809, employed with great success half-grain doses of calomel, with a grain of ipecacuanha in each powder, every hour until the mouth became sore. This treatment was successful, not so much in mild cases which a slight purgative or an active diaphoretic sufficed to terminate, but in attacks which began with urgent and violent symptoms. He employed no opium, but expressly avoided its use on finding that it counteracted the benefits of the mercurial.[4] A similar practice was adopted, with equally favorable results, by Dr. Mayne, of Dublin.[5] Sir Jas. McGrigor found mercury of especial service in dysentery when there existed diseased action of the biliary system, particularly the obscure symptoms of chronic hepatitis, which, he declares, mercury never fails to cure, or at least relieve, where the

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[1] Diseases of Bengal, 2d ed., i. 100.
[2] Med. Klinik, ii. 499.
[3] De la Dysenterie (1847), p. 572.
[4] Med.-Chir. Trans., ii. 180.
[5] Dublin Quart. Journ., vii. 303.

disease tends to become chronic, and when it is complicated "with obstruction of the mesenteric glands." In all cases of the acute form he preceded the special treatment with depletion, both local and general, after which, or without it in the less acute cases, he directed small doses of calomel and opium to be given, or mercurial inunction to be employed, until the mouth became slightly affected.[1] Illustrations of the same views might be multiplied; but it is unnecessary, after presenting those which show that the remedy is deserving of a certain degree of confidence, to do more than remark that dysentery is a disease curable by a great variety of methods, which become appropriate or the reverse according to the epidemic constitution and the peculiarities of the patient himself, and that as a general rule, applicable in all climates, the milder treatment of the disease will usually prove the most successful.

Epidemic Cholera.—Annesley[2] gave a scruple of calomel, with two grains of opium, at the commencement of the attack, and repeated the dose in six or eight hours, and again upon the following day. In the decline of the disease he ordered scruple doses of calomel for the removal of "a cream-colored, thick, viscid, and tenacious matter exactly like cream cheese, which glues the gut together, and obstructs its passage." Three, four, and even five scruples of calomel were usually taken before this effect was produced. When it is added that this practitioner held depletion to be the capital element of the treatment, and that he was equally lavish of his patients' blood and his own calomel, we can only wonder that any subjects of his heroic plan survived. A late writer on disease in India omits nearly all allusion to this extraordinary method, and even speaks of his having formerly used moderate doses of blue pill as a work of supererogation.[3] It is now conceded that mercurials, in their ordinary mode of exhibition, are less than worthless in epidemic cholera; but there is another method, proposed by Dr. Ayre, of Hull, in 1832, and to which he still adheres. It consists in administering one or two grains of calomel every five or ten minutes, and in perseveringly continuing the same dose at the same intervals of time. One or two drops of laudanum are given with each of the first few doses of the calomel. Certainly the apparent results of this method are more favorable than those of any other. In the reports to the London College of Physicians its success was rated much lower than it should have been, in consequence of its results being confounded with those in which calomel was used

[1] Med.-Chir. Trans., vi. 430.

[2] Op. cit., p. 187.

[3] Morehead, op. cit., i. 412.

in larger doses, or at longer intervals, or associated with opium, with stimulants, &c. In a disease of such formidable symptoms as cholera there is a strong temptation to use vigorous treatment, and a great deal of it, and hence the simple method of Dr. Ayre has been less generally employed than its success entitles it to be.[1]

Intestinal Worms.—It has been remarked elsewhere that mercurial vapors are generally fatal to insects and other organisms of a low grade, and hence, probably, has arisen the belief that mercury is adapted to destroy intestinal worms. But, as Brera has remarked, the workers in quicksilver at Almaden, Idria, Chemnitz, and Freiburg are peculiarly subject to verminous complaints.[2] But it is true, on the other hand, that lumbricoid worms, and also ascarides, are sometimes voided and permanently removed during a course of mercury.[3] Dr. Rush styled calomel "a safe and powerful anthelmintic," but remarked that, to be effectual, it must be given in large doses.[4] The usual mode of administering it is in association with jalap. One of the best and most certain cures for ascarides of the rectum is to introduce into the bowel daily, at bedtime, a small portion of mercurial ointment. A solution of the bichloride of mercury (gr. $\frac{1}{4}$ to gr. j in four ounces of water), used as an enema, answers the same purpose.

Metallic Mercury in Ileus.—In 1853 a Tuscan physician, Franceschini by name, published a memoir advocating the use of metallic mercury in obstruction of the bowels. Certainly he shows that it has succeeded in removing simple fecal accumulations. From fourteen cases of its administration in various intestinal affections he concludes that it always arrests the vomiting attendant upon them, and that it never does harm by its local action, and never produces ptyalism. The quantity administered was between six and twelve ounces, in three or four doses, and in the course of five or six days.

Mercury was at one time proposed as a remedy for *tetanus*, but, as Mr. Curling shows, it has, on the whole, been disastrous instead of useful,[5] or, as Mosely remarks, it has "killed more than it has cured." In acute *lumbago* Graves strongly recommended the induction of mercurial sore mouth by the administration of small doses of calomel and morphia, when the usual antiphlogistic remedies had failed to give relief.[6] But the iodide of potassium is to be preferred.

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[1] Compare Reports on Epidemic Cholera, by Drs. Baly and Gull, Lond. 1854; and Letters from Dr. Ayre, Lancet, Oct. 1853, p. 321; ibid., May, &c., 1854, pp. 536, 562, 591; Oct., p. 311; Shearman, ibid., June, 1854, p. 651; Taylor, Aug. 1854, p. 167.

[2] On Verminous Diseases, by J. G. Coffin, p. 212.

[3] Oesterlen, Heilmittellehre, p. 116.

[4] Med. Inq. and Obs., i. 213.

[5] A Treatise on Tetanus, p. 140.

[6] Clinical Medicine, p. 865.

External Use.—Besides the therapeutical applications of mercury as an internal medicine, which have been considered, there are many of a local and external sort, in which, for the most part, the mercurial acts as a stimulant, as an irritant, or even as an escharotic. The preparations of this nature are all super-salts. In some cases the milder forms of the medicine are used, on account of their supposed antiphlogistic action; in some the specific power of mercury over the insects which infest the human body is invoked; and, finally, in some others a local action upon the skin, and a general one upon the system, is obtained in certain diseases which affect the whole body, but have their chief manifestation in cutaneous eruptions.

Diseases of the Skin.—It has been stated in another place that mercury was first of all used in these affections, and it still constitutes a very important portion of their treatment. Rayer recommends for *psoriasis* an ointment of *calomel* (calomel ʒj, lard ℥j), which, he says, never produces salivation.[1] Gibert, on the other hand, declares that it often salivates, and therefore requires to be used cautiously.[2] This writer recommends a solution of fifteen grains of corrosive sublimate in a pint of water as a desiccative lotion when the skin is red and excoriated by chronic *eczema;* and as a discutient of the red spots and pustules of *couperose*, and of the papules of *lichen*. Mr. Paget uses a wash of the bichloride (gr. j to ℥j) for the removal of "*liver spots*" (chloasma). It should be applied to the whole affected surface once a day. Mr. P. declares that it nearly always removes the discoloration, and that promptly.[3]

Baths of corrosive sublimate, proposed first by Baumé, have been highly recommended by Wedekind, who directed half an ounce of corrosive sublimate and one of muriate of ammonia for a bath, particularly in cases of *syphilitic eruptions* of the skin. Rayer speaks of their efficacy as doubtful; but Trousseau[4] pronounces them to be wonderfully efficacious in non-syphilitic as well as in venereal eruptions. Besides their curative operation, he remarks, these baths exert important influences upon the skin, and indeed upon the whole system. At first they occasion heaviness of head, and often an irresistible tendency to sleep; sometimes a sense of constriction in the stomach, with slight colic, occasionally followed by vomiting and diarrhœa. These symptoms cease after the first few baths, and are sometimes succeeded by an eruption upon the skin of the lower extremities, resembling *lichen agrius*, and giving rise to itching and burning. A continuance

[1] Bull. de Thérap., xxxii. 281.
[2] Maladies de la Peau, p. 511.
[3] Times and Gaz., 1853, ii. 501.
[4] Thérapeutique, 5ème éd., i. 229.

of the baths is very apt to augment these symptoms. These statements show plainly that the efficacy of the baths does not depend entirely upon their local operation.

Lotions of bichloride of mercury may be substituted for the baths in diseases of a local character. Numerous specifics for eruptions of the face, which are sold by perfumers, contain this preparation. *Gowland's lotion* is one of the most celebrated of these; in it the excipient is formed by an emulsion of sweet or bitter almonds.

Mr. Wardrop refers to a case in which a solution of corrosive sublimate was applied successfully to remove a *corn*.[1]

Ulcers, whether syphilitic or not, are often improved by mercurial dressings, when indolent, flabby, and in need of stimulation. For this purpose powdered calomel, white or red precipitate ointment, black or yellow wash, citrine ointment, solution of pernitrate of mercury, &c., may be employed. Care must be taken lest by extent of surface, or frequency of application, or, finally, by the strength of the preparation used, the constitution become affected. In some forms of skin disease which are obstinate by nature or by the accidents of the case, these preparations are often of signal service, e. g. *lupus*, and very limited eruptions of *psoriasis*. In the treatment of *acne simplex* one of the best applications is a lotion containing a grain of corrosive sublimate to five or six ounces of water and a fluidrachm of alcohol or Cologne water. (*Rayer.*) M. Hardy has used for the same affection an ointment composed of one part of protiodide of mercury to thirty parts of lard, and in the more chronic and obstinate forms an ointment made with equal parts of the deutiodide of mercury and lard. The latter is, however, too caustic in its action, and even the former occasions smarting, and its application is followed in two or three days by exfoliation of the epidermis.[2] Dr. Fuller treats *favus* of the scalp by cutting the hair short, and, after thoroughly washing the skin with soft soap twice a day, applying equal parts of unguentum hydrargyri ammonio-chloridi, and unguentum picis liquidæ.[3] The *nitrate of mercury* has been much employed as a caustic in cases of *ulceration of the neck of the uterus*, by Eméry, Lisfranc, and Bennett.

Red precipitate, citrine, and other ointments and mercurial solutions, have been long and are still used in a great variety of *inflammations of the eyes*, whenever, indeed, the exterior of the organ requires stimulation to promote its cure. This indication is most usual in the various forms of chronic conjunctivitis, and of inflammation of the edges of

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[1] Med.-Chir. Trans., v. 140.

[2] Abeille Méd., xiv. 131.

[3] Times and Gaz., March, 1857, p. 263.

the eyelids. Lotions are most commonly employed in the former and ointments in the latter affections. Great care is to be observed in duly proportioning the strength of the application to the sensibility of the part.

Simple *ozæna*, as well as that connected with the syphilitic or scrofulous cachexia, is benefited by mercurial applications, in the form of vapor from cinnabar, or of solutions of the bichloride, or, finally, as recommended by Trousseau, of powdered calomel and red precipitate. One part, by weight, of red precipitate, two of calomel, and six of finely-powdered sugar candy should be intimately mixed, and of this mixture a pinch may be snuffed seven or eight times a day. Dr. Dewees states that in a few instances of chronic *leucorrhœa*—the leucorrhœa of habit, as he terms it—he employed with advantage an injection containing two grains of corrosive sublimate to the ounce of water. It should be used, he says, but once a day for the first two or three days; then twice a day for an equal period; and then three times a day, until heat or other signs of irritation are perceived. This state should be maintained for a week or ten days, after which saturnine injections may be substituted.[1]

All superficial *swellings* resulting from inflammation appear to have their absorption hastened by mercurial medicines, especially by frictions made with mercurial ointment, or by the application of the mercurial plaster. This treatment is particularly appropriate in glandular and other swellings arising from syphilitic infection. It is sometimes used, also, to promote the resolution of *chronic engorgement of the liver and spleen.*

Mercurial ointment has been employed with great advantage in the treatment of *paronychia.* It was first made use of in 1833[2] by Miquel, and more recently by Martin.[3] In 1843 the latter had forty-three cases under treatment by the ordinary methods, and of these forty terminated in suppuration. In the following year he had forty-eight cases, which he treated by mercurial frictions, and of these twenty-seven were cured by resolution. The method of using the remedy is to rub the affected part every hour for five minutes with mercurial ointment, and in the intervals to keep it poulticed.

The use of mercurial ointment in *erysipelas* began in Paris about 1830, and has continued to be more or less in vogue until the present time. It was highly recommended by Serre d'Alais[4] in inflammation of the subcutaneous cellular tissue, and also of the skin. In 1835,

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[1] Diseases of Females, 3d ed., p. 81.

[2] Bull. de Thérap., iv. 298.

[3] Month. Journ. of Med. Sci., June, 1846.

[4] Bull. de Thérap., iii. 5.

Dr. McDowel, of Dublin, from his own experience, concluded it to be a most valuable remedy in erysipelas.[1] On the other hand, in a discussion before the French Academy of Medicine (June, 1837), several physicians expressed an opinion decidedly adverse to the belief that mercurial applications have power to limit the extent or control the course of erysipelas. Among those who maintained this doctrine were Lisfranc, Velpeau, and also Eméry, who stated that he had employed the treatment in sixty-eight cases, and always without success; and further, that among these cases salivation was produced six times. Most of those who have adopted the method in question are probably disposed to attribute to the ointment a controlling power, at least, over the non-phlegmonous forms of erysipelas. But if they will make such comparative experiments as those of Rayer, who, in erysipelas of the face, applied mercurial ointment to one side, and simple ointment to the other, they will find, as he did, that the disease declines neither more nor less quickly under the former application than under the latter. It certainly, in some degree, allays the burning pain, in virtue of its unctuous qualities, but it at the same time exposes the patient to the serious risk of salivation.

To Prevent Pitting in Smallpox. It will, perhaps, interest the reader to have a succinct narrative of the evidence upon which rests the belief that mercurial ointment or the mercurial plaster is able to prevent the disfigurement which is so often the consequence of this loathsome disease. The first account of the subject with which we are acquainted, is contained in Zimmerman's *Treatise on Experience.*[2] "A lady who had been salivated and had worn a mercurial plaster, was afterwards seized with smallpox, when her whole body was covered with pustules, except only that part on which the plaster had been applied. M. Malouin suggested whether, judging from this fact, it might not be possible to prevent the eruption in the same manner. The experiment has not yet been tried, but it has led to using a means of preserving the faces of females from the effects of smallpox. M. Roseen covered the face of one of his patients with mercurial plaster, and the eruption appeared everywhere but on the face. M. J. Henry Sulzer has repeated the experiment at Winterthor with equal success."

The method does not, however, appear to have been generally adopted, probably owing to a certain degree of trouble which the constant adjustment of the plaster requires; yet it did not wholly fall into disuse. Wedekind says,[3] "it was long ago ascertained that mer-

[1] Dublin Quart. Journ., vi. 184. [2] Edit. de Le Febvre, 1797, liv. v. chap. ii.
[3] Beiträge zur Erforschung, &c., 1830, p. 113.

curial plasters prevent the development of variolous pustules; and he states that he has obtained a like result by frequently using a lotion of corrosive sublimate. In 1833, Serre d'Alais and Ferrier,[1] and soon afterwards Serres, of Paris, and Gariel,[2] demonstrated the abortive influence of mercurial plaster upon variolous pustules. The last named physicians further showed that this property is not possessed by simple lead plaster. Sandras, in 1837, and Baudelocque in 1838,[3] obtained similar results with the mercurial lead plaster.[4] The latter physician found that when the plaster was applied early, it entirely prevented the development of pustules; but, at a later period, it only produced induration of the pocks, or rendered the ulcers superficial.[5] In 1839, Briquet performed some interesting experiments to determine the degree of the mercurial influence. In the first place, he produced vesication or pustulation of the skin in non-variolous patients by means of cantharides, croton oil, and tartar emetic, and found that the mercurial plaster had no influence at all upon the condition of the skin. He then used it in cases of eczema, acne, erysipelas, and furuncle, with a like result. But when it was applied to vaccine punctures it prevented the formation of vesicles altogether, or else rendered their development imperfect or abortive.[6] Nonat still further confirmed these results by applying the compound mercurial plaster to the eruption on one thigh of a variolous patient, while on the opposite limb he placed a simple diachylon plaster. The latter produced no effect, but the pustules under the former were converted into solid tubercles, while the skin retained its natural color, and was neither swollen nor painful.[7] In 1841 Dr. Stewardson, of Philadelphia, who then had charge of the Smallpox Hospital, made some experiments to test the virtue of this remedy. He found that mercurial ointment spread upon thick muslin, so as to form a mask for the face, prevented, more or less, the maturation of the pustules, diminished the concomitant swelling and soreness, and rendered the resulting scars less distinct than when the eruption was left to pursue its natural course. These conclusions were demonstrated, in some cases, by applying the ointment to one side only of the face.[8] M. Goblin (who claims to have proposed this method in 1832), is of opinion that mercurial ointment is more efficacious than mercurial plaster.[9]

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[1] Bull. de Thérap., v. 33.

[2] Bull. de Thérap., ix. 295; Arch. Gén., 2ème sér., viii. 468. [3] Ibid., xiii. 132-363.

[4] Emplâtre de Vigo. Vid. U. S. Dispens., 10th ed., p. 952.

[5] Bull. de Thérap., xv. 143. [6] Ibid., xvii. 159.

[7] Gaz. Méd. de Paris, July, 1839, and Am. Journ. of Med. Sci., xxv. 451.

[8] Am. Journ. of Med. Sci., Jan. 1843, p. 86.

[9] Abeille Med., Oct. 1845, p. 253.

In 1849 Champenois proposed a plan of applying the mercurial plaster which he had used successfully. The melted *Emplastrum de Vigo cum mercurio* was applied with a mop to all of the face except upon the edges of the eyelids, and over this was laid carded cotton or fine linen, and the whole was rendered compact by holding a heated iron near the surface of the mask. Under the nose and the mouth an additional band of linen was affixed so as to prevent a separation of the dressing by means of the discharges from these orifices.[1] Prof. Bennett, of Edinburgh, has reported two cases of smallpox in which he applied to the face mercurial ointment thickened with starch, and renewed from time to time. In neither case did any pitting of the face ensue, although one of the patients had the arms and shoulders deeply indented with pits.[2] The same physician afterwards[3] met with a case in which this mode of treatment produced excessive salivation; he was thence induced to employ a zinc plaster (carb. of zinc three parts; oxide of zinc one part; olive oil, enough to form a plaster), which he found quite successful. Délioux gives the preference to simple and repeated inunctions with mercurial ointment, commenced, if possible, before the umbilication of the pustules.[4] Whatever mode is adopted of making the mercurial application, it should be borne in mind that all of the bed and body linen which it touches will become indelibly stained.

In *prurigo pudendi* lotions containing corrosive sublimate, or inunctions with mercurial ointment, are generally effectual in palliating the itching and sometimes in entirely removing it. Trousseau describes, as "extremely efficacious," a solution of two drachms and a half of bichloride of mercury in three ounces of water, of which a dessert-spoonful is mixed with a pint of *very warm* water, and employed as a vaginal injection and a lotion for the external organs. Wilson recommends the dilute nitrate of mercury ointment, the yellow, and the black wash.

Mercurial fumigation was once greatly in vogue as a means of treating syphilitic eruptions of the skin, and, indeed, other cutaneous diseases also. The red sulphuret (cinnabar), and the black oxide of mercury are the preparations which have been most employed in this way. The use of the vapors of cinnabar was, next to that by mercurial ointment, the oldest of all the methods of treating syphilis. The patient was seated naked in a wooden box or closet with an aperture in the top, from which the head projected. Cinnabar having

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[1] Bull. de Thérap., xxxvii. 76.
[2] Month. Journ. of Med., Jan. 1850, p. 60.
[3] Ibid., April, 1854, p. 300.
[4] Bull. de Thérap., xlviii. 289.

been strewn on burning coals, or on hot iron, its fumes were conveyed into the chest and surrounded the patient's body. An apparatus of a similar description has been contrived for fumigating a single limb. Even in this way mercurial fumigation has sometimes occasioned salivation, apoplexy, nervous accidents, chronic trembling of the limbs, &c. It has therefore been gradually abandoned.[1] Mr. Abernethy employed the fumes of the black oxide to induce the constitutional action of mercury with rapidity. Mr. Henry Lee prefers using the fumes of calomel. The patient being seated on a cane-bottomed chair, two spirit lamps are set under it, over one of which is a small cup of hot water, and over the other a thin metallic plate on which ten grains of calomel are strewn. The lamps having been lighted, the patient and chair are enveloped in a blanket, and at the expiration of a quarter of an hour or twenty minutes, the patient rolls himself up in the blanket and goes to bed. The constitutional effects of mercury appear in from two to eight days when this application is repeated daily.[2]

Miscellaneous.—Dr. A. C. Castle has published the following ingenious method of *removing a gold ring* from a finger upon which it had been forced, and whence it could not be withdrawn on account of the swelling of the integuments. After drying the abraded skin with powdered chalk, he polished the ring, and applied quicksilver to its surface. In less than three minutes, by pressing the ring it was broken to pieces and removed. Dr. C., it is stated, had used a similar method of extracting a brass ring from the meatus externus of a child's ear.[3]

A solution of corrosive sublimate sufficiently strong to excite an eczematous eruption of the skin has been used for the removal of *freckles*, and also of *powder grains* immediately after the explosion which drove them into the skin. Busch, of Bonn, who made use of the latter expedient successfully, employed compresses wet with a solution containing five grains of corrosive sublimate to the ounce of water, at first for an hour only at a time, and afterwards for several hours daily, until an eczematous eruption was developed. By its means the particles of powder were thrown to the surface and with a little care removed.[4]

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[1] Richter, Ausfur. Arzneim, v. 442. [2] Med.-Chir. Trans., xxxix. 339.

[3] Boston Med. and Surg. Journ., and Month. Journ. of Med. Sci., Dec. 1853, p. 546.

[4] Virchow's Archiv., xiv. 379.

ARSENICUM.—Arsenic.

As in the case of mercury, we propose, first, to describe the officinal forms and preparations of Arsenic, and afterwards their action upon the economy and their modes of application in the treatment of various diseases.

Arsenicum.—Arsenic.

This term is strictly applicable to metallic arsenic alone, although commonly used to designate its preparations, and especially arsenious acid. Arsenic is one of the metals. It was obtained by Brandt in 1773. It is sometimes found native, but generally in combination with oxygen or sulphur, and associated with many minerals, especially tin, iron, copper, cobalt, and nickel. In its pure metallic state arsenic is a crystalline metal, of sp. gr. 5.8, of a steel-gray color, granular, brittle, and presenting a brilliant surface when recently broken. It tarnishes rapidly when exposed to the air, and forms a mixture of arsenious acid and metallic arsenic, which is used to destroy flies and other insects, and hence is sometimes called *fly-powder*. When rubbed between the fingers it imparts to them a peculiar odor, and its vapors, when it is sublimed at a temperature of 356° F., consist of arsenious acid, and diffuse a characteristic smell which closely resembles that of garlic. It is used for the purpose of forming the iodide of arsenic, and the solution of the iodide of arsenic and mercury.

Acidum Arseniosum.—Arsenious Acid.

This preparation, which is generally known as white arsenic, or simply as arsenic, is found native, but is generally procured by condensing the vapors which arise from roasting the ores of cobalt, and afterwards refining the product. In commerce it is found in masses and in powder. The former are white and opaque upon the surface, but transparent internally, and exhibit a vitreous fracture. The latter is white, and its particles are very fine. Arsenious acid is completely soluble in boiling water. It has neither taste nor smell, but it leaves a somewhat acrid sensation on the fauces, and when fused, and therefore deoxidized, it emits the odor of garlic which is characteristic of the heated metal.

Arsenici Iodidum.—Iodide of Arsenic.

This compound is prepared by heating a mixture of powdered arsenic and iodine in the proportion of one of the former to five of the latter, by weight. It is "an orange red crystalline solid, entirely soluble in water, and wholly volatilized by heat."

Liquor Arsenici et Hydrargyri Iodidi.—Solution of the Iodide of Arsenic and Mercury; Donovan's Solution.

This preparation, according to the *U. S. Phar.*, is prepared as follows: "Take of Iodide of Arsenic, Red Iodide of Mercury, each *thirty-five grains;* Distilled Water, *half a pint.* Rub the Iodides with half a fluidounce of the Water, and when they have dissolved, add the remainder of the Water, heat to the boiling point and filter."

This solution is of a pale yellow color, and styptic in taste. It is incompatible with acids, opium, the salts of morphia, and many other salts. Dose, from ten minims to half a fluidrachm, three times a day, in distilled water.

Liquor Potassæ Arsenitis.—Solution of Arsenite of Potassa; Fowler's Solution; Tasteless Ague Drop.

This is a solution of equal parts of arsenious acid and carbonate of potassa in boiling distilled water, with the addition of a small quantity of compound spirit of lavender, in order to give it sufficient color and taste to prevent its being mistaken for simple water. It contains four grains of arsenious acid to the fluidounce.

This preparation is a transparent liquid, and has no taste or smell but what it derives from the spirit of lavender. It is incompatible with the metallic salts, with infusions and decoctions of cinchona, and with lime-water.

Dose, five drops, gradually increased to ten or twenty, three times a day, largely diluted, and taken after meals.

History.—The ancients were acquainted with auripigmentum, or orpiment, the yellow sulphuret, and with sandarach, or realgar, the red sulphuret, of arsenic. Of the former, Dioscorides says: It is astringent and corrosive, burning the skin with severe pain, and the production of an eschar. It removes fungous flesh, and is a depilatory. He describes the qualities of the latter in nearly the same terms; stating that, mixed with resin, it causes hair to grow when destroyed by pellagra, and with pitch it serves to remove rough and deformed nails. With oil it is used to destroy lice, to resolve abscesses, to heal ulcers of the nose (lupus?), of the mouth and fundament. With wine it is given for fetid expectoration, and its vapors, with those of resin, are inhaled in chronic cough. With honey it clears the voice, and with resin is very excellent for shortness of breath.[1] Pliny furnishes exactly the same description.[2] Paulus Ægineta says, sandarach and arsenic, when taken in a draught, occasion pains of the stomach and

[1] Mat. Med., lib. v. cap. lxxx. and lxxxi.

[2] Hist. Nat., lib. xxxiv. cap. lv. lvi.

bowels, with violent corrosion.[1] The Arabians gave to arsenic a name equivalent to the modern one of rats-bane.[2] Rhazes, Avicenna, and other Arabian writers, have done little more than copy the description of Dioscorides. Both orpiment and realgar have long been known in China. The former is employed externally to venomous wounds, and as a sternutatory to counteract miasmatic effluvia, and also internally as a tonic in several diseases. Realgar is used by the Chinese in intermittent fever.[3]

The production of arsenious acid is ascribed to Geber, who flourished in the eighth century, and enriched chemistry with the discovery of corrosive sublimate, of nitrate of silver, and of other valuable compounds. Geber denominates arsenious acid sublimed arsenic, indicating the mode in which it was then and is still procured. Avicenna terms it white arsenic, and says that it is a deadly poison; "interficit homines." In spite of its dangerous qualities, proved by many examples of fatal poisoning, arsenic gradually found its way into the hands of the surgeons. At first it was used for the cure of the external diseases of sheep and horses, and afterwards, in the fourteenth century, in the treatment of scrofulous ulcers in man. At the close of the seventeenth and at the beginning of the eighteenth century, it was employed as a caustic for cancerous tumors by men of some distinction, but the more eminent surgeons condemned its use.[4] Meanwhile the native physicians of India had long been in the habit of resorting to it as an internal remedy for various affections of the skin, including those connected with secondary syphilis, and also for intermittent fever. In modern Europe, however, it appears not to have been prescribed internally until the beginning of the seventeenth century, when, as in ancient times, orpiment was employed for the relief of pulmonary affections attended with dyspnœa, and arsenious acid was used to cure intermittent fever. At the close of the seventeenth, and at the beginning of the eighteenth century, its febrifuge qualities were in constant requisition, at least by irregular practitioners in Italy, France, Pannonia, and Thuringia. But the remedy did not then, nor for a long time afterwards, gain acceptance with the Faculty.[5] Thus we find Lemery declaring that it ought never to be taken internally, in any dose, or in any manner, whatever;[6] and Geoffroy, after stating that it is recommended by some in intermittent fevers, says: "Let it be never so much prepared and corrected, its deleterious

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[1] Adams's Trans., Syd. Soc. ed., ii. 235; iii. 53.

[2] Ebn Baithar, ed. Sontheimer, ii. 104.

[3] Edinb. Month. Journ., iii. 172.

[4] Gmelin, Apparat. Med., i. 259.

[5] Harless, De Arsenici Usu., p. 61.

[6] Dict. des Drogues, 2ème ed., 1714, p. 82.

qualities are only lessened, but never wholly removed; and, therefore, though it may be a good remedy for the present, it will afterwards prove a poison, and bring on very dismal symptoms. Arsenic, therefore, in my opinion, is worse than the fever itself."[1]

Meanwhile, however, arsenic was making its way to a better reputation through the writings of Slevogt, Frick, Keil, Jacobi, and Ackermann, and about the close of the century was accepted as a legitimate medicine by some of the most eminent physicians, among whom may be named Plencitz, in Germany, Brera, in Italy, and Fowler, in England. Fowler was led to employ this remedy without, probably, knowing that it had been used upon the continent. He learned that a nostrum which, under the name of Patent Ague Drops, became famous for its cures of intermittent fever, about the year 1780, was an arsenical solution.[2] It had, however, been still earlier employed in England. In 1774, Mr. Mowbray, a surgeon, purchased from the widow of a German empiric, a receipt for the preparation of a remedy which he had employed as a specific in the cure of agues. Its principal ingredient was arsenic. This receipt Mr. Mowbray communicated to several of his medical friends, and employed, himself, with great success.[3] Besides Fowler, must be mentioned among those who gave currency to the use of the medicine, Withering, Pearson, Girdlestone, and Adair, in England, Horn, in Germany, and Barton, Rush, and Currie, in the United States. These, and many other physicians, have established its value in intermittent fever, neuralgia, and scaly affections of the skin, the diseases in which its virtues are most conspicuous.

Action. *On Plants.*—An arsenical solution causes plants to fade, wither, and decay. The vegetation in the neighborhood of furnaces used for smelting arsenical ores, always presents a wan and withered look. Arsenic is also said to prevent the development of buds, and the germination of seeds. In regard to the latter point, Headland remarks: "The grain of wheat will germinate, and its starch be converted into sugar, after it has been steeped in a solution of arsenic to protect it from vermin."[4] In this case the coriaceous nature of the envelop protects the germ from the contact of the solution. When plants have been killed by being watered with an arsenical solution, they exhale an alliaceous odor. M. Chatin thus describes the manner in which plants perish under this operation. They may die in the course of a few days, by desiccation, if they are in a dry place, or by

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[1] A Treatise of the Substances made use of in Physick, &c. Translated by G. Douglas, M. D., 1736.

[2] Fowler's Med. Reports. Preface. [3] W. Currie's View of the Diseases, &c., p. 29.

[4] On the Action of Medicines, p. 198.

putrefaction if they are in a moist one. Sometimes the plant resists the poisonous influence with partial success. Its growth ceases, its leaves become yellow and dry, and sometimes spots, gangrenous as it were, appear upon the stalk, &c. These changes are more rapid in summer than in winter. Nor does the poisonous action appear to be equally diffused throughout the plant. It is accumulated in the leaves and in the receptacles of the flowers, but still abounds in the fruit, seeds, and stems. If the plant does not immediately perish, it gradually recovers, as the poison is eliminated; and this is accomplished in a period varying from a fortnight to three months. The arsenic enters into combination with the alkalies of the plant, forming soluble salts which are excreted by the roots, and for some time may be found in the soil.[1]

On Animals.—Jæger found that animalculæ inhabiting vegetable infusions, perish in from ten to thirty minutes on the addition of a minute quantity of arsenious acid to the liquid. Arsenic is equally fatal to spiders, flies, worms, leeches, and *crustaceæ*, such as crawfish, &c.; and before killing these creatures it excites in them convulsive movements and a discharge of the excretions. Even the salmon and the gudgeon perish with similar symptoms, but more slowly. Birds are still more tardily and incompletely affected, some of them surviving a dose of the poison sufficient to destroy an amphibious animal of equal size. When arsenic is introduced into the bowels, into the peritoneal cavity, or the cellular tissue, of birds, the following phenomena are observed: at first general repose, then winking of the eyelids, liquid and sometimes bloody stools, spasms of the pharynx, vomiting and general trembling; thirst, erection of the feathers, and corrugation of the integuments. If the poison does not prove fatal, it induces languor, and loss of appetite, with copious, loose, and greenish stools. When fatal, on the other hand, great debility, insensibility to external impressions, opisthotonos, and paralysis, precede death, after which according to several authorities, the muscles are found, in a great measure, insusceptible to the galvanic influence.[2] Brodie, on the other hand, states that "the muscles are capable of being excited after death to distinct and powerful contractions by means of the Voltaic battery."[3] But he also found that when the heart continued to act after apparent death, he was never, in a single instance, able to prolong its movements by means of artificial respiration.

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[1] Toxicologie, i. 380.

[2] Edinb. Med. and Surg. Journ., Jan. 1811; ORFILA, op. cit.

[3] Physiol. Researches, p. 82.

The symptoms of arsenical poisoning in quadrupeds are very uniformly the same, whether the poison act through the bowels, or is absorbed from a wound; but in the latter case its effects are more rapidly manifested. The animal appears to experience pain, often of the greatest severity, the breathing is hurried, the pulse feeble, slow and irregular, severe retching is followed by vomiting, and mucous and sometimes bloody stools, the hinder legs become paralyzed, and then the other parts of the body, insensibility to all impressions ensues, and occasionally convulsions precede death.

In his numerous experiments on animals poisoned by arsenic, and prevented from vomiting by ligature of the œsophagus, Orfila found that almost immediately after their death, traces of the poison were readily detected in the blood, liver, spleen, kidneys, lungs, heart, brain, and muscles, but chiefly in the liver and spleen. It was his opinion, however, that a portion of the poison reached these organs by imbibition through the coats of the stomach. According to Brodie,[1] in animals killed by arsenic, the blood is usually found to be fluid in the heart and vessels; but otherwise the morbid appearances are confined to the stomach and intestines, and to the former especially, by whatever channel the poison may have been introduced. Indeed, the gastro-intestinal inflammation is greater in degree and more speedy in taking place when arsenic is applied to a wound, than when it is taken into the stomach. The inflamed parts, says this experimenter, are, in general, universally red, at other times they are red only in spots. The principal vessels leading to the stomach and intestines are much dilated, and turgid with blood; but the inflammation is usually confined to the mucous membrane of these viscera, which assumes a florid red color, becomes soft and pulpy, and is separable without much difficulty from the cellular coat, which presents its natural appearance. In some instances, there are small spots of extravasated blood on the inner surface of the mucous membrane, or immediately beneath it, and this occurs independently of vomiting. In none of his experiments did Brodie find ulceration or sloughing of the stomach and intestines, and he is disposed to believe that such lesions are never the cause of death, unless life is prolonged considerably beyond the period of the first and most characteristic operation of the poison.

On Man.—According to Mialhe, it is probable that metallic arsenic, and also its sulphurets (realgar and orpiment), are not in themselves poisonous. But the arsenical sulphurets of commerce contain a

[1] Op. cit., p. 87.

large proportion of arsenious acid. When either of these preparations, or metallic arsenic itself, is taken into the stomach, it may furnish to the alkaline chlorides contained in the gastric secretions, the material for forming arsenious acid in sufficient quantity to operate as a poison.[1]

External Application. When arsenious acid and other active preparations of arsenic are applied to the denuded skin, or to a mucous membrane, or are introduced into a wound, symptoms of arsenical poisoning ensue. Examples of this event are innumerable, but a few may briefly be cited as illustrations in this place. One of the very earliest is that recorded by Amatus Lusitanus, of a boy who (in 1567) died from the application of arsenical ointment to the scalp for the cure of scabies. In another case, of pityriasis, a similar application was fatal.

Orfila mentions a woman who barely escaped with life after using an arsenical ointment for the purpose of destroying lice that infested her head. Dr. McCready, of New York, reports that a child two years of age died in consequence of having its head washed with a mixture of arsenic and gin, for the cure of favus. No local inflammation followed; but diarrhœa, tenesmus, and paraplegia preceded death. Two other children who were treated in the same manner recovered.[2] In 1853 Dr. Mitchell, of Liverpool, reported the following case. A man applied a mixture of arsenic and soft soap, procured for killing bugs, to the pubes, scrotum, and axillæ, which were infested with pediculi. Within twelve hours the cuticle of the scrotum peeled off, leaving the cutis raw and bleeding, and the testes swollen. There was stiffness of the neck, and slight difficulty of swallowing, with thirst, headache, and extreme sensitiveness and tension of the hairy scalp. The stomach was irritable, and there was also vomiting, with pain at the epigastrium on pressure. Recovery took place slowly under the influence of opiates and demulcents.[3]

A man engaged in washing sheep with an arsenical solution, had had his abdomen wet with it for about two hours. Shortly afterwards, the integuments of this part, and of the scrotum, penis, and thighs, became red and painful, and afterwards ulcerated in some places. He showed signs of considerable constitutional derangement.[4] Cases of the same sort are referred to by Crawford,[5] and Watson.[6]

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[1] Chimie Appliquée, p. 248. [2] Am. Journ. of Med. Sci., July, 1851, p. 259.
[3] Times and Gaz., Dec. 1853, p. 612.
[4] Brown, Edinb. Med. Journ., iii. 148.
[5] Lancet, Aug. 1857, p. 127. [6] Ibid., Sept. 1857, p. 281.

The last named reporter alludes to intense thirst as a symptom of the affection thus produced.

Sometimes the medicine has been employed with criminal intent. Mangor relates the case of a peasant who poisoned three women in succession, by introducing arsenical paste into the vagina. In one it caused severe pain and inflammation of this organ, with constant vomiting, and delirium. The external parts of generation were greatly swelled, and after death the os uteri was dilated, and its edges gangrenous. Ansiaux speaks of a man who poisoned his wife in the same manner.[1]

Many instances are recorded of absorption of the poison from an ulcerated surface. Orfila mentions a case which terminated fatally, of a person who had an ulcer of the leg treated by a quack with arsenious acid.[2] Roux states that a man who had a cancer treated with arsenical paste, died after experiencing vomiting and convulsions, and on dissection, his stomach was found inflamed, and studded with black points.[3] Long ago (1586), Baccius saw the same effects from such an application to an ulcer of the groin. Fabricius Hildanus refers to a case in which its use upon an ulcer of the hand was followed by pain, distress, fever, nausea, vomiting, delirium, and death; and the same writer refers to two other instances presenting analogous characters. Meau saw death ensue from the like application to an ulcer of the foot.[4] A case is related by Dr. Hoit in which an "Indian doctor," having applied a plaster supposed to be arsenical to an enlarged lymphatic or parotid gland, after incising the swelling, the patient was seized with violent abdominal pain, vomiting of a black and offensive liquid, stools of the same character, and great prostration. At the end of a month the patient was abandoned by the quack, and died with the usual symptoms of arsenical cachexia.[5] Quite recently (1854), in York, England, one James Lawrence Ward was tried for manslaughter, he having treated a woman for cancer of the breast by means of an arsenical paste. The disease was not arrested, and the woman died.[6]

Arsenical Vapors. It is related that persons have been poisoned by the fumes of tapers, the wicks of which had been saturated with arsenic with a criminal intent. The same effect has resulted in our own times from the vapors of candles into which arsenic had been

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[1] Wibmer, Wirkung, &c., vol. i.
[2] Toxicologie, 5th ed., i. 413.
[3] Méd. Opératoire, i. 64.
[4] Wibmer, op. cit.
[5] N. York Med. and Phys. Journ. (1824), iii. 375.
[6] Brit. and For. Med.-Chir. Rev., July, 1855, p. 280.

introduced to harden them. It is also said that smoking tobacco mixed with arsenic has proved fatal. A case is reported in which the fumes of five grains of this substance, thrown upon live coals, produced very distressing symptoms in a person sleeping in the room where this hazardous experiment was performed.[1] A case is quoted by Beck, from Vandervoort, of some men, nine in number, who were employed in sweeping up arsenic scattered in the hold of a vessel, from a barrel of this substance which had been broken in the hoisting. Several were seized with vertigo, and fell senseless; they were then attacked with vomiting and the other symptoms of arsenical poisoning. Of the nine cases two or three proved fatal in the course of a few days.[2] Numerous instances are recorded of alarming effects from arsenical fumes. They generally include the following: debility, dyspnœa, præcordial pain, and constriction, with severe cough; headache, pains in the limbs, muscular spasms, and paralysis; thirst, nausea, vomiting, dryness of the mouth and fauces, and colic; and, where the influence is prolonged, ulcers form upon the buccal mucous membrane. The pulse is generally frequent, and in some cases yellow spots appear upon the skin. Dr. Hinds, of Birmingham, relates that having had the walls of his study newly hung with a bright-green paper, which was afterwards found to be stained with Scheele's green (arsenite of copper), and after occupying the apartment by gas-light, he was affected with great depression, faintness, nausea, an inclination to vomit, and severe pains in the abdomen.[3] Miners, and other workers in arsenic, suffer more or less in their health from the poisonous exhalations. The diseases engendered are essentially chronic, but very fatal. There is a constant and slow fever, with loss of flesh, colic, and paralysis.[4] Schweinfurth's green, which is a solution containing equal quantities of arsenious acid and acetate of copper, used in the manufacture of paper-hangings, produces in the workmen who handle it vesicles, pus-

[1] Richter, Ausfür. Arzneim., v. 679.

[2] Med. Jurisp., from N. Y. Journ. of Med. and Surg., ii. 483.

[3] Times and Gaz., Feb. 1857, p. 177. Numerous other cases of illness from the same cause have been published, all tending to show the extremely deleterious nature of the pigment referred to. The following articles upon this subject may be consulted: Hinds, Times and Gaz., May, 1857, p. 521; ibid., Jan. 1858, p. 64; Halley, ibid., p. 76; Griswold, New York Journ. of Med., July, 1858, p. 64; Whitehead, Brit. and For. Med.-Chir. Rev., April, 1859, p. 519; Hassall, Lancet, Jan. 1859, p. 70; Taylor, Times and Gazette, Jan. 1859, pp. 5 and 94; Kesteven, ibid., p. 43; and Wright, ibid., p. 169. Vohl has shown (Casper's Vierteljahrs., xv. 172) that each square yard of such paper as is referred to in these cases contains, on an average, one grain of arsenious acid, five-sixths of a grain of oxide of copper, and one grain and a quarter of oxide of lead.

[4] Patissier, Maladies des Artisans, p. 20.

tules, and ulcers upon the hands and other parts of the body habitually touched by the soiled fingers.[1]

Internally. *In small or medicinal doses* ($\frac{1}{30}$ to $\frac{1}{15}$ of a grain), arsenic excites a sense of warmth in the stomach and bowels, increases the appetite, and in some degree also the fecal and urinary discharges. According to Vogt, this stimulant effect is shared by all parts of the system. The skin is warmer, the pulse fuller and more frequent, the muscular system more active, and the whole organism invigorated, freer, and lighter in its movements, and even the mind improves in activity and power. In doses such as occasion no sensible phenomena, or only after the lapse of many days, arsenic seldom, according to Vogt, produces chronic poisoning; on the contrary, digestion appears to be permanently fortified, "as when true tonic medicines, and especially cinchona, are administered." It is well known, says this author,[2] that old and worn-out horses recover their appetite, activity, and strength under the operation of small doses of arsenic, and later authorities inform us that in Vienna the grooms are accustomed to mix a small quantity of arsenic with the feed given to horses, and attach a portion to the animal's bit, for the purpose of producing a bright aspect of the skin, roundness and elegance of the form, and foam at the mouth. The medicine is also said to put them in a singularly good condition to perform long journeys, particularly in a hilly country; but it is also added that when the use of it is left off the horse gets thin, loses his freshness, and becomes dull.[3] Vogt further reports that, according to Jæger, a pigeon, to which arsenic was given, displayed greater vivacity and a stronger appetite than before. In upper Steyermark it is said that the peasantry employ arsenic as a stomachic, and as a condiment with several kinds of food, particularly with cheese; and it is related of a healthy peasant that every day he was accustomed to take two grains of arsenic, and did not believe that he could live without it.[4] This curious statement, when originally made, did not attract much attention, but more recently additional testimony has appeared to lend it support, and excite inquiry as to its correctness. In 1854 Dr. Tschudi published the following statement in a Vienna medical journal: "In some countries of Lower Austria and Styria there exists among the peasantry the singular habit of eating arsenic. These poison eaters have a double aim; first, they wish to give themselves, by

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[1] Follin, Archives Gén., 5ème sér., x. 683; Pietra Santa, Annales d'Hygiène, 2ème sér., x. 339; Guy, Archives of Med., i. 86.

[2] Lehrbuch der Pharmakodynamik, 3tte Aufl., i. 591.

[3] Times and Gazette, July, 1854, p. 67.

[4] Vogt, loc. cit., and Med. Jahrb. des öster. Staats, 1822, i. 99.

this dangerous habit, a fresh and healthy appearance, and a certain degree of *embonpoint.* Many of the peasant girls, and even the men, have recourse to this expedient from coquetry and a desire to please; and it is remarkable what success they attain, for the young toxiphagi are distinguished by the freshness of their complexion, and by an aspect of flourishing health. . . . . The number of deaths from the abuse of arsenic eating is by no means inconsiderable, especially among the young people; . . . . but so careful are the victims to conceal what they have done, that the secret often is revealed only on the death-bed. The second advantage gained by the toxiphagi is that they become more volatile, more free in respiration, and able to ascend high mountains with ease. Upon every long excursion into the mountains they take a small piece of arsenic, which they allow to dissolve in the mouth. The effect is surprising. They ascend without difficulty heights which would have been almost insurmountable without this practice. The author adds that, upon this experience, he has advantageously administered Fowler's solution in cases of asthma. The toxiphagi commence with a bit of arsenic the size of a lentil-seed, or about half a grain. They keep to this dose, which they swallow several times a week, morning and evening, for a long period, to become accustomed to it. Then they increase the quantity insensibly, but with precaution, until the desired effect is produced. . . . . It is to be remarked, however, that, when the practice is dropped, emaciation generally ensues from some cause, either from the withdrawal of the stimulus, or from accidental or acquired disease."[1]

The accounts above given by Vogt and Tschudi, and which are substantially confirmed by Kaltenbrenner, Vitzhum, and other writers, has been ridiculed or contradicted by Pereira, Christison, Taylor, Kesteven, and Inman. They assert that the descriptions of the practice of arsenic eating are derived from hearsay evidence alone; question whether the substance used is really arsenic; declare that its alleged effects are at variance with common experience in regard to arsenical preparations, and opposed to those known to be produced by arsenical emanations upon the miners in Cornwall, &c. These criticisms being all based on conditions presumed, but not proved, to be analogous to those which exist when arsenic is taken under ordinary circumstances as a medicine, should have but little weight in opposition to direct and circumstantial testimony. We do not know whether the preparation used in Styria is arsenious acid, or one of the sulphurets of arsenic which bears the same name. If the latter,

[1] Times and Gazette, July, 1854, p. 66.

it might explain the dose alleged to be taken with impunity in the beginning of the practice. It is also to be remarked that the ancients employed arsenical preparations for "shortness of breath." Again, there is, apart from these statements themselves, some reason to believe that toleration of arsenic may be partially, at least, produced. Flandin states that he gave animals doses of arsenious acid in powder, commencing with one sixty-fifth of a grain mixed with their food; and that in nine months, by progressive increase, they bore a dose of upwards of fifteen grains of arsenious acid in powder in twenty-four hours without their appetite or health becoming affected.[1] This, says Dr. Taylor, "is contrary to all experience in the medicinal use of arsenic in the human subject;"[2] but it tallies with the statements respecting the arsenic eaters of Austria, and unless, therefore, some direct refutation can be given to both, it is difficult to perceive why they should be rejected as untrue. The miserable consequences of the vice described by Tschudi are pictured in terms which could scarcely have been used except to portray a reality, and this, of itself, while it lends probability to the account given of arsenic eating, is surely enough to deter any one from falling into so degrading and fatal a vice.

The solution of arsenite of potassa, in doses of two or three drops, gradually increased to seven or eight drops,[3] three times a day, seldom produces any immediate effects. If the quantity given at first be ten or twelve drops, it is apt to occasion loss of appetite, nausea, and griping, and even vomiting and purging, with epigastric pain. These symptoms are most distinct immediately after each dose of the medicine, particularly when the stomach is empty. The urine is occasionally increased, more rarely perspiration occurs, the conjunctiva becomes more or less injected, and in some few instances an eruption of urticaria, pityriasis, or psoriasis appears upon the skin. The pityriasis chiefly affects parts covered by the clothing; "it has a dirty brown, dingy, unwashed appearance." Urticaria has sometimes followed a single dose of the medicine, and in rare cases giddiness and tremors have been observed.[4] Along with these symptoms, or under the influence of continued small doses of arsenic, and independently of such effects, a characteristic puffiness of the face arises, with œdema of the eyelids, which at first is most visible in the morning, but is afterwards more permanent and extensive, occupying the

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[1] Taylor, On Poisons, p. 6. [2] Ibid. (2d Am. ed.), p. 94.

[3] Six drops of Fowler's solution are equivalent to nearly twelve minims of the same, or to one-twentieth of a grain of arsenious acid.

[4] Edinb. Med. Ess. and Obs., iv. 41.

ankles, the limbs, and the abdomen with a dropsical effusion. When not excessive, it generally subsides on the suspension of the medicine.

In rather larger doses, arsenic acts as a gastric irritant, occasioning a sense of constriction of the œsophagus and stomach, with a pricking and somewhat burning sensation at the epigastrium; thirst is increased, but the appetite declines, eructations ensue with nausea, and vomiting is readily provoked. There is a tendency to diarrhœa, and the urine is voided frequently. To these phenomena are superadded flushes of heat, especially felt in the head and abdomen, with cool perspiration of the forehead and cheeks; the pulse is more frequent and is sometimes irregular; the patient feels exhausted, but uneasy and restless, and, if of a nervous temperament, may be affected with spasmodic movements. In the course of twelve or twenty-four hours these symptoms disappear. In this degree of its operation arsenic first manifests poisonous qualities.

If the influence of the drug is sustained permanent derangement of the system, or *chronic arsenical poisoning*, ensues; the loss of appetite, nausea, derangement of the digestion, diarrhœa, or constipation continue, with thirst, salivation, tenesmus, colic, and intestinal cramps; the respiration is labored and painful, a sense of oppression is experienced, with pain in the breast, cough, extreme wasting of the flesh, and hectic fever; the limbs grow tremulous, and not uncommonly they become paralyzed, especially the lower extremities;[1] pains in the whole body are experienced, but are very constant in the hands and feet, and are a source of extreme suffering; stiffness and contraction of the extensor muscles of these parts succeed, numbness gradually invades the extremities, and the mental faculties subside into insensibility and torpor; œdema of the face and extremities, and even general anasarca, are not unusual; at the same time the hair falls out, the epidermis scales off, pustular and other eruptions ending in ulceration attack the skin, which acquires a lifeless, earthy hue, the countenance, if not œdematous, is sunken, the conjunctiva is strongly injected, and a reddish circle surrounds the eyes. Such phenomena are most frequent among workmen engaged in the sublimation of arsenical ores.

The symptoms of *acute arsenical poisoning* may be thus described: Immediately after the poison is swallowed, a metallic taste is perceived, with constriction of the fauces. A violent burning pain, which soon

[1] Dr. Gibb (Trans. Path. Soc., Lond., ix. 442) has reported the case of a lady in whom these symptoms, and especially neuralgia and paraplegia, appeared to be due to the long-continued use of small doses of arsenic.

becomes excruciating, is felt in the stomach, and gradually extends itself over the whole abdomen, steadily increasing in severity until it becomes intolerable. Retching and vomiting, and cramps of the bowels, ensue, with spasms of the œsophagus and chest, which resemble those of hydrophobia. The thirst is insatiable, but even the mildest drinks cannot be retained; the tongue is generally fissured, hard, and dry, although occasionally there is profuse salivation, and the voice is hoarse. There is also tenesmus, with bloody and offensive stools, and retraction of the abdomen. The irritation is propagated to the urinary organs, occasioning, in the male, tumefaction of the penis, and in both sexes strangury. Sometimes the urine is completely suppressed, and sometimes it is mixed with blood. Prof. Christison says that in the female there is burning pain in the vagina, and excoriation of the labia, "but this does not happen unless life is prolonged beyond three days." Bachman had previously noticed the pain alluded to, and also profuse menorrhagia, among the symptoms in females. The pulse is rapid, irregular, and intermittent; the muscles are spasmodically affected; the skin presents a livid eruption of the species already mentioned. The sense of anguish is unutterable, and sometimes there is delirium. The breathing is oppressed. A consuming fire appears to prey upon the vitals, while the whole body is pale, cold, shivering, and clammy. The features are sunken and sharp; if vomiting occurs, it is convulsive and affords no relief. Exhaustion of mind and body, prostration and despair, with anxious restlessness, generally attend this stage of the attack. On the approach of death, spasm yields to general resolution, the pulse grows slow and feeble, and the urine and fæces are voided involuntarily; but sensibility and consciousness are lost only in the last moments of life.

The duration of the symptoms is variable, and may be stated in general as from six to twelve hours; but occasionally they last for several days. Sometimes, also, though rarely, a fatal termination takes place almost immediately after the poison is swallowed, and without other symptoms than slight fainting fits. Dr. Christison has collected fourteen or fifteen cases of acute arsenical poisoning in which the signs of inflammation, after death, were slight, or altogether wanting, and the fatal issue occurred in five or six hours, with symptoms denoting "a powerful debilitating influence on the circulation, or on the nervous system."[1]

Even when recovery follows the complete development of acute arsenical poisoning, it is seldom perfect. For months, or even years,

[1] On Poisons (Am. ed.), p. 241.

the joints of the limbs remain swollen and stiff, so as to render walking difficult and painful; the digestive organs for a long time continue irritable and feeble, and all of the functions of the nervous system are impaired. In some cases there is more or less paralysis of the upper or lower extremities, and in others gangrenous ulcers attack the legs. Arsenical paralysis, most frequently affects the lower limbs first, extending gradually to the arms; but it is more permanent in the legs, continuing for months or even years. It is accompanied with cramps, spasmodic movements, numbness, and formication. The cutaneous sensibility is impaired, and the patient generally complains of coldness in the parts affected.[1]

After death from arsenic, whether the poison be introduced by the mouth, the rectum, or the skin, the lesions are essentially the same. It is said that the muscles and the limbs become relaxed, and speedily lose their irritability; but Orfila asserts, on the contrary, that they are unusually rigid. The skin in many parts, but especially about the genital organs, is stated to have an ecchymosed appearance. The influence of arsenic on the putrefactive process is variously estimated by different writers. Thus Richter asserts that it promotes this change, while the greater number agree that it tends to retard it. It is said that the blood is generally dark and liquid, unless death has taken place very speedily; the stomach, intestines, œsophagus, and even the fauces are inflamed. The gastric mucous membrane is chiefly affected. It is usually of a dark brown, or of a deep crimson color, and often ecchymosed; sometimes effused blood, or tough, coriaceous fibrin, is found upon its surface, and has often been mistaken for a gangrenous eschar. If death is long delayed, ulcers, or more properly erosions, may exist. The consistence of the membrane is generally diminished. In some cases, those in which the symptoms resemble nervous prostration, there may, as has already been intimated, be a complete absence of gastric lesions. Several cases of the sort are referred to by Orfila. The lungs are highly congested, and the tracheal mucous membrane is very red. The heart is usually filled with blood, which stains its lining membrane.

The quantity of arsenic sufficient to cause death will depend in a great measure upon the condition of the stomach when the poison is swallowed. If it contain much food, a very slight effect may be produced by a large dose of the poison. A case occurred to Oesterlen, in which a quarter of an ounce of arsenic was swallowed by a man, who just before had eaten and drunken heartily. Emetics, &c., were im-

[1] R. Leroy D'Etiolles, Bull. de. Thérap., lii. 230.

mediately administered, and no evil consequences ensued.[1] Mr. Godfrey has reported the case of a woman who swallowed about a dessert-spoonful of arsenic immediately after a copious dinner. Vomiting did not occur, nor were any remedies administered for an hour and a half. Within five days complete recovery had taken place.[2] A case published by Dr. W. C. Jackson, seems to show that the stomach may sometimes appear to be comparatively insensible to the action of the poison. A quantity of arsenic estimated at two ounces, was taken when the stomach was empty; there was great heat in this organ and in the throat, and irritability of the former after the active use of emetics, but within twenty-four hours even these symptoms had nearly disappeared.[3] On the other hand, very small doses may produce violent and even fatal symptoms. This is particularly the case when an arsenical solution is taken. Under such circumstances, four, three, and even two grains of the mineral have destroyed life.

Modus Operandi.—The caustic operation of arsenic demonstrates how readily it enters into combination with the constituents of the body. Its detection in so many of the organs and secretions, and the symptoms which it occasions in the former, render evident its wide diffusion through the economy. The fact that, however introduced, its effects are essentially the same, and that it frequently, when swallowed, is fatal without producing any gastric lesion whatever, proves, also, that its action is not merely local. Further, this presumption is sustained by all the phenomena of chronic arsenical poisoning. The gastro-intestinal symptoms usually produced by arsenic in the human subject, and in animals poisoned by it, even when it is applied to the skin, show that it seeks an outlet from the system by the bowels; while the fatal cases just alluded to, in which no gastric lesion is produced, prove, on the other hand, that its chief morbific (and curative) operation is upon the system at large. These facts and conclusions point to the blood as the probable seat of the changes upon which its sensible effects depend. What these changes are, has not been revealed by any direct observation. The fluidity of the blood observed in some cases of arsenical poisoning is not present in all; but the production of serous effusions as an ordinary effect, and of chronic anæmia as the consequence of prolonged exposure to arsenical influences, appear to furnish grounds for believing that in sufficient doses, arsenic, like mercury, tends to disintegrate the blood-corpuscles, to diminish the proportion of fibrin, and possibly, also, to attack still

[1] Heilmittellehre, 4te Aufl., p. 209.
[2] Lancet, Aug. 1857, p. 114.
[3] Am. Journ. of Med. Sci., July, 1858, p. 77.

more directly the vital principle upon which the normal qualities of the blood depend. This theory is not inconsistent with the results obtained by the administration of arsenic in minute doses, and which have led to a tonic virtue being attributed to it. In such doses it unquestionably stimulates the stomach, either by its direct action or by its secondary operation, and probably at the same time promotes the secretion of the liver, pancreas, and mucous glands. If so, it does what all condiments are intended to effect, facilitate digestion, and by that means improve nutrition. Indeed arsenic has with the irritant condiments (pepper, mustard, ginger, &c.) this common quality, that when the habit of using it is suspended, digestion languishes, and the health declines.

The question in regard to the action both of arsenic and of mercury on the blood, is one which might be greatly elucidated by experiments upon animals. This has not yet been done.

REMEDIAL EMPLOYMENT. *As an Anti-Periodic.*—The original experience with arsenic in the cure of intermittent fevers, by physicians in Germany, England, and America, has been too often confirmed by later observation, to permit a reasonable doubt being raised in regard to the reality of its virtues. It is not now enough, as it was in the time of Lemery and Geoffroy, to condemn the medicine without trial, on the ground of its poisonous nature. On such a ground the materia medica would lose nearly all of its most useful members. We shall endeavor to show what the real value of arsenic is in periodical diseases, by a brief abstract of the results which have attended its employment.

From Fowler's summary of his own experience it appears that 171 out of 247 cases of "agues" were radically cured by the arsenical solution; 45 were cured by Peruvian bark after the failure of the solution; and, of the remainder the greater number had the fits suspended only for a time. The cures generally took place within four days from the time when the administration of the medicine was commenced. Withering cured 33 patients out of 48 by the solution alone; in the remaining 15 cases it failed entirely.[1] Willan prescribed it in about fifty cases of different species of intermittents, and "it succeeded almost instantaneously in every case."[2] It was found by Winterbottom to be equally successful in African intermittents at Sierra Leone, where he cured twenty-one cases of the disease by its use. Among these cases were two of the quartan type.[3] In Philadelphia it was early employed

[1] Appendix to FOWLER'S Treatise.
[2] Miscell. Works, p. 466.
[3] Med. Facts and Obs., vi. 1.

by Wister, Griffiths, Barton, and Currie, the last named of whom mentions that it was a common practice in the State of Delaware to give the Asiatic pills (composed of arsenic and black pepper) for the cure of agues.[1] In 1820 Dr. T. D. Mitchell found it more effectual than bark during an epidemic at Norristown, Pa.; but unless he gave Fowler's solution in doses of fifteen or twenty drops his patients derived no benefit from its use.[2] Eberle was of opinion that it is best suited to the cure of the disease "in persons of a firm and healthy constitution, and most apt to act injuriously when given in a debilitated, cachectic, and irritable state of the system." In France, Desgranges and Foderé, the former in 1807, and the latter in 1809, attempted the introduction of arsenic as a substitute for cinchona, which, owing to the wars which then ravaged Europe and destroyed its commerce, had become extremely scarce. In England, as late as 1833 we find Dr. Joseph Brown stating that he had given the arsenical solution in many hundreds of cases, without witnessing any permanently ill effects produced by it. He ranks the medicine below bark and quinia, but states, what general experience has now confirmed, that cases are met with, which, having proved rebellious to one of these medicines, will be cured by the other.[3]

In despite of these and many other similar proofs of its efficacy, arsenic did not succeed in supplanting cinchona as a remedy for periodical fevers, and it gradually ceased to be used for this purpose, except in certain chronic cases, which were found intractable to bark. The discovery of quinia and its salts served still further to throw arsenical preparations into the background, and we should probably not again have heard them proposed, as a general means of treatment, had not the supply of Peruvian bark threatened to fall short of the demand for this precious drug.

In 1845 M. Boudin, a French military surgeon, addressed a communication to the Academy of Medicine, in which it was stated that during the previous five years he had treated 2947 patients with arsenical preparations, and had never met with any accident attributable to the medicine. His patients were treated in Senegal, Algeria, Syria, Italy, Corsica, the mouths of the Rhone, and Strasbourg, in all seasons, and at every period of life. He gave arsenious acid the preference over the arsenite of potassa, and administered it in doses of one-fifth of a grain dissolved in about three ounces of distilled water. Three doses were generally prescribed in anticipation of the

[1] View of the Diseases, &c., 1811, p. 34. [2] Eberle's Therapeutics, 6th ed., p. 254.
[3] Cyclop. of Pract. Med., ii. 226.

paroxysm, at intervals of two hours, and so that the last dose should precede the attack by three or four hours. Once the fever was arrested, a single dose was administered daily for about a week. By this plan M. Boudin found that the whole duration of the treatment was generally short, and that relapses were much less frequent than after the use of bark and its preparations.[1] In like manner Maillot and Masselot, the former at Lille, and the latter at Versailles, used this remedy with good effect, and a number of physicians both in Germany and France have imitated their example.[2] M. Frémy treated 361 cases of ague, of which 106 were cured by arsenic without having been subjected to any other treatment, and 158 after quinia had failed. He conceived it to be most applicable to chronic cases, and especially to those which had resisted the preparations of bark.[3]

On the other hand, several authorities of equal weight set a much lower value upon this plan of treatment. In 1849 and 1850, Jacquot made trial of the arsenical treatment in 282 cases of intermittent fever occurring at Rome, and his conclusions were decidedly adverse to its utility. In particular, he remarked that it is not allowable to substitute arsenic for quinia in the treatment of the malarial fevers of warm climates, because the attacks are often grave, and require to be met by a large dose of the specific remedy, which in the case of arsenic would be unsafe or impracticable. He concludes that arsenic is only allowable in chronic cases which have resisted quinia.[4] M. Gintrac, of Bordeaux, after giving an impartial summary of the experience of other physicians on this subject, and showing that the weight of testimony is decidedly adverse to a belief that arsenic is comparable to quinia as an antiperiodic, presents the results of his own observations which fully agree with those just stated.[5] Oesterlen, who, like Gintrac, employed arsenic in a locality where periodical fevers are endemic, found it far less effectual than bark or quinia;[6] and Clarus goes so far as to deny that it possesses antiperiodic properties at all, adding that he has so often seen it fail of curing, that he hesitates to admit the correctness of the many reports made in its favor.[7]

Such, it is believed, is a candid statement of the evidence now before the profession relative to the influence of arsenic in intermit-

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[1] Bulletin de l'Acad. de Méd., x. 1010.

[2] Arch. Gén., 4ème sér., x. 121, 456, and xi. 56; where the reader will find all that can be said in favor of the arsenical treatment of intermittents.

[3] Times and Gaz., Sept. 1857, p. 302.

[4] Archives Gén., 5ème sér., iii. 678.

[5] Pathologie et Thérapie, iii. 698.

[6] Heilmittellehre, 4te Aufl. p. 212.

[7] Specielle Arzneim., p. 861.

tent fevers. In estimating its value, the fact should never be lost sight of that a large proportion of simple intermittents tend spontaneously to cure, if the patient but keeps his bed, avoids disturbing influences, and, above all, if he has faith in the curative virtues of whatever prescription he follows. When such conditions have been allowed to act for a few days, without the use of any active medicine, it will then be time enough to introduce the remedy whose virtues are to be tested. There is, we apprehend, no doubt that arsenic is incomparably inferior to quinia in recent attacks of intermittent fever. At the same time, it is perhaps equal to quinia in chronic forms of that affection, and it certainly constitutes a precious resource in the small proportion of cases which resist cinchona in all its forms and in every dose.

The rules for the administration of Fowler's arsenical solution in intermittent fevers are these: Children of from two to seven years of age to take one drop at a dose for each year; between the ages of eight and twelve years the dose should be seven to ten drops. Beyond this age, ten or twelve drops three times a day should be given for five days, then suspended for two or three days, and again resumed to prevent a relapse. If the paroxysm is not suspended in five days, and the injection of the conjunctiva and the puffiness of the eyelids are moderate, it may, if necessary, be continued for two or three days longer. If the disease is still unconquered, the arsenic had better be laid aside, and cinchona given in its place.[1] If the solution occasions diarrhœa with moderate griping, five or six drops of laudanum may be added to each dose for an adult. To delicate persons, only two doses a day should be administered, and in children under two years of age the medicine had better be avoided.

In some cases of local disease which assumes the intermittent form, this remedy has been of service. Darwin cured a case of regular *intermission of the pulse* by the administration of four drops of a saturated solution of arsenious acid three times a day.[2] It has also been used successfully in intermittent *gastrodynia*, and still more so in *periodical headache*. Of this some notice will be found below.

Diseases of the Skin.—For many centuries the Hindoo physicians have been in the habit of prescribing arsenic in very minute doses for the cure of certain scaly affections.[3] A similar statement is made by Sir William Jones. In the western world it does not appear by whom this treatment was first recommended. It is said by Mérat to have been used by Adair in 1783–4.[4] But some of its earliest successful

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[1] Fowler, p. 88.
[2] Headland, the Action of Medicines, p. 197.
[3] Ainslie, Mater. Indica, i. 502, 641.
[4] Dict. de Mat. Méd., i. 441.

applications to the cure of skin diseases were made in the United States, by Drs. Martin, of Maryland, and Potter, of Philadelphia,[1] as early as 1796. In 1804, Dr. Otto, of the latter place, cured an obstinate case of eczematous eruption and other skin diseases, with the arsenical solution.[2] Soon afterwards (1806) Dr. Girdlestone, of Yarmouth, England, published an account of his successful use of the remedy "in some hundreds of cases of lepra, lichen, psoriasis, tinea capitis, &c."[3] Subsequently it was employed and eulogized by Willan and Bateman in England, and by Biett in France, and these physicians soon found imitators of their practice and success. But, on the whole, its reputation in cutaneous affections rests upon its efficacy in scaly eruptions and in chronic eczema.

Cazenave and Schedel, following in the path of Biett, advise the arsenical solution as the best remedy for lepra and psoriasis.[4] Its first effect, they state, is an increased activity in the eruption, which grows redder and more irritable; then the central portion of the patches becomes healthier, the edges crack and gradually subside, and often in less than two months the disease disappears after a tormenting duration of several years. In a case published by Cazenave,[5] the patient who, for fifteen years, had been afflicted with *psoriasis inveterata* was cured in twenty-six days by means of Fowler's solution, and that without any constitutional disturbance whatever.

Yet, however prompt and decidedly curative this treatment sometimes is, its success is by no means uniform, and they who employ it should not be too profuse of their promises to cure. Emery, whose high authority will not be contested, says: "I have notes of 140 cases of psoriasis, or lepra vulgaris, treated by various arsenical preparations, and of this number only 38 left the hospital apparently cured, after a treatment of two, four, six, eight, and even fifteen months. In the course of eighteen months 22 of these patients returned with a renewal of the disease. Of the remainder, 40 were more or less benefited, and 62 experienced such various ill effects from the medicine that, after eight or nine months of fruitless efforts, I was obliged to abandon it."[6] At the same time, Emery admits that, after all, arsenic is the best internal remedy for psoriasis, and by combining its use with the external application of tar ointment he obtained the highest degree of success. This, indeed, accords with general experience. The effects of a pure arsenical treatment were found by Gibert to be

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[1] CALDWELL's Medical Theses, p. 61. [2] Philad. Med. Museum, i. 47.
[3] Med. and Phys. Journ., xv. 297.
[4] Abregé Prat. des Mal. de la Peau., 2ème ed., 1833.
[5] Journal Hebdomadaire (1828), i. 258. [6] Bull. de Thérap., xxxvi. 481.

almost identical with those observed by Emery. Out of 98 cases subjected to this method, only 40 were cured, and 38 improved[1]. Dévergie prefers Fowler's solution to all other medicines in the treatment of scaly eruptions. He, however, does not think it of much utility in cases of inveterate psoriasis—those, for instance, of ten years' duration or more. In its administration, he commences with two drops the first day, three the second, and so on until sixteen drops a day are taken, and he does not venture beyond that quantity. Indeed, he is of opinion that to support this dose the patient must be robust, and have sound lungs and a good digestion; otherwise the gastric functions become deranged, the appetite fails, and emaciation ensues.[2] If such risk attends the method here proposed, there is a strong objection to employing it, and we should very decidedly give the preference to that which appears to have been so efficacious in the hands of Mr. Hunt.[3] He maintains that the curative powers of the medicine reside only in doses too small to be mischievous, although sufficient manifestly to affect the economy. Instead of gradually increasing the dose from a very minute one, he advises to begin at once with the largest dose intended to be used, and to reduce, but not suspend, the medicine whenever redness of the tarsi begins to appear. Mr. Hunt has embodied his method of treatment in the following code of regulations, which we think of sufficient importance to be inserted here.[4]

1. The use of arsenic is contraindicated where there is a feverish state of the system, a quick pulse, hot skin, &c.

2. It should never be given on an empty stomach.

3. It should never be given in increasing doses. This is a fatal and almost universal mistake.

4. The largest dose ever required is five minims of Fowler's solution three times a day.

5. This, if mixed with the food, will not irritate the stomach or bowels, but will, in the course of a few days or weeks, produce an itching or smarting in the conjunctiva. This membrane will appear slightly inflamed, and the lower eyelid will soon become a little puffed or swollen. The cutaneous disease will now begin to decline, and the dose must be reduced to four minims.

6. If the conjunctiva continues much inflamed, the dose must be further reduced, but the conjunctiva should be kept tender throughout the whole course.

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[1] Bull. de Thérap., xxxix. 115. [2] Maladies de la Peau, p. 100 et seq.

[3] Lancet, Jan. 1846, p. 77.

[4] Prov. Med. and Surg. Journ., April, 1846; and BRAITHWAITE'S Retrospect (Am. ed.), iii. 74.

7. If the skin becomes more inflamed, the course must not be interrupted, but a few leeches must be applied to the margin of the diseased portions, or an occasional aperient exhibited.

8. The arsenical course must be continued for as many months after the final disappearance of the eruption as it had existed years before. This will prove a security against a relapse.

9. Cutaneous disorders treated in this way seldom return, and never severely, nor is there any danger of metastasis.

Chronic eczema is hardly a less obstinate disease than psoriasis. Biett is reported to have cured it with singular rapidity by means of arsenic. Rayer testifies that "the preparations of arsenic are sometimes the only medicines which are adapted to the inveterate form of the disease affecting the scrotum, the vulva, the verge of the anus, &c., when a complete cure is desirable;" and Mr. Hunt brings evidence of its curative power after the inflammatory symptoms of the attack have been subdued. These results are further confirmed by Dr. Handfield Jones.[1] We found it the only one of a great variety of remedies which promoted the cure of an inveterate case of this disease affecting the whole body.

Of the other forms of skin disease, *chronic impetigo* and *lichen* are occasionally benefited by arsenic, when the inflammatory element has entirely disappeared; and a case is on record in which it cured *chronic pemphigus* on several successive occasions, but did not prevent its return.[2] Donovan's solution (*Liquor Arsenici et Hydrargyri Iodidi*) contains only one-quarter as much arsenic as Fowler's solution; but the union of arsenic with the two great alteratives of the Pharmacopœia is supposed to impart peculiar virtues to the compound. It appears to be especially adapted to those cases of scaly eruption which are of syphilitic origin, hereditary or acquired. Apart from this complication, squamous affections of the skin are apt to be aggravated by the use of any preparation containing mercury.

Among the other diseases for the cure of which arsenic may be given internally, is *chronic rheumatism*. As early as 1804, Mr. Jenkinson, of Manchester, used the arsenical solution in some cases of this affection, such as were afterwards described by Haygarth as "nodosity of the joints."[3] Bardsley thought "that it is only in the protracted chronic rheumatism, where the vital powers are much diminished, and the ends of the bones, periosteum, capsules or ligaments of the joints, are likewise partially affected, that the use of arsenic is likely to prove eminently successful."[4] In the form of disease, to which Dr. Haygarth

[1] RANKING'S Abstract (Am. ed.), xxiii. 113.
[2] Lancet, Feb. 1859, p. 158.
[3] Lond. Med. and Phys. Journ., xi. 492.
[4] Med. Reports, p. 32.

gave the name above mentioned, he found it of great service; and Dr. Christison says that he has known several cases of this affection get well under the continuous administration of arsenic for several weeks.[1] Eberle presents a similar account of its virtues, which he thought were very decidedly evinced in syphilitic rheumatism, but most of all in the form following "the imprudent use of mercury."[2] Similar attestations of the value of this treatment have been furnished by Fuller,[3] and Begbie.[4] The form of rheumatism referred to by these writers appears to be that which generally yields to the iodide of potassium, or to an alterative course of mercury. But in some cases circumstances may exist, difficult to state with precision, but still which prevent the curative action of these remedies, or render mercury, at least, unsuitable. In such cases the arsenical solution should be tried.

Chorea is an affection which is often more amenable to arsenic than to any other remedy. Many years ago, Mr. Salter reported four cases of the disease cured by giving three drops, three times a day, of Fowler's solution, and gradually increasing the dose.[5] Mr. McLeod says that when carbonate of iron fails to cure chorea, he has "recourse to the liquor arsenicalis, and with invariable or almost invariable success."[6] Dr. D. M. Reese, of New York, states "that he has employed arsenic in over two hundred cases of chorea without failing in a single instance in effecting a radical cure."[7] Romberg says he has learned by an experience of several years that foremost among the remedies which are able to arrest the disease in a short space of time is arsenic, in the form of Fowler's solution;[8] M. Aran has published a case of unilateral chorea cured by arsenious acid, and he regards the medicine as peculiarly applicable in the anomalous and obstinate forms of the disease.[9] Dr. D. Rice, of Massachusetts, informs us that during a period of five years he has cured all his cases of chorea in from two to six weeks by the use of Fowler's solution,[10] and Dr. Begbie declares that arsenic holds the foremost place among the various remedies employed for the cure of chorea.[11]

Neuralgia.—The intermittent form of neuralgia is that to the cure

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[1] Dispensatory (Am ed.), p. 252.
[2] Therapeutics, 6th ed., p. 255.
[3] Ranking's Abs. (Am. ed.), xxv. 37.
[4] Loc. inf. cit.
[5] Med.-Chir. Trans., x. 219.
[6] Lond. Med. Gaz., Jan. 1836, p. 651.
[7] Note to Am. ed. of Copland's Dict., art. Chorea.
[8] A Manual of the Nervous Diseases of Man (Syd. Soc. ed.), ii. 73.
[9] Bull. de Thérap., 1856, l. 289; lvi. 257.
[10] Boston Med. and Surg. Journ., Feb. 1858, p. 77.
[11] Edinb. Med. Journ., iii. 972.

of which arsenic is peculiarly adapted, and certainly, in cases that have resisted the power of quinia, it may be employed with great hopes of success. Fowler, in his Essay, reports seven cases, showing the efficacy of arsenic in this disease when it arises from a malarial cause. But its power is not confined to such cases. An instance of that terrible form of internal neuralgia which constitutes one of the varieties of angina pectoris, has been published by M. Garin, of Lyons, and in it arsenious acid effected a cure when everything else had failed to afford relief.[1] A very similar instance of the same disease cured by Fowler's solution was long ago reported by Alexander.[2] In neither case were the paroxysms regularly intermittent. A violent neuralgia of the supra-orbitar and other branches of the fifth pair, resulting from a wound and fracture of the right frontal protuberance made by a dagger, is reported to have been cured by arsenious acid, after the failure of other remedies.[3] To these evidences in favor of the remedy may be added the testimony of Maculloch, who says that he found it more generally efficacious in neuralgia than in intermittent fever, for it often acted like a charm on the pain, even in cases of many years' duration.[4] Finally, Romberg, speaking of the treatment of facial neuralgia, says: "The united testimony of various observers agrees in according to arsenic the chief place among metallic preparations; but it will not do to rest contented with such timid doses as might be worthy of a homœopathic quack. It must be exhibited in increasing doses, from three to ten drops of Fowler's solution, two or three times daily; it should be persevered in until the toxic effects show themselves, in sickness, a sense of fainting, formication in the toes and fingers, dryness of the fauces, and white tongue; then a pause should be allowed, and the solution be resumed as soon as those symptoms have subsided."[5]

Asthma.—In certain cases of shortness of breath, which, however, are not well determined, arsenic appears to be of service. The ancient use of sulphuret of arsenic for asthmatic affections has already been noticed, and it may now be added that, according to Moschati,[6] the mountaineers of Dalmatia and Albania are in the habit of employing the inhalation of arsenical vapors in chronic disorders of the lungs. Some cases illustrative of its use in such affections, have been published of late years, but are not very conclusive as to the efficacy of the remedy. Trousseau found that in tuberculous phthisis it some-

[1] Bull. de Thérap., xlviii. 351.
[2] Duncan's Commentaries, 1789, xv. 373.
[3] Journ. Compl. des Sci. Med., xii. 327.
[4] On Marsh Fever and Malaria, ii. 377.
[5] Op. cit., i. 53.
[6] Harles, op. cit., p. 106.

times suspended the progress of the disease in a remarkable manner. He gave arsenious acid in doses of $\frac{1}{25}$ to $\frac{1}{4}$ grain, and caused his patients to smoke cigarettes made of paper saturated with a solution containing half a drachm or a drachm of arsenite of soda, in three drachms of water. Such inhalations, we should suppose, might be mischievous, unless closely watched.

Uterine Disorder.—Dr. Hunt mentions that he was successful in curing a number of cases of *menorrhagia*, which he publishes at length.[1] In most of them the hemorrhage appears to have depended upon a feeble rather than a sthenic condition of the uterine system. He employed Fowler's solution, and also arsenious acid; of the latter the dose prescribed was $\frac{1}{20}$th of a grain three times a day. Dr. Locock, from whom Dr. Hunt originally derived the suggestion for using this remedy, found it advantageous not only in atonic menorrhagia, but also in the acute form of the affection after depletion had been resorted to.[2] Dr. Hunt has also found arsenic a valuable remedy in *dysmenorrhœa* and *leucorrhœa*, and all forms of uterine disorder associated with rheumatism. Dr. Simpson has used it successfully in *amenorrhœa*, as well as in that peculiar affection of the bowels characterized by copious discharge of membranous shreds, and accompanied by great emaciation, and a long train of neuralgic and other nervous symptoms.[3]

M. Imbert-Gourbeyre has drawn attention to the great utility of Fowler's solution in the treatment of *vulvar pruritus*.[4]

Arsenic has been used in various other affections, as *whooping-cough*, *epilepsy*, *tetanus*, *furunculus*, *snake-bites*, *dropsy*, &c., but its efficacy in all of these affections is too uncertain to entitle it to confidence.

External Application.—Cancer. It may be proper to premise a few words respecting the use of arsenic as an *internal* remedy for this disease. Harles recites the names of many distinguished physicians who used this remedy with success, and among them Lentin, Frick, Tode, Adair, and Roennow. The last mentioned is said to have used this treatment for more than forty years, and to have cured thirty cases of well-marked cancer. He, however, also employed arsenical caustics. Mr. Hill extols the medicine in a great variety of diseases as well as cancer, and with so little measure as to weaken our faith in his judgment respecting the latter. He states, however, that certain tumors presumed to be scirrhous, and certain ulcers believed to be cancerous, occasionally amend or are removed by the use of arsenic. The judgment of Dr. Walshe, in respect to the *iodide of*

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[1] Med.-Chir. Trans., xxi. 277.
[2] Lancet, April, 1838, p. 93.
[3] Edinb. Med. Journ., iii. 978.
[4] Times and Gaz., May, 1859, p. 505.

arsenic is of sufficient importance to be quoted here. This compound was introduced by Dr. A. T. Thompson, who supplied the earliest evidence of its favorable influence on cancer. Since then, says Dr. W., "I have used it in several cases, from which (in the greater number, other but not equally energetic means were simultaneously employed), I feel myself justified in drawing the following inferences as to its effects. It is to be premised, that in all these cases, the species of cancer treated was scirrhus in the non-ulcerated stage, that the breast was the part affected, and that the constitution had in some begun to suffer seriously. 1. Given in doses of one-sixteenth to one-twelfth of a grain twice daily, two hours after eating, the iodide of arsenic is well borne, and may be continued without risk for several months. 2. The system generally soon gives evidence of its action—unusual perspiration with dryness of the fauces and alimentary canal occur. Sometimes slight headache is complained of, but this is rare; and I have known most violent periodical headache, which had afflicted a lady for years, disappear while she was under the influence of the salt. 3. The pain of the tumor decreases in violence. 4. The size of the breast generally diminishes; and if the tumour itself does not actually lessen in bulk, I have at least found that its enlargement, previously more or less active and apparent, becomes, as far as can be determined, suspended. 5. The general health improves."[1] These conclusions, considering the source from which they emanate, are entitled to serious consideration, and both warrant and encourage the use of the remedy in the cases referred to.

The use of arsenic as a *caustic* is of ancient date. Celsus recommends orpiment, lime, and chalcites, in gangrene of the penis;[2] and in the sixteenth and seventeenth centuries, it was used in the topical treatment of cancer by Fernel, Fallopius, Mayerne, Guyde, Chauliac, and others.[3] Some employed it much diluted to improve the action of the ulcerated surface, and others as a caustic to destroy the cancerous structure. The cancer paste of Frère Côme consisted of Cinnabar ℥ij; ashes of old leather gr. viij; dragon's blood gr. xij; arsenious acid ℥ij. These ingredients were brought to a proper consistence with water, and then applied in a thin layer over the whole surface of the cancerous ulcer, previously dried with lint. It occasioned severe pain and great inflammation, after which a slough formed, and was thrown off in the course of two or three weeks. If the resulting wound did not heal, the operation was repeated, and this was sometimes done

[1] The Nature and Treatment of Cancer, p. 201.

[2] Book VI. chap. 18.

[3] Richter, op. cit., v. 146.

several times in succession. Rousselot's powder consisted of two drachms of arsenious acid, mixed with two of the bisulphuret of mercury, and the same quantity of dragon's blood. In our own times Dupuytren was in the habit of using a powder composed of ninety-nine parts of calomel to one of arsenious acid, and sometimes increasing the latter to five or six parts in the hundred. From time to time the treatment of cancer by arsenical paste after having been laid aside by surgeons, acquired a certain vogue through the reports of cures wrought by its use in the hands of irregular practitioners. Thus Dr. Rush gives an account of a medical quack, who was said to be very successful in the treatment of cancer by means of a powder which was found to contain arsenic. It is, however, particularly stated that these cancers were seated upon the nose, cheeks, and surface of the body or extremities, and not in the neck, breast, or axilla. Hence it is possible that they were cases of lupus merely. A similar account is given by Dr. Thomas Sewall, who was persuaded of the curative virtues of the application.[1]

In regard to the value of arsenical caustics in cancer, Dr. Walshe remarks: "That arsenical preparations have with some frequency effected a cure of cancerous ulcers in the manner described is a fact concerning which no doubt can be held." But, after mentioning that the paste causes a slough which separates in from two to six weeks, and that sometimes a second and third application of it is required, he continues: "The dangers increase to such a degree that it is now a matter of received doctrine that these preparations should only be used in cases of superficial cancer." Indeed, it is certain that numerous persons treated by their means have perished miserably from pain, inflammation, or hemorrhage following the application. It is difficult to perceive what advantage the tedious and very painful operation of caustics can possess over the speedy and less painful action of the knife, and least of all since the use of anæsthetics has done so much to deprive the surgeon's hand of its terrors. Yet the use of caustics for cancer has always been and continues to be a favorite field for the manœuvres of quackery, and hardly a community exists that has not furnished one or more victims of its cruel operations.

In the treatment of *lupus*, which is a tuberculated scrofulous inflammation of the skin, several caustics are employed, such as the Vienna paste, the chloride of zinc, and the acid nitrate of mercury, but when the tubercles are large it is necessary to select one

[1] N. England Journ. of Med., iv. 111.

that acts powerfully and deeply, but not to apply it upon an extensive surface, for fear of the danger of arsenical poisoning. M. Lebert relates that Pope Gregory XVI., having a cancroid ulceration of the nose, which the Roman surgeons were unable to heal, M. Allertz, of Aix-la-Chapelle, was consulted, and was successful in producing its complete cicatrization. It appeared afterwards that he had employed the arsenical paste of Frère Côme, which had previously been used, but less thoroughly.[1] If this caustic is selected it should be very cautiously applied over the nasal cartilages. Its action is very painful; it occasions an erysipelatous inflammation for several days, and, for a week, the patient may expect to enjoy no sleep. The eschar falls between the tenth and the fifteenth day, and generally leaves a healthy granulating surface.

Treatment of Arsenical Poisoning.—The following precepts have reference especially to the most usual form of arsenical poisoning, that by arsenious acid. The first care should be to procure the discharge of the poison from the stomach, and, as far as possible, by means of remedies which will not irritate the mucous membrane of this organ or depress the system. The emetics to be preferred are ipecacuanha, in doses of from twenty to forty grains, alum, or the sulphate of copper or of zinc, and their operation is to be promoted by large draughts of tepid and demulcent drinks, such as mixtures containing the white of egg, milk, flour, oil, animal broths, lime-water, &c., which serve, in some degree, to envelop the poison and shield the membrane. Their action should be further promoted by tickling the fauces, and then, if vomiting does not take place freely, the stomach should be thoroughly washed out by means of the stomach-pump. Having thus, as far as possible, removed the poisonous substance, those preparations may be administered which are supposed to enter into chemical combination with the arsenic and render it inert. Of these the one most commonly employed is the hydrated sesquioxide of iron, which must be given in very large doses to be efficient. A tablespoonful every five or ten minutes is the dose recommended. It combines with the dissolved portion of the acid, and, in the vomiting which its bulk occasions, an additional portion of the poison may be discharged. The hydrated sulphuret of iron (*sulfure de fer hydraté*) has been proposed by Mialhe as superior in efficacy to the hydrated sesquioxide.[2]

Magnesia, when finely calcined, or still better, when prepared by precipitation from its solutions in the form of a hydrate, has also been

[1] Maladies Scrofuleuses, p. 263.

[2] Chimie Appliquée, p. 253.

recommended as an antidote to arsenic, and so have animal charcoal and lime-water. How far the operation of any of these preparations is chemical, and how far it is merely mechanical by enveloping the poison and delaying or preventing its contact with the walls of the stomach, is far from being satisfactorily determined. It is, perhaps, not unworthy of consideration that they must tend, by their direct action upon the gastric mucous membrane, to promote, or even to cause, its inflammation, and hence it would seem that a certain moderation, with reference to the violence of the symptoms, ought to be observed in administering them.

After having carried the use of these means as far as the exigencies of the case require, it is usually advised to direct a dose of castor oil for the purpose of expelling from the bowels whatever portion of the poison they may still contain. At the same time, if the surface of the body is cold, it should be briskly rubbed and dry heat applied to it by means of heated sand, bottles or other appropriate vessels containing hot water, &c. This is also the period when stimulants may be resorted to. Of these, opium and alcoholic liquors are the most important. The utility of the former is sometimes very decided by relieving the pain and sustaining the strength, and, perhaps, also by diminishing the rapidity of the absorption of the poison. It should be given in doses adapted to stimulate but not to narcotize the patient, that is to say, in small quantities repeated at short intervals. This intention will be promoted by wine or brandy administered along with the opiate or in the intervals between the doses of the latter.

It is sometimes advised to use depletion, both local and general, to combat the inflammation of the stomach, but however clear the indication for an antiphlogistic treatment may be, if drawn merely from the physical condition of this organ, there is in reality a state of the system which takes precedence of the local derangement, and calls more imperatively for relief. The symptoms in fatal cases are often those of depression and a tendency to collapse. If these are not combated the patient must die, under the combined pressure of the local and the constitutional poisoning; but if the system is upheld until the violence of the attack has spent itself, the restorative power of nature can be exercised with less restraint.

IODINIUM.—Iodine.

Sources. Preparation.—Iodine is one of the most widely disseminated of the elementary bodies. According to M. Chatin it exists in rain water and in the atmosphere.[1] It is found in every kingdom of nature, but most abundantly in plants which grow upon the sea-shore, and in marine zoophytes. Among the products of the ocean the natural family of *Algæ* furnish it most abundantly, and those which inhabit deep water possess it in largest proportion. It has been detected in many fresh water plants (*confervæ*), and in several land plants or their products, and particularly in the *agave mexicana*. Of animals, those of the genus *Spongia*, and a great number of shell fish, are rich in this product. It has also been found in eggs, in milk, especially of the ass, in cod-liver oil, and in human urine. An insect met with in Italy, *Julus fœtidissimus*, emits, when disturbed, a yellow fluid smelling strongly of iodine, and which immediately strikes the characteristic violet color with starch.[2] Iodine exists, also, in various mineral springs of Germany, Italy, France, and other parts of Europe, especially in those of Heilbronn, Kreuznach, Saleset, Cauterêts, and Barêges. In the United States the iodine spring of Saratoga is said to contain 3.5 grains of hydriodate of soda to the gallon of water. It also exists in the Kenhawa saline waters, and in those of western Pennsylvania.

The iodine of commerce is procured from *kelp*, *i. e.*, the ashes of sea weeds, by mixing them with water and evaporating the solution until all the saline matters contained in the lixivium are precipitated except the iodide of sodium. The solution is then acidulated with sulphuric acid and distilled with deutoxide of manganese. The reaction between these several bodies results in the evolution of iodine, which is condensed in appropriate receivers, while sulphate of soda and sulphate of the protoxide of manganese remain behind. The iodine thus procured is purified by washing and a second sublimation.

Properties.—Although crystallizable, iodine is generally in the form of opaque, soft, and friable scales, of a leaden color and metallic lustre. It evolves an odor somewhat analogous to that of chlorine, and has an acrid, pungent, and burning taste. It stains the skin temporarily of a brown color, due to the formation of hydriodic acid. With starch it gives a characteristic deep-blue color, but when it is in combination with other bodies it must be set free before this test can be applied.

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[1] Bull. de l'Acad., xxiii. 346. [2] Br. and For. Med. Rev., v. 163.

At ordinary temperatures it evaporates slowly, but at 225° F., it disengages a dense violet-colored vapor, which has a specific gravity of 8.7, and is the heaviest vapor known.

Iodine dissolves readily in alcohol, ether, and animal oils, forming a very dark brown solution, which gradually becomes paler on being exposed to the sunlight. Water precipitates it from its spirituous solutions, and in mixtures containing organic substances it is converted into iodureted hydrogen.

Potassii Iodidum.—Iodide of Potassium; Hydriodate of Potassa.

This salt is obtained by mixing together an aqueous solution of potassa and iodine slightly in excess. A part of the potassa is decomposed into oxygen and potassium, the former of which produces iodic acid with a portion of the iodine, which unites with the undecomposed potassa forming iodate of potassa. The remainder of the iodine combines directly with the metalloid, and forms iodide of potassium. The mixture is subsequently heated with charcoal, which abstracts the oxygen from the iodate of potassa, leaving iodide of potassium only behind. By filtering and evaporating the solution, the latter product is obained in a crystalline form.

Iodide of potassium generally crystallizes in cubes or octohedra. The crystals are sometimes transparent and sometimes opaque. They have a saline, penetrating, and bitter taste, readily deliquesce in a moist atmosphere, and are soluble in three-fourths of one part of cold water, and in six parts of alcohol. The solution is inodorous and colorless. It is the preparation of iodine chiefly used for internal administration.

Tinctura Iodinii.—Tincture of Iodine.

This is a solution prepared by dissolving an ounce of iodine in a pint of alcohol. The French Pharmacopœia directs an ethereal solution made in the same proportions. The tincture of iodine is very apt to become altered by exposure to the sunlight; and if not kept in well-stopped bottles, a portion of the alcohol evaporates, and iodine is precipitated. This result also takes place on the addition of water. It is employed almost exclusively as an external application, but may be given internally in doses of from *ten to thirty or forty drops*, very much diluted.

Tinctura Iodinii Composita.—Compound Tincture of Iodine.

This tincture is made by dissolving an ounce of iodine and an ounce of iodide of potassium in a pint of alcohol. It is a more permanent preparation than the simple tincture, and has over the latter the great advantage that its iodine is not precipitated on the addition of water.

Hence it is much better adapted for internal use. It is also much more readily absorbed, and therefore may be applied externally when it is desired to affect the system by this mode, or to influence local organic changes. It is, however, much less irritating than the simple tincture.

The compound tincture of iodine may be administered internally in the dose of from *ten to thirty drops*, largely diluted with water or some mild liquid.

Liquor Iodinii Compositus.—Compound Solution of Iodine; Lugol's Solution.

This preparation is made by dissolving six drachms of iodine and an ounce and a half of iodide of potassium in a pint of distilled water. It is a stronger solution than the last, and differs from it also in having water for a menstruum instead of alcohol. Owing to this circumstance, it is less objectionable as an internal medicine. It is, however, used as an external application, and, when largely diluted with warm water, by inhalation also.

The dose of this solution is from *five to fifteen drops* in a draught of sweetened water, and repeated two or three times a day.

Unguentum Iodinii.—Ointment of Iodine.

This preparation is made by rubbing together twenty grains of iodine and four grains of iodide of potassium with six minims of water, and incorporating the mixture with an ounce of lard.

Unguentum Iodinii Compositum.—Compound Ointment of Iodine.

This ointment is prepared by rubbing together half a drachm of iodine and a drachm of iodide of potassium with a fluidrachm of alcohol, and incorporating the mixture with two ounces of lard.

It is much preferable to the simple ointment of iodine, on account of the proportion of iodide of potassium which it contains, and which is perhaps more readily absorbed by the skin, while its local irritant effects are equal to those of the other preparation.

Sulphuris Iodidum.—Iodide of Sulphur.

By rubbing together four ounces of iodine and one of sulphur, and heating the mixture to fusion, this compound is obtained. It is a solid of a grayish-black color, having the radiated appearance of sulphuret of antimony. It stains the skin like iodine, and has the odor of this substance. It is chiefly employed as an external application, but may also be given internally in the dose of from *one to six grains*, and in pilular form.

Unguentum Sulphuris Iodidi.—Ointment of Iodide of Sulphur.

A drachm of iodide of sulphur incorporated with an ounce of lard forms this ointment. Its qualities are those of a local stimulant.

Amylum Iodatum.—Iodized Starch.

This preparation, which is not officinal, is formed by the admixture of one part of iodine and twenty of starch. It was proposed by Buchanan as a convenient means of introducing into the system a large quantity of iodine without irritating the alimentary canal. According to Winckler, when powdered starch is spread out under a bell-glass along with a vessel containing iodine, the starch absorbs so much iodine in the course of from one to two weeks as to turn almost black, and, on analysis, is found to contain as much as thirty-six grains of iodine to the ounce, while Buchanan's preparation contains only twenty-four grains to the ounce.

This mixture renders it possible to introduce a very large quantity of iodine into the system. Thus Buchanan prescribed as much as one ounce three times a day, which is equivalent to seventy-two grains of iodine, without any unpleasant symptoms.[1]

Medical History of Iodine.—The discovery of iodine in the mother waters of soda was made by Courtois in 1811, but its nature as an elementary body was determined by Davy and Gay Lussac in 1813. On account of the violet color of its vapor (ἰοειδής, *violaceus*), it received the name which it now bears. It was, as already mentioned, detected in a great number of natural bodies, and especially in *fuci* and sponges. These had long been celebrated for the cure of goitre. Even Galen speaks of burnt sponge as acrid and discutient, and other European and also Arabian writers say the same thing, but without any special reference to goitre. The productions referred to are, however, mentioned as curative of goitre in Chinese works of 1567.[2] In the thirteenth century, Arnold de Villanova, an eminent physician of Montpellier, employed burnt sponge for goitre and for scrofula, and in the beginning of the eighteenth century, Lemery spoke of it as a remedy for goitre and the scurvy.[3] In 1776, Mr. Lane, of London, reported two cases of this affection treated by the remedy in question.[4] Lewis says the burned sponge is a principal article in what is called the Coventry method of cure of the bronchocele, and also in that published by Mr. Prosser.[5] Indeed, it would appear that sponges and other marine products containing iodine, have from time imme-

[1] Lond. Med. Gaz., xviii. 516.

[2] Stanislaus Julien, quoted by Boinet, Iodothérapie, p. 1.

[3] Dict. des Drogues, 2ème éd., p. 811.

[4] Mem. Med. Soc. Lond., i. 217.

[5] Mat. Med., 4th ed., 1791, ii. 385.

morial been recognized as popular remedies for goitre and scrofula, and to these may be added cod-liver oil, which, in its pure state, contains a certain proportion of iodine.

In February, 1820, Dr. Straub, of Hofwyl, published an account of his having discovered iodine in sponges, &c., and suggested that iodine might be advantageously used in all the diseases in which prepared or burnt sponge had been employed.[1] In the same year, Coindet, of Geneva, finding that the *varech* (*fucus vesiculosus*) had been used as a remedy for goitre in the same way as burnt sponge, suspected that the iodine which both contain was the source of their curative properties. He accordingly put his conjecture to the test of experiment, and met with astonishing success, an account of which he published in July, 1820.[2] Immediately the new remedy became famous, and was employed not only for its original purpose, but for various and discordant objects, many of which it failed to accomplish. It was also used with so little circumspection as to occasion the serious results of acute and chronic poisoning; so that it began to be viewed with distrust, and was prescribed reluctantly. The gradual introduction of iodine into medical practice, through the influence of Coindet, Lugol, Biett, Gairdner, Lallemand, Velpeau, and, more recently, by Gibert and Boinet, has overcome the disfavor with which its preparations were viewed, and they now stand second in value to mercury alone among the alterative medicines.

Action. *On Plants.*—According to Cantu, the seeds of plants sown in clean sand, and watered with a solution of iodine, germinate rather sooner, and produce somewhat hardier plants than usual.[3] Results, the very opposite of these, were obtained by Vogel, Robin, and Bouchardat, the last named of whom asserts that plants die, in the course of two or three days, in water containing one-thousandth part of iodine, and that a somewhat stronger solution of iodide of potassium is very injurious to them. These discrepancies are perhaps reconcilable by a reference to the quantity of iodine employed in the several experiments. In minute proportion, it probably promotes vegetation, for it exists in many of the most fertile soils.

On Animals.—According to Bouchardat, iodine is an active poison of the lower animals, for fishes perish in from two to five minutes in a watery solution containing only the one-thousandth part of this substance.

When *small* and *often repeated* doses of iodine, or of its tincture, are

[1] Med.-Chir. Trans., xi. 432.

[2] Bayle, Bibl. de Thérap., i. 1.

[3] Boinet, op. cit., p. 47.

given to animals, they produce general excitement of the nervous and arterial systems, irritation of the stomach and bowels, shown by vomiting and diarrhœa, an increased flow of urine, and a gradual but progressive emaciation of the whole body, but especially of the glandular structures. *Larger* doses occasion more decided evidences of gastro-intestinal derangement, and very large ones produce inflammation and ulceration of the stomach, generally terminating in death, within a week.[1] Yet some animals recover in spite of excessive doses of iodine. Dick, of Edinburgh, gave iodine to a horse for three weeks, in doses of from one to sixteen drachms, or, on an average, two drachms, without any other effect than to create a marked aversion to water.

As an illustration of the effects of iodine in large doses, the following experiment of Orfila may be quoted.[2] Ten drachms of iodine were given to a dog of medium size. It appeared to irritate the fauces, for the animal's mouth was presently filled with a yellowish foam, and repeated acts of swallowing were performed. Five hours afterwards, fæces of natural consistence were voided, and yellowish matters were vomited. There were but slight evidences of pain. On the morrow, the dog refused food, and lay still; the third day, there was some fever, and in the evening a stool, which, however, contained no iodine. On the seventh day, the animal died from mere exhaustion, having presented no definite or characteristic symptoms. The stomach on examination was found lined with thick and tenacious mucus; seven or eight linear ulcers were formed upon folds of the mucous coat, and elsewhere, softening of this membrane was more or less marked. The lining membrane of the small intestine was covered with a yellowish and tenacious mucus tinged with blood. These lesions appear to have been due mainly to the direct corrosive action of the iodine.

Dr. Christison gave forty grains of finely-powdered iodine in an ounce of water to a rabbit, followed by an equal quantity of pure water. Very soon the pupils became dilated, the heart beat feebly and slow, the breathing was laborious and jerking, and saliva flowed abundantly from the mouth. In half an hour the animal was dead. The only lesion found was a corrugated and roughened condition of the mucous membrane of the cardiac portion of the stomach, and fluidity of the blood in the large vessels.

When iodine in solution is injected into the *veins*, it is in general, speedily fatal, occasioning convulsive movements, dyspnœa, cough, and tumultuous beating of the heart. But when Patu injected a

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[1] Strumpf, Handbuch., ii. 666.

[2] Toxicologie, i. 97.

drachm of iodine dissolved in two ounces of diluted alcohol, into the jugular vein of a horse, the animal at first manifested great disturbance of function, but in the course of an hour and a half had quite recovered.[1]

Dévergie administered to a dog, through an opening in the œsophagus, two drachms of *iodide of potassium* dissolved in an ounce of distilled water. Efforts at vomiting ensued, the animal seemed prostrated, and died on the third day. Upon dissection, the gastric mucous membrane was found red, especially at the greater extremity of the organ, and numerous dark striæ ran in various directions. Some spots of ecchymosis existed in the submucous tissue.[2] In another experiment, three drachms of the salt were employed, and a ligature was applied to the œsophagus. After some indications of pain, the animal became quiet, and grew more and more dull, until, on the third day, it died in a state of complete relaxation. In addition to the lesions found in the first case, there were superficial ulcers of the mucous membrane. In other cases submucous emphysema was observed in the stomach. In the experiments of Stubenrauch, of Berlin, who gave rabbits from two to eight drachms of iodide of potassium dissolved in water, the symptoms were slow respiration, general prostration, a feeble pulse, diuresis, spasms, and death in the space of from one to four hours.

When a solution of iodide of potassium is injected into the *veins* of an animal, death takes place very speedily, and is preceded by convulsions. Experiments upon larger as well as smaller animals, such as horses and rabbits, and performed by various persons, have furnished almost identical results. In most cases the blood is of a bright red color, and shows but little tendency to coagulate.

Upon Man.—Externally. On the Skin. When iodine mixed with an unctuous substance is applied by friction to the skin, and especially if the integument is delicate, a sense of warmth is perceived, with more or less redness, prickling, and burning, which may indeed become very severe. The tincture of iodine stains the skin of a yellow or brownish-yellow color, which gradually disappears; but if the tincture be strong or the skin tender, an exfoliation of the cuticle usually takes place. Sometimes the application is followed by an erythematous inflammation of the skin which may extend beyond the part covered by the solution and occasion pain and some fever. Sometimes, also, a measly or papular eruption appears, and, in either case, if the part affected is furnished with hairs they are apt

[1] Strumpf, op. cit., ii. 668.

[2] Archives Gén., x. 264.

to fall out. The absorption of iodine, when it is applied to the skin, is supposed to be shown by its action upon glandular structures, causing them to diminish in size, and by the colic, diarrhœa, and dryness of the fauces which are reported to have been observed in some cases. It has, in fact, been generally believed that iodine produces its deleterious and also its curative effects upon the system, quite as certainly, though, perhaps, not so readily, by the external as by the internal mode of its administration.[1] Recent experiments, however, throw great doubt upon the current opinion in relation to this subject. It was found by Braune that neither foot-baths containing forty-five grains of iodide of potassium in six quarts of water, nor frictions with iodine ointment upon the breast, abdomen, and back, produced the slightest trace of iodine in either the saliva or the urine.[2] In spite of these experiments, we are still disposed to believe in the absorption of iodine by the skin. Too many examples of its curative operation by this mode exist, to be rejected upon the sole ground of the experiments referred to. If tincture of iodine is applied to the denuded cutis, as upon a blistered or ulcerated surface, it acts as a caustic, producing severe pain, and afterwards gastro-intestinal derangement. Bonnet has shown this to be true,[3] and similar results (which he employed therapeutically) were obtained by Philippeaux.[4]

On Mucous and Serous Membranes, &c. When tincture of iodine is applied to the denuded cutis, or to mucous membranes, its action is nearly the same as upon the skin, viz: it occasions smarting followed by contraction and dryness of the tissue, which is then protected from the air by a film of albumen mixed with iodine. If the application is frequently repeated, swelling, pain, and bloody exhalation may ensue. The contact of a solution of iodine with the living *serous* membrane, produces inflammation of varying intensity according to the preparation employed. Of a certain strength, it appears to limit its action to the arrest of the secretion proper to the membrane, but when more concentrated, it excites adhesive inflammation. The membrane afterwards presents a shining surface of a somewhat leaden color. The liquid is in part absorbed, and can be detected in the secretions. Owing, perhaps, to the facility of its absorption from cellular tissue as well as from serous membranes, it seldom occasions inflammation when by accident or design it is diffused through the former, and its action on the latter is mainly confined to limiting or prevent-

[1] Med.-Chir. Rev., June, 1824, p. 105; also, BUCHANAN's Remarks, loc. cit.

[2] VIRCHOW's Archiv., Marz, 1857, p. 295.

[3] Gaz. Méd. de Paris, and Am. Journ. of Med. Sci., Oct. 1852, p. 495.

[4] Bull. de Thérap., xliii. 19, 62.

ing the tendency to serous effusion when that exists, unless applied in a concentrated form.

Internally.—When strong *vapors* of iodine are inhaled, they irritate the mouth, fauces, and respiratory passages, occasioning coryza, cough, watering of the eyes, and headache. The prolonged action of iodic emanations, as in manufactures, gives rise to inflammation of the throat, severe pains in the breast, and sometimes to nervous disorder, such as confusion of the mind, dizziness, ringing in the ears, flashes of light before the eyes, and headache. When preparations of iodine are applied to mucous membranes or to the denuded cutis, they are readily absorbed. Iodine has been detected in the blood, the milk of nursing women, in the tears, the saliva, and most of all in the urine. Wallace found it in the urine of a child whose nurse was taking iodide of potassium.[1] It has been detected within half an hour in the urine after the smoking of an iodized cigar. (*Strumpf.*) It has also been recognized in the serous effusion of hydrocele, and of dropsy of the joints, in persons who were taking it medicinally. But it has not been found in the perspiration, in the purulent secretion of the skin, or of mucous membranes, nor in the serum of blistered surfaces. Iodine is much less rapidly eliminated than the iodide of potassium. Indeed, it is maintained by some observers, in view of the large proportion of the latter excreted with the urine, that it is not decomposed in the system at all. The quantity discharged in this manner may be judged of from the experiments of Scharlau, who recovered three hundred and forty-five centigrammes of the salt from the urine of a patient who had taken three hundred and fifty centigrammes of it. The remaining five centigrammes must have been distributed to the other secretions, the saliva and the tears in particular. So Marchal gave the dose of one gramme (fifteen grs.) of the salt, and recovered nearly nine-tenths of it from the urine.[2] It is probable, however, that the rapidity of the elimination is not always the same. Thus, in a case in which *iodism* was strongly marked, iodine was found in the urine six weeks after the medicine had ceased to be taken.[3] The tendency of iodine to be excreted chiefly by the kidneys, is also illustrated by Buchanan's experiments with the iodide of starch. He analyzed the alvine dejections of a patient who was taking daily an ounce of this compound, containing thirty-six grains of iodine. They were natural in color, or even paler than usual, and did not contain a particle of iodine.[4] The same experimenter having

[1] Lancet, March, 1836, p. 6.
[2] Iodothérapie, p. 32.
[3] Revue Méd., civ. 570.
[4] Lond. Med. Gaz., xviii. 517.

taken two drachms of the iodide of potassium, drew blood from his arm as soon as the salt appeared in his urine, and found both serum and crassamentum deeply impregnated with iodine.

The carefully conducted experiments of Dr. C. Handfield Jones, undertaken for the purpose of discovering, if possible, some uniform effects upon the urine from iodide of potassium, could determine none. It increased the urine or diminished it, rendered it sometimes more and sometimes less acid, and had an equally variable influence upon its proportion of chlorine, of urea, and of uric, sulphuric, and phosphoric acids.[1]

The effects of iodine *in small doses, but not long continued*, may be inferred from the following experiments: Orfila took two grains of this substance, fasting. He found its taste extremely disagreeable, and was somewhat nauseated. The following day, on increasing the dose to four grains, a sense of heat and constriction in the throat was felt for a quarter of an hour, when vomiting of the iodine took place. The next day but one he took six grains of iodine, and, as before, immediately experienced heat and constriction of the throat, nausea, eructation, salivation, and epigastric pain. In ten minutes, copious bilious vomiting occurred. On the morrow, no effects of the medicine remained, except a slight feeling of lassitude.[2]

The experiments of Jörg and his assistants offer more detailed results. They used a tincture containing one grain of iodine to ten drops of alcohol. Of this preparation, from one to five drops in half an ounce of water caused an irritation of the throat with a saltish taste in the mouth, and more or less oppression in breathing. The larger of the doses occasioned fugitive pains in the head, back, and arms, augmented appetite, and copious frothy stools, followed by constipation. Doses of from six to fifteen drops gave rise, in addition, to colic and borborygmi, hunger, thirst, watery stools; an increased flow of light-colored urine, of nasal mucus, and of saliva; transient malaise, tension of the head, and oppression of the chest. When the dose was raised to eighteen drops the symptoms were more marked, and besides those already enumerated, there was a diffused sense of heat, quickened pulse, sexual excitement, and a dry cough.

The experiments of Jörg led him to the following conclusions: Iodine irritates the alimentary canal, augmenting the salivary and pancreatic secretions, increasing hunger and thirst, and producing colic and diarrhœa. It also occasions pains in different parts of the head, and tends to develop irritation, congestion, and even inflamma-

[1] Beale's Archives, i. 182.

[2] Toxicologie, 5ème éd., i. 100.

tion of the lungs, augmenting at the same time the secretion of the nasal passages and the bronchia. It further excites the genito-urinary organs when its action attains its maximum or has been long continued; but this effect is not constant.[1]

Among the symptoms produced by the *continued use* of iodine in medicinal doses the following call for especial notice. Various *eruptions of the skin* appear, which will be specified under the head of *iodism*. The *salivation* which it produces, independently of mercury in the system, is, in many cases, very analogous to that which is observed during pregnancy. It is usually mild, and ceases when the medicine is suspended. In particular the secretion is destitute of the fetor which is characteristic of mercurial salivation. Yet like this it is sometimes, although rarely, accompanied with inflammation of the palate and fauces, loosening of the teeth, and swelling of the salivary glands, but never with ulceration. The patients usually complain of a saline taste in the mouth. Iodic salivation cannot be very frequent, for many practitioners have used the medicine extensively without ever having witnessed it. In a hundred cases Lisfranc did not once observe it.[2] A case is mentioned by Buchanan of a man who in the course of twenty-four days took 2,864 grains of iodide of potassium, when he became salivated and had swelling of the face with *ulceration of the mouth*. But the patient had several times before been salivated with mercury.[3] In a discussion of this subject at the College of Physicians of Philadelphia, a number of cases were referred to in which salivation had followed the use of iodide of potassium. In some of them mercury had previously been taken, but in others none.[4]

Increase of appetite with an improved condition of the general appearance, has repeatedly been noticed; indeed the desire for food is sometimes craving. On the other hand, and particularly when the tinctures of iodine are administered, evidences of gastric irritation are pretty sure to arise sooner or later.

The influence of iodine upon the *mucous membranes* is marked by coryza and a congested state of the nostrils and pharynx, a feeling of tension over the frontal sinuses, and a red and œdematous state of the conjunctiva and eyelids. Langston Parker has described a swollen, lobulated, and fissured condition of the tongue produced by the long-continued use of preparations of iodine. The action upon the gastro-

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[1] Materialien, p. 473, &c.

[2] Two striking cases of iodic salivation are related by Drs. Battersby and Neligan, *Dublin Quart. Journ.*, xxi. 412. Wallace saw one in a child four years of age, *Lancet*, March, 1836, p. 8.

[3] Lond. Med. Gaz., xviii. 522. [4] Trans. Coll. Phys., Phila., April, 1855, p. 409.

intestinal mucous membrane has already been referred to, but it may here be added that the mucous secretion of the bowels may be increased so as to render the stools slimy. There is often also a mucus deposit from the urine, and this secretion becomes alkaline. Discharges from the urethra or vagina which have recently been cured are very prone to recur under the influence of this medicine. Perhaps it is under the influence of the congestion or irritation which appears to affect these parts, that the menstrual discharge is apt to increase in the female, and that in the male erections of the penis and seminal emissions are observed, signs of excitement which, in some cases at least, appear to be afterwards exchanged for an opposite state denoted by atrophy of the testicles or mammæ and sexual indifference.

It is difficult to select from the above enumeration of phenomena those which are most distinctive and characteristic. If we are to accept the statements of certain writers, the medicine often acts as iron does, in appropriate cases, augmenting the appetite and strength, and the activity of all the functions, mental as well as bodily. Others, however, mention such effects as rare or as only secondary to the removal of the disease which the medicine was given to cure; while others still attribute to a slight excess in using it a peculiarly distressing depression of mind and body, amounting even to hypochondriasis. Finally, not a few have been unable to notice any phenomena attributable directly to iodine. We can only infer from this diversity of effect, that the apparent operation of the medicine is greatly influenced by the condition of the patient to whom it is administered.

The number of cases which have terminated fatally through *the direct poisonous agency* of iodine is very small indeed. Almost the only one in which death occurred within a week from the ingestion of the poison is that reported by Mr. J. H. Smith, of Sheffield.[1] But in this example the patient, a woman, was laboring under erysipelas of the face. The quantity taken was rather less than a drachm of iodine in an ounce of spirit. In other cases the symptoms have been a burning heat of the throat and stomach, retching and sometimes vomiting, severe griping pains, diarrhœa, general paleness, cold extremities and collapse, followed, in some instances, by redness of the skin, an active pulse, and other signs of reaction. Even such cases usually terminate favorably, or, if fatal, become so by exhaustion after the lapse of several weeks. In one reported by Nélaton symptoms such as have been described followed the injection of a diluted tincture of iodine into the cavity of an abscess of the thigh. A female patient

[1] Taylor on Poisons (1st Am. ed.), p. 249.

of the same surgeon became affected with œdema of the glottis during the use of iodide of potassium.[1] A similar, but fatal, case of the same accident occurred in the practice of Dr. Lawrie.

This preparation, even in moderate doses, has occasionally produced alarming symptoms. In one case reported by Dr. Lawrie the larynx was also the part affected, and the symptoms resembled those of spasmodic croup. There had been taken in all but seven and a half grains of the salt. In another case where half a drachm had been administered in the course of four days the patient complained of excruciating headache, and acute pain in the eyes, with profuse lachrymation.[2] Dr. Horst relates the history of a man, who, after taking less than a grain of the iodide of potassium, complained of fulness of the head, giddiness, constriction of the throat and chest, dryness of the mouth, anxiety, tickling cough, and trembling of the limbs in walking. These symptoms lasted an hour. The evening of the same day they returned on a second dose being taken, and on subsequent days, also, they recurred when the medicine was repeated.[3] In the last case we suspect that the solution contained the *cyanide* rather than the *iodide* of potassium, and in the previous ones, it must be presumed that the medicine was not what it was supposed to be, or else that its effects were quite exceptional.

Uncertain Effects of Large Doses. Very large quantities of iodine have sometimes been taken without injury, a fact which can only be explained on the supposition that the medicine combined immediately with the starchy or albuminous contents of the stomach. Magendie states that he took two drachms of the tincture, containing ten grains of iodine, without injury, and that a child, four years old, swallowed the same quantity without serious consequences.[4] Dr. Samuel Wright met with the case of an infant not more than three years old, who took three drachms of the tincture at once, and suffered only from attempts to cough, some retching, and much thirst.[5] In like manner we are told by Gully, that he used the tincture in gradually increasing doses, to the extent of three drachms a day, without observing any ill effects from it. Kennedy is quoted as having given nine hundred and fifty-three grains of iodine in the form of tincture, in the course of eighty days to a woman, and, at the end of this period, eighteen grains a day, without her general health being at all impaired.[6] Buchanan states

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[1] Abeille Méd., x. 317.

[2] Lond. Med. Gaz., xxvi. 588.

[3] Dierbach, Neueste Entdeck, iii. 980, where other cases will be found of unusual symptoms from apparently small doses of iodide of potassium.

[4] Galtier, Toxicologie, i. 100.

[5] Christison, On Poisons (Am. ed.), p. 155.

[6] Lond. Med. Repository, 1822.

that among his patients in the Glasgow Infirmary, many took a quarter to half a pound of iodine in the course of a month or six weeks, and others of them half an ounce in the space of twelve hours, without its producing any injurious effects upon the general health.[1] The only precaution he observed in giving these large doses, was to make the patient drink freely of diluents. Delisser gave a scrofulous child, three years of age, two hundred and twenty-two grains of iodine in less than two months; and to a lady affected with cancer of the breast, one thousand one hundred and nineteen grains in two months. At one period "her mouth fell into a sort of ulceration, with fetid breath, differing, however, from that caused by mercury, and, if possible, more disagreeable," but ten days' suspension of the medicine sufficed to remove these symptoms.[2] Julia de Fontenelle relates the extraordinary instance of a young man who swallowed by mistake, a solution containing more than two and a half drachms of iodine, and yet did not experience any remarkable effects.[3] Dr. Porcher speaks of a case in which sixty grains a day of iodide of potassium were given for ten days without the slightest injurious consequence, or any appreciable effect, except relief of the nocturnal pains of tertiary syphilis. In another case the patient took forty grains daily for twenty days, without untoward effects except a feeling of fulness about the head, and symptoms of catarrh.[4] Of the iodide of starch still larger doses, as an ounce three times a day containing seventy-two grains of iodine, have been given without any untoward results.[5]

Chronic Poisoning.—Iodism. The general derangement of health which is sometimes the consequence of taking large doses of iodine for a long time, was early described by Coindet, who noted among its phenomena, the following: a frequent pulse, palpitation of the heart, dry cough, sleeplessness, rapid emaciation and loss of strength, swelling of the legs, trembling of the limbs, nervousness of the movements, &c. Subsequent experience enables us to enlarge this catalogue considerably, which, however, is only to a small extent, and in rare cases, descriptive of the effects of iodide of potassium.

Iodism is most conspicuously manifested by the *alimentary canal.* Digestion is impaired, and the appetite lost; the patient complains of an annoying and even a painful sensation in the throat and epigastrium, which ultimately becomes a fixed burning pain in the latter, and a distressing heat and dryness of the former. Watery diarrhœa

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[1] Lond. Med. Gaz., xviii. 515. [2] Edinb. Med. and Surg. Journ., xi. 230.

[3] Strumpf, op. cit., from Journ. de Chimie, 2ème sér, i. 545.

[4] Charleston Med. Journ., xi. 174. [5] Buchanan, Lond. Med. Gaz., loc. cit.

ensues, with colic, and sometimes salivation,[1] which in some cases may be attributable to the revival of mercury in the system, conjunctivitis, coryza, nasal catarrh, and emaciation. The opinion has been entertained, that iodine produces emaciation by its stimulation of the absorbent system. Hence the loss of flesh usually proceeds faster in children than in adults. Graefe, of Berlin, employed iodine as "an emaciating agent," with complete success in a case of polysarcia.[2] Cullerier has pointed out a probable explanation of the different results of observation in respect to this subject. He remarks that if the patient is in poor condition through the influence of a disease which iodine is capable of curing, he will increase in flesh with the progress of the cure. This writer cites from his own experience several cases which illustrate the tendency of iodine to produce atrophy of the testicles and the mammæ, and to diminish the mammary secretion.[3] Other symptoms, referable to the *nervous system*, are produced by iodine; such as anxiety, palpitation of the heart, sleeplessness, painful dreams, headache, disordered vision and hearing, dulness of mind, and general debility.[4] Occasionally there is tremulousness of the hands and of the arms and legs, and even convulsive attacks have been observed. Sir B. Brodie asserts that he has known iodine to cause paralysis. The following case illustrates in a striking manner this class of symptoms. The patient, a man of fifty-five years, was under treatment with iodide of potassium for an eruption of *acne indurata*. At first he experienced a painful burning sensation in the feet, then a trembling of the limbs and a feeling like intoxication. His movements were irregular and uncertain, and his expression haggard and dull; he became short sighted, and objects often appeared double or in rotatory motion. By degrees the muscles of the lips and cheeks became paralyzed, the gait staggering, and the articulation spasmodic, or jerking.[5] M. Rilliet has shown, by several examples, that the prolonged use of food prepared with *fuci* and other marine plants, as recommended by Boinet, occasionally produces emaciation, palpitation of the heart, with general trembling, and nervousness, in a word, the phenomena of iodism. These effects are peculiarly apt to be observed in persons advanced in life.[6] In some cases preparations of iodine affect *the skin* and even the *hair*, rendering their color darker. More commonly there is a tendency to copious perspiration and to eruptions of urticaria, impetigo, prurigo, lichen, eczema, or furuncles.

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[1] Oesterlen, Heilmittellehre, 4te Aufl., p. 278.

[2] Hobson, Trans. N. York Med. Soc., ii. 299, and Brit. and For. Med. Rev., v. 164.

[3] Revue Méd., cii. 603, &c.

[4] Dierbach, Neueste Entdeck., iii. 975.

[5] Revue Méd., civ. 568.

[6] Annuaire de Thérap., 1859, p. 187.

In some cases also ecchymosis or purpura of the inferior extremities has been observed. Anæsthesia of the skin from the local application of tincture of iodine has been noticed. In other cases the *genital organs* are affected. The sexual propensity is sometimes unduly excited,[1] the menstrual flow excessive, and during pregnancy abortion may take place in consequence of the direct operation of the medicine, or as an effect of the retarded development of the fœtus. The discharge of urine is generally increased, and is often darker than natural, or, at any rate, becomes so readily on the addition of nitric acid and starch.

Remedial Employment. *Internally.*—Although, for the sake of convenience, we shall consider at the same time the uses of iodine in solution, and of its several preparations, it cannot be denied that in many cases one of these may have a decided advantage over another. It has been seen that iodide of potassium is very rapidly eliminated from the system, very much more so than iodine itself; wherefore it is probable that the latter is to be preferred whenever it is intended to modify the living and normal elements of the economy, but that the former should be employed whenever the elimination of some effete, imperfectly organized, or abnormal material is the object to be accomplished. The relative value of solution of iodine and of the iodide of potassium has not been fully ascertained. The facility with which the latter is supported, and the completeness with which it performs some of its remedial offices, have perhaps led prematurely to the neglect of the less agreeable preparation, and it may be well for those who employ them to bear in mind that one may succeed where the other has failed.

Mercurial Salivation. In 1832, Knod v. Helmenstreit, of Aschaffenberg, successfully made use, in several cases, of the tincture of iodine, given internally, to combat mercurial ulceration of the mouth. In the following year this method was employed by Kluge, of Berlin, who effected a cure, in seventeen cases, in the course of from three to twelve days.[2] Many other physicians were equally successful, and among them Dr. Jaurin, of the Canary Isles,[3] and Aran, of Paris.[4] It is to be remarked that iodide of potassium has not always been found to possess the same virtue which is here ascribed to iodine. Dr. Laycock assures us that, given in ptyalism, it seems to have the effect of increasing the discharge;[5] and Hacker, of Leipzig, relates four cases

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[1] See a case by Zink, Journ. Complémentaire, xviii. 126.

[2] Dierbach, Neueste Entdeck., i. 430, and ii. 1010.

[3] Bull. de Thérap., xli. 234.

[4] Ibid., xliv. 268.

[5] Lond. Med. Gaz., 1839, xxiii. 823.

in which a solution resembling Lugol's rather aggravated mercurial ulceration of the mouth. But this untoward result is probably exceptional. Dr. Corson, of New York, has published several cases which prove the iodide to have been in his hands a prompt and certain cure for mercurial ptyalism.[1]

Elimination of Mercury and Lead. The earliest suggestion of the power of iodide of potassium to cure chronic poisoning by lead or mercury was made by MM. Guillot and Melsens to the French Academy of Sciences in 1844.[2] The more complete results of the latter were published in 1849.[3] In them, says his translator, Dr. Budd, it is assumed, no doubt rightly, that the metallic substance is in actual union with the affected parts, and is there retained as an insoluble compound. The iodide of potassium sets it free by rendering it soluble, and thus enables it to escape from the system, by the kidneys especially. That the saline solution liberates the metal lying dormant in the tissues, appears to be proved conclusively by the fact that, on the administration of the former, symptoms arise which are peculiar to the metal with which the system is impregnated, and this is proved by experiments upon animals as well as by the observation of what takes place in man. Melsens showed that when an insoluble preparation of lead is given to a dog, comparatively slight symptoms ensue; but if the iodide of potassium be then administered, the animal will die. He also proved, by appropriate tests, that mercury thus set free is found in the urine; and similar proof, in the case of lead, was brought forward by Dr. Parkes,[4] of London, by Dr. Goolden,[5] and by Dr. Swift, of New York.[6] The last-named gentleman published an account of twenty-three cases of lead-poisoning which were treated very successfully by means of the iodide of potassium. In many of them lead could be detected in the urine during the administration of the remedy. These results were confirmed by M. Malherbe, of Nantes,[7] who detected the metal in the saliva as well as in the urine, and also by Dr. Sieveking.[8]

Chronic Poisoning by Mercury and Lead. It follows from what has been stated above, that if the symptoms of poisoning by these metals depend upon their presence in the economy, a cure may be expected from their elimination. In the case of lead, abundant proofs exist of

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[1] N. Y. Journ. of Med., Sept. 1853, p. 243. [2] Archives Gén., 4ème sér., iv. 517.
[3] Annales de Chimie, Juin, 1849; Brit. and For. Med.-Chir. Rev., Jan. 1853, p. 201.
[4] Brit. and For. Med.-Chir. Rev., April, 1853, p. 522.
[5] Lancet, Nov. 1853, p. 522. [6] N. Y. Med. Times, iii. 145.
[7] Month. Journ. of Med. Sci., April, 1855, p. 342.
[8] Times and Gaz., Feb. 1857, p. 162.

the efficacy of iodide of potassium in curing the various forms of nervous disease to which that metal gives rise. Dr. Nicholson reports one case in which lead colic was associated with paralysis, but both affections were cured by the iodide.[1] Melsens relates several in which paralysis and neuralgic pains had reached a serious degree, but were entirely cured by this medicine; and, as already stated, Dr. Swift has added largely to the number of those which prove the success of this treatment. The former gentleman dwells upon the necessity of caution in administering the remedy. If too freely exhibited at first, it is apt to produce the symptoms of acute saturnine poisoning. During the first period of the treatment, indeed for the first week or two, the urine is of a deep-brown color, but it gradually becomes lighter. The same remarks are applicable to the affections of the nervous system produced by exposure to mercurial vapors. The following case may serve as an example. An old man, who had been a gilder, lost the use of his limbs by the exercise of his calling. His sight was gone, and he was, moreover, tormented by violent and constant pains. Iodide of potassium was administered every day, in the dose of a drachm. At the end of a fortnight's treatment he left the infirmary alone and without help, whereas on his admission he was obliged to be brought on a litter. Equally striking cures were effected by M. Melsens when trembling palsy was added to the other symptoms mentioned. In fact, no medicine appears to be more serviceable than iodide of potassium in all the forms of chronic poisoning by mercury and lead.

Constitutional Syphilis. The original suggestion for the cure of this affection by means of iodine, must be attributed to Dr. Robert Williams, of London, who, in 1831, employed it successfully in the treatment of various forms of syphilis, but, first of all, of two cases of nodes which had proved intractable to other medicines.[2] Dr. Clendenning soon afterwards published a number of cases illustrating its value in the affection referred to.[3] But more general attention was attracted to the subject by Dr. Wallace, of Dublin, whose large experience left no doubt in regard to the efficacy of the medicine.[4] Finally, its peculiar power of curing deep-seated syphilitic diseases of the integuments, cellular tissue, and bones, was established in the confidence of the medical profession by M. Ricord.[5] Mercury is incompetent to cure the tertiary symptoms of syphilis, and, indeed, so often aggravates

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[1] Lancet, Jan. 1854, p. 42.
[2] Lond. Med. Gaz., xiv. 41.
[3] Ibid., xv. 833 and 866.
[4] Lancet, Feb. 1836, p. 743, and March, 1836, p. 5.
[5] Bull. de Thérap. (1839), xvii. 21.

them, that they have been regarded by some persons as effects of chronic mercurial rather than of syphilitic poisoning. However this may be, such symptoms are curable by the iodide of potassium more frequently, and with more certainty, than by any other remedy. It is also useful in the transition from the second to the third stage of syphilis, particularly when the system is impaired, and phagedenic or gangrenous ulcers attack the throat, and ecthyma or rupia appears upon the skin. When given to cure the appropriate symptoms, says Ricord, a marked and decided improvement rarely fails to appear during the second week of the treatment, and sometimes sooner. The tubercles are absorbed, the ulcers become clean, the suppuration diminishes, the osteocopic pains cease, and the osseous tumors, if they are not permanently indurated, soon begin to take on resolution.

At the London Ophthalmic Hospital this remedy is said to have been used with as much success as mercury in the cure of *syphilitic iritis;* but the reporter does not state whether or not the patients who were cured had or had not previously taken mercurials.[1] A subsequent report from the same Institution renders it probable that the medicine is most successful when mercury has previously been taken, although it is often of itself sufficient for the cure.[2]

The *modus operandi* of iodide of potassium in curing constitutional syphilis presents an extremely interesting problem. Although the question cannot be considered as thoroughly solved, the following observations render it highly probable that the medicine is chiefly curative by virtue of its power of liberating the mercury which an antecedent mercurial treatment has accumulated in the system. This explanation was originally proposed by MM. Melsens and Guillot, and founded upon their experiments and observations previous to 1845.[3] Several years afterwards, the former of these gentlemen published an essay,[4] in which, by a variety of proofs, he showed that iodide of potassium is capable of rendering soluble every mercurial compound that can occur in the living economy, and even metallic mercury itself, and of causing their elimination with the urine, in which secretion they can be discovered by means of appropriate tests. But in order thus to eliminate mercurial preparations, it must first render them soluble, and consequently may reproduce all of their specific operations, including both their curative and their morbid effects. Dr. Budd[5] refers to a case of secondary syphilis in a man who five months

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[1] Times and Gaz., July, 1854, p. 11.

[2] Ibid., May, 1859, p. 546.

[3] Bouchardat, Annuaire de Thérap., 1845, p. 168.

[4] Annales de Chimie, Juin, 1849; Brit. and For. Med.-Chir. Rev., Jan. 1853, p. 201.

[5] Brit. and For. Med.-Chir. Rev., Jan. 1853, p. 202.

before had taken mercury largely, but subsequently had used none. On being treated with iodide of potassium, he was profusely salivated, and presented all the usual symptoms of this condition, including the characteristic fetor of the breath. Dr. Budd subsequently met with numerous instances of the same description. Melsens has also shown that the iodide of potassium, administered along with a salt of mercury, renders the latter much more active, and that "the action of iodide of potassium, on a dog treated by corrosive sublimate, may be so energetic, that even eight days after he has taken the sublimate, a pretty large dose of iodide of potassium will prove fatal to him."

It has been mentioned by Bouchardat[1] that the tertiary symptoms of syphilis are, in fact, owing to a mercurial rather than a syphilitic infection or poisoning, or at all events, that they proceed from a combination of the two, and that the iodide is useful in curing these symptoms, not because it restores activity to the mercury, but because it expels the mercury from the system. If in doing so, mercurial salivation occurs, it is, according to this view, an accident of the treatment, but is no wise necessary to its success. This theory is sustained by adverting to the singular rapidity with which the disease declines; and the doctrine that the cure is owing directly to the iodic preparation, is opposed by the fact that other forms of iodine have not the same beneficial effect.

But that iodide of potassium performs so negative and indirect a part in the cure of syphilis is not rendered probable by a survey of all the facts of the case. As Dr. Basham has very correctly pointed out,[2] there are two classes of cases presenting pains, nodes, &c., of the superficial bones, classes apparently identical in nature, yet differing in this, that the one is benefited by iodide of potassium, while the other is not so, but is relieved by mercury. Cases of the former class have at some previous time been treated by mercurials, while in the latter these remedies have never been used. The same writer, speaking of simple chronic rheumatism, states that no benefit is derived from iodide of potassium, unless mercury has previously been administered. Besides these and many analogous conclusions of clinical experience, we find, as in the results obtained by M. Melsens, that direct experiment favors the belief that iodide of potassium is useful in tertiary syphilis chiefly by reviving the mercury lying dormant in the tissues. It appears to be highly probable, also, that its salutary influence is derived, in part, at least, from the state of minute division

[1] Annuaire, &c., 1850, p. 283.

[2] Lancet, Nov. 1853, pp. 478 and 500.

in which the mercury exists, and the increased facility it thence derives for penetrating the ultimate elements of the tissues.

Yet it must not be supposed that iodide of potassium is incompetent to cure tertiary syphilis without the intervention of mercury. Ricord has emphatically pronounced this notion a mistaken one,[1] although he believes that a previous mercurial course is best fitted to secure the favorable action of the salt. It has also been proved erroneous by Dr. Hassing, of Stockholm. He treated with iodide of potassium 125 cases of tertiary syphilis in patients who had previously taken mercury, and 70 cases in those who had not done so.[2] Among the former cases, 29 resisted the treatment, and of the latter 21; so that although the proportion of cures was greater in the first class, yet it did not greatly exceed that obtained in the second. M. Rodet, of Lyons, it may also be remarked, maintains that iodide of potassium is most efficacious when no other treatment has preceded it. He even affirms that a previous mercurial course is often productive of unpleasant symptoms (iodism), and that iodic preparations sometimes occasion formidable lesions when mercury has been taken shortly before.[3] This experience is certainly singular, unless it be taken as an imperfect representation of the effects observed by Budd and Melsens, and as attributable to the revival of the mercury by the iodine.

Hypertrophied Organs.—Goitre. The influence of iodine upon the function of nutrition is strikingly illustrated by its efficacy in the cure of hypertrophy, and the removal of unorganized deposits. Indeed, as is well known, the virtues of iodine were earliest recognized in one of this class of affections, viz., in goitre. In many cases of simple *chronic enlargement of glandular organs*, *e. g.*, of the mamma, the testes, the liver, the spleen, and the prostate gland, iodine appears to have exerted a very salutary influence, whether employed internally or topically. It may be presumed that its operation is most manifest in proportion as the increased size of an organ depends upon nutritive rather than inflammatory action, although it sometimes acts in the latter cases with very happy effects. It has been used to diminish the size of the *mamma* when hypertrophied, and to restrain the secretion of milk. It has also been proposed as a means of diminishing the size of the fœtus in utero in cases of contracted pelvis. Excessive corpulence has also been reduced by its operation.

In *goitre* its virtues are most signally displayed. But, as Rampold

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[1] Lectures, 1849, Am. ed., p. 276.

[2] Brit. and For. Med.-Chir. Rev., Oct. 1845, p. 384.

[3] Révue Méd., ciii. 459.

and others have pointed out, there are two forms of disease confounded under the name of goitre, the one in which the tumor is formed of cysts containing a liquid, while the other is simply a hypertrophy of the gland with its cellular tissue and fat. The latter variety is readily cured by iodine, but the former is not so.[1] The one tumor is generally soft and painless, and is most curable when recently developed, the other is formed in part by calcareous or cartilaginous deposits. These statements will serve to explain the different degrees of success obtained with iodine by persons who were not aware that tumors of the thyroid body are not always of the same nature. Thus Bardsley found that in some cases large tumors of this body greatly diminished within a short space of time under the internal and external use of iodine, but in not a few instances the beneficial influence of the remedy was solicited in vain.[2] Gairdner, on the other hand, states that the medicine seldom fails of effecting a complete cure, and, when it does so, it almost always reduces the swelling very considerably. Besides these radical differences in the tumors referred to, it should be borne in mind, as Coindet originally pointed out, that even in genuine bronchocele, if the part is tender and inflamed, or excites paroxysms of dyspnœa, it should first be leeched and fomented before a resort is had to iodine.[3] It is probable that all cases of true goitre in persons under middle life are curable by iodine. Bayle, in his summary of results, which evidently includes a great many cases unsuitable for this treatment, found that 264 out of 364 cases were cured. In favorable cases the action of the medicine is apparent within a few days, the tumor becoming softer and smaller, and its interference with breathing and swallowing much less. Not unfrequently the cure is effected in from six to eight weeks. It sometimes happens that the rapid subsidence of the goitre is attended with general emaciation, which is, however, temporary. It is advisable to administer the compound solution of iodine internally in the dose of from five to ten drops three times a day largely diluted with water.

The addition of a syrup containing tannic acid, as the syrup of cinchona, or of orange-peel, is said to prevent the medicine from deranging the stomach. At the same time, iodine ointment should be applied externally, or a mixture of equal parts of tincture of iodine and sulphuric ether, or else, as Boinet recommends, an iodized collar should be worn, composed of finely-powdered iodine quilted between two layers of cotton wadding, covered on either side with several folds

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[1] Canstatt, Jahresbericht, 1845, p. 226.

[2] Hosp. Facts and Obs., p. 122.

[3] Bibliothèque de Thérap., i. 22.

of flannel, and externally by a layer of oiled silk, or of gutta percha, to prevent evaporation.

Dr. Glover has used *iodoform* very successfully in several cases of goitre, one of them of seven, and another of four years' standing. He gave the medicine in doses of two or three grains, three times a day.[1]

Scrofula. From the use of iodine, in the cure of goitre, to its employment in other *glandular enlargements*, and to *scrofula*, the transition was easy. But since the time when Lugol held iodine to be a specific for scrofula, as really as cinchona is for ague, or mercury for syphilis, experience has shown his estimate to be an exaggerated one. Some have even gone so far as to attribute all of the improvement which notoriously took place in many of his patients at the St. Louis Hospital, to the good food and the comfortable lodgings which many of them then enjoyed, for the first time in their lives. Certain it is that in private practice a similar degree of success has seldom been obtained.

In the most common and the earliest form of scrofula, glandular enlargement, two elements are frequently combined, the hypertrophic and the tubercular. Under the influence of iodine, the former may be entirely removed, but it is doubtful whether the latter is ever really so. At an advanced stage of the disease, when softening of enlarged glands and ulceration of the integuments have taken place, iodine will frequently promote the healing of the ulcers, while it improves the general health in a marked degree. Even in scrofulous enlargements of the articulations depending partly upon thickening of the fibrous coverings and partly upon effusion within the synovial capsule, this medicine, externally as well as internally, exerts a decidedly curative influence, especially when associated with cod-liver oil. It is also capable of producing a marked amelioration of caries of the bones, and sometimes it effects a complete and permanent cure. It is prudent in all such cases not to make use of iodine, so long as an inflammatory action predominates; if then employed, it tends to induce the suppuration of enlarged glands, and to excite inflammation in other diseased structures. It is true that the suppuration is generally of a more acute form, and terminates more rapidly in cure than that which tends to arise spontaneously, and probably would so arise in the part affected. *Tabes mesenterica*, although generally a fatal disease, is probably in some cases susceptible of cure. This would appear to be proven by Rilliet and Barthez, who found the mesenteric glands converted into cretaceous masses. A number of cases, also, collected by

[1] Month. Journ. of Med. Sci., Feb. 1848, p. 581.

Boinet, appear to prove that the removal of the disease occasionally takes place under a plan of treatment of which iodine forms the principal part. But in this, as in all other scrofulous affections, the association of iron and cod-liver oil with iodine greatly enhances the probability of cure. To be successful, also, the treatment must be continued for a long time after the disappearance of the local disease. For scrofula is eminently a constitutional affection, and it is only by a well devised and steadily pursued regimen, both dietetic and medicinal, that it can be kept in abeyance. It is in this disease that Boinet especially recommends his iodized food, consisting of bread, gingerbread, cakes, biscuits, chocolate, wine, beer, &c., made with natural products yielding iodine, such as fuci, marine plants, cruciferæ, salts containing iodine, and some mineral waters holding this substance in solution.[1]

Scirrhus and Cancer. The great difficulty of distinguishing the true character of all hard tumors affecting the glandular structures has led to very opposite estimates of the different remedies which are alleged to cure cancer in its first stage, and iodine forms no exception to this statement. By some its efficacy is regarded as unquestionable, while others, and the greater number, probably, discard it as worthless. The latter class, it is true, includes nearly all of those who look upon surgical means as including the whole of therapeutics, and the time employed in endeavoring to avert the necessity of a resort to them as worse than wasted. It must, however, be acknowledged that in the case of cancerous tumors, especially of the scirrhous form, there is a period when their structure contains but few of the anatomical elements of cancer, and that these multiply with the tumor's age and growth. Microscopical examination, as well as the fact that many tumors, which have for years remained quiescent, may be roused to rapid cancerous growth and degeneration by accidental circumstances, leave no room for incredulity upon this head. It is during this latent or rudimentary stage that iodine and other medicines besides display their salutary power, and when we cannot but believe they are to be preferred to surgical treatment. That they are so is attested by the numerous examples of the entire removal by their means of tumors condemned to the knife by eminent surgeons. It is wholly illogical to deny that such tumors were really cancerous because they were removed by medicine; to do so is to beg the very question which the facts alluded to prove to be debatable. If a tumor, presenting the characters of cancer, disappears under the use of iodine or any other medicine, that fact constitutes a valid reason why medical means

[1] Bull. de l'Acad. de Méd., xxiii., 1182.

should be employed and systematically persevered in until they are proved by the progress of the disease to be inoperative or insufficient. The use of surgical remedies then becomes justifiable, and it may be imperative. In Bayle's collection, the success of medical treatment is vouched for by Wagner, Ullmann, Hirsch, Magendie, Hufeland, and Osann, to which names we may add those of Gairdner, Klaproth, Zimmermann, Walshe, and Travers in testimony of the occasional success of this method. As before intimated, it is quite possible that in the cases treated by these physicians the true cancerous element was still undeveloped or devoid of activity, and that the medicine did little more in removing the tumor than destroy the nidus in which cancer-cells would afterwards have been deposited under the influence of an inherited cachexia or an accidental injury. Even with this limitation iodine is assuredly too valuable a remedy to be lightly dismissed from the treatment of tumors supposed to be cancerous. It may be added that, apart from whatever curative virtues it possesses, iodine, in the form of tincture or lotion, forms a useful application for correcting the fetor, and diminishing the discharge, of ulcerated cancerous tumors.

Pulmonary Consumption. In this affection iodine was vaunted as a cure by Berton, Chevallier, Elliotson, Martin-Solon, Bardsley, and others. Dr. Murray, of Belfast, Dr. Corrigan, of Dublin, and afterwards, Sir Charles Scudamore, eulogized the efficacy of its vapors in consumption. The last-named physician employed inhalations of the vapor from a solution composed as follows: Iodine and iodide of potassium, of each six grains; distilled water, five ounces and six drachms; alcohol, two drachms. A drachm of this mixture, with thirty minims of a saturated tincture of conium, or when there was spasmodic cough, some ethereal tincture of lobelia, was directed to be mixed in an inhaler half full of water at 120° F., and inhaled for ten, fifteen, or twenty minutes. It is important that the tubes be of large calibre, and the quantity of the solution be gradually increased.[1] This treatment was only intended to be an auxiliary to the approved remedies in consumption, but it was found well fitted to allay the cough, diminish the bronchial secretion, and favor the efforts of nature in those cases where a suspension of the disease tends to take place.

More recently, M. Piorry, of Paris, without any reference to the earlier trials and comparative failure of iodine inhalations, has vaunted his success in their use.[2] His patients were made to breathe in a wide-

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[1] Lancet, June, 1841, p. 492.

[2] Comptes Rendus, Jan. 1854, and RANKING's Abs. (Am. ed.), xx. 70.

mouthed jar containing either a scruple of iodine, or some of the tincture, the vapors of which were disengaged by heat. They were, moreover, obliged to sleep in an apartment in which iodine was exposed to the air. The majority of them took from twenty to sixty grains of the iodide of potassium daily, and were kept upon a very nutritious diet. The ultimate results claimed for this method were, decided improvement in the symptoms and anatomical characters in twenty consumptive patients; disappearance of the physical signs and most of the symptoms in seven cases; death without improvement in four. M. Piorry believes that iodine causes the induration around the tuberculous deposit to diminish, that it probably may favor the removal of tubercles, and that it promotes the healing of cavities. We do not learn that results so strikingly favorable have been obtained by other physicians, although many have made iodine inhalations the subject of a special study. They probably have never cured tubercular phthisis, although they frequently diminish the bronchitis which complicates and aggravates it. The deposit of tubercle takes place from within, and, if it is to be prevented, the prophylactic agent must be applied through the blood. If the disease is to be cured, the remedy must, in like manner, approach it upon the side, where alone it can be subjected to vital operations.

Iodide of iron has been much used in the treatment of phthisis. It is a convenient form under which to exhibit ferruginous preparations in this disease, which is so often marked by an extreme degree of anæmia, but there is no evidence whatever of its superiority to other medicines of the same class. It has been attempted to bring *cod-liver oil* into the list of iodic remedies, although this product contains a proportion of iodine not exceeding the one-two-thousandth part. If it is efficacious in the cure of consumption, assuredly it is not to this infinitesimal quantity of iodine that its virtues are owing.

Dropsy. The iodide of potassium has been employed successfully in several cases of *ascites* which apparently depended upon enlargement of the liver.[1] Dr. Kissam, of Hartford, cured a case of the same description,[2] and Bradfield one of ascites with œdema of the lower limbs by means of this medicine internally, and an iodine liniment applied to the legs.[3] It has also cured similar cases in the hands of Dr. A. T. Thomson,[4] Dr. Cumming,[5] Dr. Stokes, and others. Dr. Sieveking cured *hydrothorax* of an aggravated character by the internal administration of iodide of potassium.[6]

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[1] Hospital Facts and Obs., p. 126.
[2] Bost. Journ., vol. x.
[3] Lancet, June, 1829, p. 368.
[4] London Dispensatory, p. 496.
[5] Lond. Med. Gaz., xvii. 13.
[6] Times and Gaz., March, 1857, p. 300.

In that most hopeless of all forms of disease attended with serous effusion, *acute hydrocephalus*, iodide of potassium has appeared to be the cause of recovery in a number of instances, of which the following may be taken as examples. Roeser reports the case of a child who had been ill for six days, and was insensible, with fixed and dilated pupils, complete paralysis of the right side, automatic movements of the left side, difficult deglutition, and a frequent pulse. Calomel had been given ineffectually, when iodide of potassium, in the dose of a drachm in the course of twenty-four hours, was prescribed. In two days amendment was visible. In a week consciousness returned, and a crop of boils broke out on various parts of the body. In three months the cure was complete.[1] A case of not inferior success was treated by Alken, of Bergheim, but in it calomel and iodine were used together.[2] So Wœniger, of Hamburg, in a case resulting apparently from a blow, applied the remedy with success after calomel and the other usual means had failed.[3] Golfin, of Montpellier, has published three cases which he appears to have cured by means of an ointment containing protiodide of mercury, iodide of potassium, and camphor. This gentleman declares that since he has adopted the method alluded to, the greater number of his patients in the second and even in the third stage of the disease have recovered.[4] Several cases apparently in desperate condition are reported by Mr. Fluder to have been saved by this medicine administered after mercury.[5] A case also occurred to Dr. Guérard, of Beaufort, S. C., of *chronic hydrocephalus* occurring soon after birth, and cured in six months by the iodide of potassium.[6] Two most aggravated and apparently hopeless cases of this disease recovered under the same treatment in the hands of Dr. Carson, of Coleraine, Ireland.[7] In all of the instances above referred to more or less mercury had been administered before the iodide of potassium, or in conjunction with it, so that we are not entitled to attribute the cures to the latter medicine alone.

In general *anasarca* independent of organic disease, iodide of potassium is often serviceable. In 1834, Coster published several examples of its success.[8] Osborne cured this affection by means of frictions with a liniment composed of tincture of iodine, soap liniment, and oil of turpentine; and Graves spoke of the administration of the iodide of potassium with the greatest confidence.[9] In some cases of *ovarian*

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[1] Edinb. Month. Journ., October, 1841, p. 748.

[2] Dierbach, Neueste Entdeck., ii. 1026. [3] Ibid., iii. 1007.

[4] Boinet, Iodothérapie, p. 774. [5] Lond. Med. Gaz., Sept. 1842, p. 23.

[6] Am. Journ. of Med. Sci., Jan. 1851, p. 109.

[7] Times and Gaz., March, 1859, p. 245.

[8] Bull. de Thérap., vii. 51. [9] Clinical Medicine, p. 541.

dropsy it was successful when used by Gairdner and by Baron, and Dr. Thomson says that in two instances he used it after paracentesis with advantage, but adds that his hopes of its utility had not been realized. It is said to have cured *œdema of the glottis* arising from syphilis. Dr. Sieveking speaks of the eliminative power which it appears to exert in cases of *cerebral apoplexy*[1] after the acute symptoms have subsided.

Rheumatism. In *muscular* rheumatism the iodide of potassium is often extremely serviceable after the acute symptoms have subsided. It is of comparatively little use in *acute articular* rheumatism, although cases cured by its means have been reported by Campbell,[2] Weber, and Oulmont,[3] but in the *chronic* form, the more exclusively the fibrous tissue is affected, whether of the joints or of the middle of the bones, the more favorably does the remedy operate. When the periosteum is implicated, it gives speedy relief, and not infrequently removes the pain and swelling in the course of a few days. Indeed, so potent is the medicine over this particular form of the disease, that in many instances the cure may be safely intrusted to its unassisted power.[4] On the other hand, when the joints themselves are enlarged, their fibrous investments thickened, and their movements painful, the compound tincture of iodine is said to be preferable to the saline preparation.[5] Several cases of that form of rheumatism which Sydenham described,[6] and which Haygarth termed "*nodosity of the joints*," a disease generally regarded as incurable, have been restored to health by Dr. Laségue.[7] He treated them with iodide of potassium without any benefit whatever, but found that improvement began and advanced steadily under the use of the compound tincture of iodine. The medicine was prescribed in doses of ten drops, diluted with water or weak wine and water, and taken at or after breakfast and dinner. A case of the success of this treatment in the hands of M. Gintrac has been published.[8]

In chronic *gout* iodide of potassium has frequently been used with advantage, and a late writer has set a high estimate upon its powers in this affection. Dr. Spencer Wells says: "I have given it very extensively for the last thirteen years, in almost all forms of gout, except during the acute attack, and in almost every case with the most encouraging results. I have tried it in doses from eight grains three times a day, to one grain daily, in divided doses, ... and its good effects were too uniform to leave any doubt as to the value of the re-

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[1] Times and Gaz., March, 1857, p. 300.
[2] Dublin Hosp. Gaz., Feb. 1858.
[3] Bull. de Therap., liv. 325.
[4] Fuller, on Rheumatism (Am. ed.), p. 298.
[5] Délioux, Bull. de Thérap., xlix. 241.
[6] Works, Syden. Soc. ed., i. 255.
[7] Archives Gén., Sept. 1856, p. 300.
[8] Bull. de Thérap., liv. 187.

medy. . . . Except in cases of combination with syphilis, one grain three times a day is as much as can be given for any length of time with benefit or safety."[1]

In 1840, Graves, of Dublin, first drew attention to the effects of iodide of potassium in subacute and chronic *lumbago* and *sciatica*, by publishing an account of its prompt and complete efficacy in an attack of the former affection under which he was laboring.[2] Dr. Osbrey also found it an excellent remedy.[3] Several favorable cases, of one of which he was himself the subject, are reported by M. Izarié. After ten days of suffering with lumbago, the pain yielded almost to the first dose of the medicine.[4] Payan used frictions with iodide of potassium upon the loins with marked relief in a number of cases of lumbago. In that *rheumatic form of neuralgia* which frequently attacks the face, and appears to proceed from cold, Dr. Watson has found a few doses of iodide of potassium, of five grains each, to work a speedy and permanent cure. Dr. Oliver, of Mass., used it in his own person with great advantage for the relief of *angina pectoris*.

Dr. Casey reports that he employed iodide of potassium in twenty-five or thirty cases of *asthma*, some of them very severe and aggravated, and in no one instance did it fail "to afford unequivocal and decided relief."[5] He gave from two to five grains three times a day in solution. It does not, however, appear what form of "asthma" is here referred to, the purely nervous affection, or that connected with emphysema and catarrh, or chronic bronchitis, or with cardiac disease. The first form is probably not the one referred to, since few private practitioners have met with twenty-five or thirty cases of it in a lifetime; and as regards the other forms, as they are essentially incurable, it is probable that a temporary suspension of the attacks has in some cases been mistaken by the reporter for a cure. It is proper to mention, however, that a writer in the *Boston Medical and Surgical Journal* states that he had tried the iodide in a number of cases of "asthma" without having been disappointed in its effects in a single instance.[6]

In some cases of *paralysis* the medicine appears to have been of service, probably when the paralytic condition depended upon pressure made upon the brain, or upon a nervous trunk, by an effusion or a thickening which the iodide has caused to be absorbed. In *chorea*, affecting persons tainted by syphilis or scrofula, it has also proved useful.

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[1] Pract. Obs. on Gout, 1854, pp. 219 and 248.
[2] Dublin Quart. Journ., xviii. 244.
[3] Ibid., xxi. 430.
[4] RANKING's Abstract (Am. ed.), xvi. 71.
[5] N. Y. Journ. of Med., iv. 33.
[6] Oct. 15, 1857, p. 226.

Iodide of potassium has been employed to moderate *excessive lactation*. Rieseberg relates the case of a woman who, owing to deformity of the nipples, was unable to suckle her children, but whose milk nevertheless continued to be secreted profusely. This occurred in her second and also in her third confinement, and on both occasions the secretion was arrested by the internal use of the compound solution of iodine.[1] M. Rousset, of Bordeaux, has published twenty cases intended to demonstrate this virtue in the medicine, when given to the extent of eight or ten grains, in divided doses, in the course of the day.[2] In the *vomiting of pregnancy* iodine appears to be a remarkably successful remedy. Dr. Schmitt, by administering two drops of the tincture every two hours, to a woman, who, in consequence of vomiting, had had four abortions, enabled her to complete her fifth pregnancy securely; and Dr. Eulenberg succeeded in relieving one who had become very much reduced by vomiting during gestation, by giving her, every three hours, three drops of a solution of a scruple of tincture of iodine in three drachms of alcohol.[3] M. Becquerel and M. Buisson use for the same purpose one part, by weight, of tincture of iodine, and one and a half parts of iodide of potassium, dissolved in thirty parts of water, of which a tablesponful, diluted in a glass of sweetened water, is directed to be taken in three doses during the day. M. Buisson reports three examples of its complete success.[4] Dr. Masson also mentions five cases in which he succeeded in arresting this distressing and dangerous symptom, by administering, every morning in a glass of sweetened water, three drops of a mixture of one part of tincture of iodine with five and a half parts of alcohol.[5] *Salivation during pregnancy* has been arrested by the use of pastilles, each containing a grain of iodide of potassium.[6]

Strumpf states that it is of "unquestionable advantage" in cases of *barrenness* and inability to procreate,[7] probably when this condition depends upon general debility. When *amenorrhœa* occurs under similar circumstances, iodine is sometimes of service; in this affection and in *dysmenorrhœa* it was originally recommended by Coindet, particularly where general debility and a strumous habit existed. Under like conditions of the general health it is useful as a remedy in *leucorrhœa;* but in all of these cases it should be associated with iron.

Friedrich, of Leipsic, gives a summary of nine cases of *ulcerative stomatitis* occurring in scrofulous persons, and cured by a solution

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[1] Boinet, op. cit., p. 782.
[2] Bull. de Thérap., lv. 38.
[3] Times and Gaz., Nov. 1856, p. 527.
[4] Bull. de Thérap., liii. 474.
[5] Abeille Méd., xiv. 268.
[6] Bull. de Thérap., liii. 238.
[7] Handbuch, ii. 692.

containing one and a half grains of iodine, and three grains of iodide of potassium, to four ounces of water.[1] It has also been given with advantage in cases of *ozæna*, probably of syphilitic origin.

Topical Application of Iodine.—Like other substances endowed with an irritant action, iodine is employed as a substitutive and also as a revulsive remedy; in the former case being directly applied to the inflamed or otherwise diseased surface, and in the latter to the sound skin to relieve internal inflammation. When used to establish a new and healthy action in the place of a morbid one, its action is something more than irritant, and when applied as a revulsive there is, probably, also some absorption of iodine, and consequently a direct action upon the nutritive process.

Erysipelas. In the more superficial forms of this affection, the application of tincture of iodine is frequently sufficient to arrest the disease. Dr. Ross, of Scotland, found it useful in the form referred to, and also in œdematous erysipelas occurring in an old cachectic subject.[2] Dr. Norris, of Edinburgh, claims to have cured at least thirty cases of the disease by this treatment conjoined with purgatives, tonics, &c., according to the nature of the particular case.[3] The physicians of Boston have given very decided testimony on this subject, by reporting a number of cases, equal to the above, in which the local use of tincture of iodine appears effectually to have arrested the development of erysipelas of the face.[4] In several other superficial inflammations, having a certain analogy with erysipelas, this application has been found equally useful. These are *burns*, *scalds*, and *chilblains*. In the last it is beneficial, like many other stimulant agents, provided that the inflammation is not active, and the skin is unbroken.

To prevent Pitting in Smallpox. In 1844, Dr. Crawford, of Montreal, published an account of his having employed the compound tincture of iodine for this purpose in consequence of the decided benefit he had derived from its use in erysipelas. In 1845 Dr. S. Jackson (formerly of Northumberland, Pa.) resorted to a similar expedient. He found that in one case it prevented the maturation of the pustules and the swelling of the skin, and rendered the pits more superficial than where the application was not made. Dr. Goddard applied the remedy successfully in five cases, and Dr. Sargent used it at the smallpox hospital of Philadelphia; but although it greatly mitigated the inflammation, it did not prevent pitting.[5] Similar experiments were made by

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[1] Dierbach, op. cit., ii. 1015. [2] Month. Journ. of Med. Sci., Sept. 1842, p. 792.

[3] Bull. de Thérap., xlv. 172.

[4] Bost. Med. and Surg. Journ., Sept. 1855, p. 140. For other cases see Lanyon, Lancet, June, 1840, p. 484.

[5] Philad. Med. Exam., Aug. 1846, p. 464.

Dethier at the hospital of Mons, and with the same general results, but it is not stated to what extent pitting was prevented.[1] In 1854 Dr. Crawford again drew attention to the method, in which he continued to have undiminished confidence. He employed a saturated tincture of iodine, applying it with a brush to the face and other parts of the body once or twice every day from the commencement of the eruption.[2] Boinet goes so far as to say that he has frequently made use of this preparation in confluent smallpox, and has "always seen the variolous pustules abort without inconvenience to the patients."[3]

In various *diseases of the skin* iodine has been employed with occasional success, both internally and locally, but, except in those which depend upon constitutional syphilis, its virtues have not been very clearly exhibited. Doubtless it may in both modes occasionally cure *psoriasis*, *herpes*, *acne*, and even *favus*, but none of them as certainly or as speedily as other remedies. With *lupus* the case is somewhat different. This is an affection generally engrafted upon a scrofulous constitution, and on that account, probably, is more amenable to the internal administration of iodine than the other cutaneous diseases mentioned. To obtain its full benefits, however, the remedy must be continued for a long time, and in very moderate doses, not exceeding a grain, two or three times a day. As an external remedy in lupus, iodine is too feeble to be of much service. The tincture has sometimes been found successful as an application for the cure of *warts*, soft *corns*,[4] and vascular *nævi*. A solution of iodide of potassium may be used to remove *stains* produced by *nitrate of silver*. The stain should be moistened thoroughly with the solution, and exposed to the sun.

Various *mucous fluxes* have been cured by the local application of the tincture or the solution of iodine. Lugol employed the latter, when diluted, as an injection into the nostrils in *ozæna*. *Chronic laryngitis* may be treated advantageously by iodine inhalations, and by tincture of iodine applied to the skin of the fore part of the neck. The same means should be tried in *aphonia*, arising either from debility and relaxation, or from chronic thickening of the laryngeal mucous membrane.[5] M. Ancelon found the application of the tincture of iodine to the pharynx, by means of a probang, very efficient in overcoming *spasm of the œsophagus*.[6] In *leucorrhœa* it has been successful when applied thoroughly, by means of a mop and speculum, to the whole vaginal surface and os uteri. Dr. Russell, of Louisiana,

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[1] Abeille Méd., xii. 293.
[2] New York Journ., N. S., xii. 137.
[3] Op. cit., p. 647.
[4] Bull. de Thérap., lv. 141.
[5] Bennett, Times and Gaz., Jan. 1858, pp. 116, 138.
[6] Bull. de Thérap., lv. 92.

states that he used a solution containing from one to four grains of iodine, with double the quantity of iodide of potassium, in an ounce of water, as an injection, with better effects than those obtained from the nitrate of silver.[1] A similar treatment has been found successful in the cure of *gleet*. Two drachms of tincture of iodine in an ounce of water form a solution which should be injected night and morning for several days. Boinet cured several cases of chronic *catarrh of the bladder* by means of an injection containing one part of tincture of iodine to twelve of water. After drawing off the urine, the solution was injected through a catheter, and allowed to remain for about three minutes. An emollient injection followed. A similar solution, given as an enema, has been found effectual in the cure of *chronic dysentery*.

The compound tincture of iodine forms a valuable application to *ulcers of the tonsils*, whether specific in their nature or not. It has been highly recommended by Dr. J. J. Ross, and by Ricord, who says that he does not know anything equal to it in such cases. A gargle may be used of the following composition: ℞.—Tr. iodinii f℥j to f℥ij; tr. opii f℥j; aquæ f℥vj.—M. S.—Gargle three or four times a day. It is equally applicable to *granular inflammation* of the fauces. Dr. H. F. Campbell cured an obstinate case of *scrofulous ozæna* in less than a month, by the application, three or four times a day, of two grains of iodine dissolved in an ounce of glycerin.[2] Dr. Norman Cheevers found that a gargle containing from two to five fluidrachms of the compound tincture of iodine in eight ounces of water "exerts an absolutely prophylactic or curative influence" on *mercurial ptyalism*. He relates several cases which show that it is capable of arresting this process with singular promptness.[3] In various chronic inflammations of the eyes the local use of iodine has been found an excellent mode of stimulation, particularly in the several varieties of *scrofulous ophthalmia*, such as granular inflammation of the conjunctiva, blepharitis, &c. In some of these cases the vapor of a solution of iodine in chloroform has proved of great service.[4] A solution of iodine and iodide of potassium has been used successfully to dissolve and remove a *scale of iron lodged in the cornea*.

In cases of *indolent glandular inflammation*, including that of the inguinal glands, it has been found useful to apply a solution of iodine upon and around the affected gland, or to have iodine ointment daily rubbed into the affected part. The tincture is recommended by Dr.

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[1] N. Y. Journ. of Med., April, 1854, p. 398.

[2] Am. Journ. of the Med. Sci., April, 1859, p. 578.

[3] Indian Annals; and Am. Journ. of the Med. Sci., Oct. 1854, p. 528.

[4] Boston Med. and Surg. Journ., Nov. 1855, p. 284.

H. C. Stewart as having in many cases prevented the formation of *mammary abscess*.[1] Bonnet, of Lyons, reports the cure of a case of *pleurisy*, with large effusion, which resisted various modes of treatment until iodine ointment was applied to a blistered surface upon the affected side of the chest.[2] The same effect has been obtained by painting the skin with tincture of iodine.[3] This latter method has also been used with advantage to relieve *pleuritic stitches*. Norris, of Edinburgh, employed it in puerperal *peritonitis*,[4] and others have, with more probability of advantage, used it in the chronic forms of peritoneal inflammation occurring in strumous subjects. It is likewise serviceable in *hydrarthrosis*, or fluid effusion within the joints, and in all cases of fibrinous exudation, whether involving the articular ligaments or the periosteum.

Dr. Brainard, of Chicago, has proposed iodine as a means of neutralizing *animal poisons* introduced into wounds, whether those of venomous animals, or the product of animal decomposition. The latter application of iodine has been illustrated by M. Boinet, in the treatment of gangrenous and ill-conditioned suppurating cavities, to prevent purulent absorption and its consequences. It appears that iodine has the property of disinfecting the secretions of such diseased surfaces, while by its coagulating action upon the fluids in the substance of the walls of abscesses, it erects a physical barrier to absorption. When a virus such as that of the mad dog, of glanders, or of a venomous animal is inoculated, the application should be made immediately, and a large cupping-glass retained for some time over the wound. Dr. Brainard recommends, in addition, the injection of a solution of iodine into the cellular tissue around the wound. This physician has also injected a solution of iodide of potassium into the subcutaneous cellular tissue for the removal of serous and fibrinous effusions, as in œdematous erysipelas.[5]

Injection into Serous Cavities. It has been already stated that iodine, although an irritant, does not excite suppuration unless a very strong solution of it is employed, but only occasions an adhesive inflammation. This singular property has been applied to the treatment of various forms of dropsy. It was first employed in 1832, by Martin, of Calcutta, for the radical cure of *hydrocele*, and speedily became the ordinary method. A mixture of one part tincture of iodine

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[1] Philad. Med. Exam., May, 1853, p. 292.

[2] Bull. de Thérap., xliv. 88.

[3] M. Vaulpré reports five cases of its complete success. Bull. de Thérap., lii. 80.

[4] Bull. de Thérap., xlv. 172.

[5] Am. Journ. of Med. Sci., April, 1852, p. 563.

with two parts of water is thrown into the cavity of the tunica vaginalis after the evacuation of its serum, and is allowed to remain for five or six minutes. It seldom occasions pain unless the part is compressed, but some fever usually follows, and continues for several days. The result is nearly always a successful one, if the operation has been performed with care. In eleven hundred and forty-eight cases treated with iodine injections, only three failed; and these injections succeeded in nine cases where the previous use of port wine and sulphate of zinc had proved ineffectual.[1]

A similar injection has been used to cause obliteration of the sac in reducible *hernia*, and thus to prevent a recurrence of the accident. Velpeau, more than any other surgeon, has extended the use of iodine injections to the cure of all those tumors formed by a collection of synovial fluid in the *bursæ* and *sheaths* of tendons. The inflammation excited by this procedure is said never to become phlegmonous or to be accompanied by alarming symptoms. The same surgeon, and Bonnet, of Lyons, divide the honor of applying this method to the treatment of *white swelling* or *hydrarthrosis*. Boinet expresses the following opinion of its value. "It is proved by experience, that the method is not a dangerous one. It has in no instance occasioned death, and in most cases it has succeeded. It has never given rise to phlegmonous inflammation, and has cured the disease when it was not complicated with caries, necrosis, articular fungus, or swelling of the surrounding soft parts. Even in these unfavorable cases it was beneficial."[2] The immediate consequences of the operation are stated to be considerable local pain, and fever for several days, but nothing that requires active treatment, or which need create anxiety; and the ultimate result, if not a cure, is said at least never to be an aggravation of the symptoms or anchylosis of the affected joint.

The injection of a solution of iodine into the abdominal cavity has been used for the cure of *ascites*, in certain cases, independent of organic mechanical causes. It was first employed by Dr. Brainard, in 1845.[3] The strength of the injection employed has usually been about one fluidrachm of tincture of iodine, and five grains of iodide of potassium to eight fluidounces of water. Boinet has collected thirteen cases treated by this method; of these, eleven were successful, and in the two cases that were not so, no serious consequences ensued. M. Gintrac, Jr., of Bordeaux, considers the operation as contraindicated in all cases in which an organic affection of the heart, lungs, great vessels,

[1] South's Chelius (Am. ed.), iii. 227.
[2] Op. cit., p. 320.
[3] Am. Journ. of Med. Sci., Oct. 1850, p. 560.

alimentary canal, kidneys, uterus, &c., and whenever the liquid evacuated by the trocar is purulent.[1]

The symptoms following the operation are described by him, and also by Boinet, as generally slight. There is reason to believe that the results here stated are more favorable than are always obtained. Dr. Spengler, of Ems, resorted to this method in a case of ascites depending upon hepatic disease. The operation was performed twice unsuccessfully, and the death of the patient occurred soon after the second injection.[2] Dr. Cyprien Oré, of Bordeaux, performed the operation in five cases, and two only were cured. It is true that in the others death is said to have occurred from causes independent of the operation.[3] Its effects are thus described by Dr. Oré. No sooner is the solution of iodine injected than the patient turns pale, his limbs grow cold, his pulse sinks, and he experiences severe pain in the abdomen. These symptoms, however, are speedily followed by a moderate degree of reaction. In the cases which terminated fatally, there was general adhesion of the peritoneal surfaces, by means of false membranes. In a case operated upon successfully by M. Jules Roux, the patient died three months afterwards of typhoid fever, when extensive adhesions of the intestines were found, and the free portion of the peritoneal membrane was of a slate color, and had a metallic lustre.[4]

Injecting the pleural cavity for the cure of *chronic pleurisy* is an ancient practice. Simple puncture of the thorax is generally successful when the distending liquid is serous, and as generally fatal when it is purulent, but in the latter case the issue can often be rendered favorable by the use of stimulating injections, and especially of those containing iodine. For this method we are indebted to M. Boinet, who attributes to it the following advantages: it corrects at once the fetor of the pus, and so modifies the condition of the pleural surfaces as to render a cure possible even in cases supposed to be necessarily mortal. His mode of procedure is to evacuate the pus very gradually during a period of several days, then to wash out the chest with thin mucilage, and immediately afterwards to inject the iodized solution. This should be very weak if the case is a recent one, *e. g.*, four or five grains of iodine, and as many of iodide of potassium, in a pint of water. But much stronger solutions have sometimes been used, *e. g.*, one part of the compound tincture of iodine to ten of water, or even, as in a case of M. Aran, one part of iodine to two of water, with the

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[1] Bull. de Thérap., xlix. 130.
[2] Canstatt, Jahresbericht, 1852, p. 103.
[3] Bull. de Thérap., xliii. 241.
[4] Archives Gén., Oct. 1855, p. 479.

addition of iodide of potassium. In this case, which terminated in cure with retraction of the side, the constitutional effects of iodine were evident.[1] The injections ought to be repeated every third or fourth day according to the changes produced in the discharge, and in quantity they should be proportioned to the size of the pleural cavity. A very interesting instance of the perfect success of this method is reported by Dr. Brainard. The patient was a boy, sixteen years of age, and the empyema followed a pleurisy, caused by a wound with a knife. A solution consisting of one grain of iodine, three grains of iodide of potassium, and an ounce of water was injected twice a day.[2]

Dr. Brainard was the first to propose and make use of injections of iodine for the cure of *spina bifida*, or more correctly, of *hydrorachis*. His patient was a girl thirteen years of age, partially paralytic in the lower extremities, and idiotic. She had a fluctuating tumor over the sacrum three inches in diameter. Into this was injected, without evacuating it, a drachm of water holding in solution one grain of iodide of potassium and half a grain of iodine. Diminution of the tumor followed. A second operation of the same sort was performed three weeks afterwards, and the swelling continued to subside.[3] From the result of this and other cases, Dr. B. regards hydrorachis as generally in itself a curable disease; but its complications may render the operation by injection, or any other operation, inexpedient or even fatal.[4] Cases have also been operated upon by Chassaignac and by Velpeau, which terminated in complete cure.[5] These surgeons instead of injecting a weak watery solution into the still distended tumor, preferred evacuating the latter, and employing an injection containing from one-third to one-half of its bulk of tincture of iodine, and which was not allowed to remain in the cavity more than a minute. This method has been tried in *hydrocephalus*, but, generally, it would seem, without success.[6] In a case treated by Dr. Tournesco, of Bucharest, the patient, a child two months old, not only survived the operation, but the head after the serum had been evacuated did not again enlarge, and thirty-five days afterwards the child was in good health. Dr. Brainard, who cites this report, has published a case in which he

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[1] Bull. de Thérap., xliv. 54.

[2] Am. Journ. of Med. Sci., July, 1858, p. 289.

[3] Ibid., July, 1848, p. 262.

[4] Ibid., Oct. 1850, p. 560.

[5] Bull. de Thérap., xlv. 65, and xlvi. 123.

[6] See, among other cases, one reported in the Med. Times and Gaz., Nov. 1855, p. 408.

operated twenty-one times on the same patient in the course of eight months, when the child died.[1]

Cysts. M. Boinet includes under the title of cellular cysts all shut sacs produced by disease, and constituting in themselves a disease. An abscess is a cellular cyst containing pus. Other varieties contain blood, serum, hydatids, melicerous, or atheromatous matter. The principal seat of these cysts is in the lymphatic glands. Another division includes all cysts resulting from the distension of natural cavities lined by a mucous or sero-mucous membrane. These occupy the thyroid body, the parotid, sublingual, submaxillary, or mammary gland, the liver, the ovary, the bones, &c. It is foreign to the purpose of this work to enter into details respecting these various forms of disease; suffice it to say, as regards the greater number of them, that no method whatever has proved so efficacious in their cure as the one now under consideration. The conclusions of M. Boinet in regard to ovarian cysts, the most common of the graver forms of encysted dropsy, we shall, however, quote more fully. They are as follows:—

"1. Hitherto encysted dropsy of the ovary has been supposed to be incurable.

"2. Simple puncture of the tumor is only palliative, and is sometimes dangerous.

"3. Extirpation is not absolutely to be rejected, since numerous examples of its success have occurred in England, Germany, and America; but it is a very serious operation, and should be employed only for certain varieties of cysts.

"4. A single puncture or successive ones followed by iodized injections duly performed, *have never involved the least danger*, whether the cysts were simple or complicated; they often bring about a radical cure, and always a notable improvement, even in cases which are essentially incurable.

"5. The method should be modified according to the size of the cyst, the quality of its contained liquid, the complications, &c.

"6. Serous, simple, unilocular, small, and recent cysts without organic complications, are more readily cured than old, multilocular cysts, &c.

"7. Sometimes, a serous cyst, even when very large, is cured by a single injection, but generally more are required.

"8. The injections should be repeated until the cyst is completely obliterated.

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[1] Boston Med. and Surg. Journ., May, 1859, p. 343.

"9. It is important to operate as soon as liquid can be detected, and to renew the operation if the cyst re-forms.

"10. The strength of the injection must be modified according to the extent and nature of the cyst, its complications, and peculiarities.

"11. The puncture should be made above Poupart's ligament, and not through the vagina.

"12. It should always be made on the side where the tumor originated."[1]

It is proper also to call particular attention to the remarkable success obtained by the physician above referred to, in applying the same treatment to all kinds of *suppurating cavities*, especially those which are inaccessible to the stimulants commonly employed to promote the cure of superficial ulcers. Such are *lumbar and iliac abscesses, cold abscesses, white swelling, fistulæ of the larynx, of the anus*, &c. In regard to *anal fistulæ*, M. Boinet draws the following conclusions from his experience, viz., that iodized injections cure them more speedily and with less danger and annoyance than any other method; for they are less painful, easier to make use of, do not require the patient to keep his bed for a long time, are applicable to all cases, and especially to those which are unsuitable for an operation; and even if they should fail, the knife remains as a last resort.[2]

Modus Operandi.—If, in order to determine the nature of the curative influence exercised by iodine, we survey the whole field in which this substance and its compounds operate therapeutically, we are struck by the fact that, like other alteratives, its operation is gradual and usually unaccompanied by active phenomena. In dropsy of the great cavities, or of the joints, it appears to effect a cure by a very slow and steady removal of the effusion, and without augmenting in a notable degree, the urine, the perspiration, or the alvine discharges. The same is true in reference to such tumors (simple enlargement of the thyroid body, of the ovaries, the testes, &c.), inflammatory or otherwise, which it is competent to cure. If we turn to other diseases in which its action is useful, such as metallic poisoning, tertiary syphilis, and certain cutaneous eruptions, we find in the first, material

[1] Numerous examples of this operation have recently been published, and among them the reader will find it of interest to refer to the following: Mr. Hardwick, Times and Gaz., Jan. 1857, p. 110 and 138; Dr. S. Beck, Ibid., May, 1857, p. 498; Mr. Erichsen, Lancet, May, 1857, p. 452; Dr. B. Roemer, Am. Journ. of Med. Sci., Apr. 1857, p. 332; Mr. J. B. Brown, Times and Gaz., Dec. 1877, p. 587; Mr. Hutchinson, Ibid., June, 1858, p. 602; Mr. Bickersteth, Ibid., p. 655; Dr. Savage, Ibid., May, 1859, p. 548.

[2] Op. cit., p. 608.

proofs of its eliminative power, and, in the absence of any other sufficient explanation of its efficacy in the latter, we may conjecture that, in them, also, it brings about the discharge of some *materies morbi* from the system. If we add to these considerations that the operation of iodine upon the economy, when long sustained, is evidently to cause a wasting of the tissues, beginning with the fat and glandular structures, and that it tends to reduce the proportion of the solid constituents of the blood, the conclusion appears to be a legitimate one that it is curative because it tends to eliminate from the system, first, those of the constituents of the body which are most slightly incorporated with it, and which are, indeed, foreign to its structure, and that its action ultimately becomes pathological instead of salutary, when it promotes the disintegration and discharge of the organic elements themselves.

ANTIDOTES.—When an overdose of iodine or of its tincture has been taken, lukewarm water containing starch, white of egg, or mucilage should be freely administered, for the purpose of inducing emesis and of neutralizing the iodine. Milk is also an appropriate remedy. A solution of carbonate of soda may be given as a chemical antidote. After the amylaceous solution which is thrown up ceases to present a blue tinge, attempts to excite vomiting should be abstained from, and means employed to quiet the local and general excitement. If there is much tenderness or burning pain at the pit of the stomach, leeches may be applied there, and small quantities of iced water or gum-water taken internally. An opiate should at the same time be administered to calm the general agitation as well as the local pain. Black drop, or a salt of morphia in solution is preferable to solid opium. The food for some time should be unirritating and taken in moderate quantity.

ADMINISTRATION.—Besides the special directions given in this article for the administration of iodine, it may be well to add one or two in this place. The tinctures and solutions of iodine should always be prescribed in small doses, at first, and very largely diluted. When they occasion pain, disturb digestion, &c., they should be temporarily withdrawn, and on being resumed, the dose should be diminished. The dose of iodide of potassium, which ought also to be largely diluted, may be gradually augmented until the object of giving the medicine is attained, or symptoms of iodism appear. Externally, iodine may be applied in substance, as already stated, by being quilted in some suitable tissue worn next the skin. The tinctures and solutions are applied to the skin by means of a camel-hair pencil or some analogous instrument. After repeated applications the integument becomes

hard, and it is proper before reapplying the medicine to wash the part with alcohol. If the cuticle exfoliates it is better not to resume the application until this covering is formed anew, or, if this delay is not judged proper, a weaker solution should be applied. When used upon a part which tends to suppurate, a cold water dressing is preferable to a warm poultice.

OLEUM MORRHUÆ.—Cod-Liver Oil.

Description.—Cod-liver oil is obtained from the livers of several species of *Gadus*, but especially of *G. morrhua*, or common cod, a fish that abounds near the coasts of America, in northern latitudes. Three varieties of the oil are found in commerce, the *pale*, the *light brown*, and the *dark brown*. The first named is procured from the fresh livers of the fish, sometimes by simple dripping, but more generally by maceration and a moderate degree of heat. In this country the livers are first reduced to a pultaceous mass by boiling with water, or by being inclosed in a metallic cylinder surrounded with steam. Afterwards, upon standing, the oil separates, floats upon the surface, and is removed. In England, after exposing the sliced livers to a temperature of 180° F., the oil which drains away is exposed to a temperature of 50° F., in order to congeal the bulk of the margarine, which is then removed, and the oil carefully bottled. Its color is a golden yellow, it has a peculiar but not offensive smell, and its taste is fishy. *Light brown* cod-liver oil only differs from the first-named in having a somewhat deeper color, a stronger smell, and an acrid or bitter as well as a fishy taste, qualities which are probably due to its being procured from livers which, although not putrid, are still not perfectly fresh. The *dark brown* oil is prepared by heat from partially decomposed livers; it is less transparent than the other varieties, has an offensive empyreumatic smell, and a bitter and acrid taste.

Besides the ordinary constituents of animal oils, such as oleic and margaric acid and glycerin, cod-liver oil contains a great variety of substances in very minute proportions, particularly the constituents of bile, and chlorine, bromine, and iodine. Of the last it is said that there exists less than four one-hundredths of a grain of iodine to every hundred grains of the oil.

It may be distinguished from other oils by placing a small quantity of it upon a white surface, as that of a plate, and letting fall upon its centre two or three drops of sulphuric acid, which will instantly occasion a number of radiating currents of a delicate and beautiful lilac

hue. This peculiarity is ascribed to the bile which is contained in the oil. As Winckler has shown, by the addition of ammonia, a peculiar volatile principle is developed, called *propylamin*, which has a strong, pungent odor, recalling that of herring pickle. This effect is produced in no other officinal fatty oil.

HISTORY.—Pliny mentions the fat of fishes among the remedies used for diseases of the skin.[1] From time immemorial cod-liver oil has been used in Westphalia as a popular remedy for gout and rheumatism, and in the Highlands of Scotland for rickets and scrofula.[2] In 1778, Günther, of Cologne, saw a large number of persons affected with chronic rheumatism resort to a tannery near Eberfeld to obtain cod-liver oil, which they believed would cure them.[3] In 1782, as we learn from Percival, nearly a hogshead of the oil was annually consumed at the hospital of Manchester, for the cure of chronic rheumatism, sciatica of long standing, premature decrepitude, &c. Its internal administration at the institution is said to have been accidental in the first instance; but so much benefit resulted from the remedy that very soon, Dr. Kay, a physician to the Infirmary, was led to employ it generally in cases of chronic rheumatism.[4] It is remarkable that Mr. Darbey, the house surgeon, in a letter to Dr. Percival, should have ranked this medicine next to bark, opium, and mercury, and that half a century should have been required to bring the medical world to this opinion. Bardsley, in 1807, partially confirmed the judgment of Percival and his associates; but, from that time, little was heard of the remedy until 1822, when Schenck, of Siegen, published an account of his having cured by its means sixteen cases of chronic rheumatism. Four years later, he added twenty other cases to the number, besides several of scrofulous disease.[5] The success of the remedy in the practice of many German physicians, was made known[6] in France in 1837 by Taufflieb,[7] Riester,[8] Carron du Villards,[9] who also recommended it as a topical remedy for ulcers of the cornea,[10] by Gouzée[11] and others. In England, Dr. J. H. Bennett, who had become acquainted with the remedy in Germany, first drew attention to it by the publication of a treatise,[12] which drew upon him a grave reproof for expending so

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[1] Hist. Nat., lib. xxxii. chap. xxvii.
[2] RICHTER, Ausfür. Arzneim., i. 236.
[3] TAUFFLIEB, from HUFELAND'S Journ., 1824.
[4] PERCIVAL'S Essays, ii. 354.
[5] RICHTER, op. cit.
[6] Die Neue Arzneimittel., p. 508.
[7] Gaz. Méd., v. 502.
[8] Journal des Progrès, 1830, ii. 182.
[9] Bull. de Thérap., 1834, vi. 266.
[10] Bull. de l'Acad., i. 459.
[11] Bull. de Thérap., xiv. 279.
[12] Treatise on the Oleum Jecoris Aselli, or Cod-liver Oil, as a Therapeutic Agent in Certain Forms of Gout, Rheumatism, and Scrofula, London, 1841.

much enthusiasm upon a subject which, in the opinion of the reviewer, did not call for any at all.[1] Time, however, did justice to the correctness of his conclusions, for in 1853 we learn from Dr. Theophilus Thompson, one of the physicians to the London Hospital for Consumption and Diseases of the Chest, that *six hundred gallons* of the oil were annually used in that institution.[2]

Action of the Oil. *On Nutrition.*—Dr. Pollock has procured some very interesting information in regard to the influence of cod-liver oil upon the fattening of *animals*, particularly pigs, bullocks, and sheep. In all there seemed to be a decided limit to the quantity which could be digested. Pigs consumed from one to two ounces *per diem;* sheep, one ounce; and bullocks, from three to nine ounces. If more was taken, it invariably disagreed, producing derangement of the digestion, and giving the fat a yellow appearance, and a fishy taste.[3] Klencke shaved some young dogs, and rubbed them with cod-liver oil twice daily for three weeks. At the end of this period, they were in as good condition as dogs to whom oil had been internally administered; their bile was found as rich in fat, and their chyle equally charged with corpuscles without nuclei. Similar changes were observed in the bile and chyle of a cat bathed twice a day for some time in the same liquid, and some oil was discovered in the urine of the animal, proving, it was supposed, its free absorption by the skin.[4]

The fattening property of the oil in the human subject is too familiar to need particular illustration in this place. It was first noticed by Bardsley. Simon, and also Thomson, have shown that under the use of the oil the proportion of red globules in the blood is materially increased.[5] These changes in the blood are most conspicuous during the treatment of phthisis, and will be alluded to more particularly in the sequel. It would appear probable that the continued use of the oil may sometimes predispose to local parenchymatous congestions. Dr. Benson found a congested and consolidated condition of the lung unusually frequent in consumptive patients treated by its means,[6] and, although Dr. Bennett says he has never known it to induce pneumonia, or fatty disease of the liver or kidney, however long continued,[7] there are some experiments on healthy animals that countenance the original statement. Thus, Gluge and Thiernesse produced pneumonia arti-

[1] Brit. and For. Med. Rev., Jan. 1842, p. 197.
[2] Clinical Lect. on Pul. Consumption (Am. ed.), p. 93.
[3] Lancet, Nov. 1853, p. 435.
[4] Thompson, op. cit., p. 100.
[5] Brit. and For. Med.-Chir. Rev., Jan. 1856, p. 249.
[6] Braithwaite's Retros. (Am. ed.), 1850, xxi. 356.
[7] On Pulmonary Tuberculosis, p. 64.

ficially in certain animals by feeding them exclusively on cod-liver oil. The lesions found were hepatization of the lungs, the accumulation of a fatty fluid in the pulmonary parenchyma, in the liver, the kidneys, and the blood.[1]

The action of the oil upon the function of *digestion* is often marked. It is sometimes laxative, but, if the bowels are sound, more frequently constipates. When it exerts a favorable influence, the appetite and digestion usually improve. It sometimes, after having been taken for a considerable period, impairs the appetite, renders the tongue foul, excites heartburn, pain in the epigastrium, and rancid eructations, and may even produce vomiting. These effects are common to all oily substances. Dr. Russell observed that the people of Aleppo, who consume large quantities of olive oil, are very prone to "fevers and infarctions of the lungs." (*Percival.*) It was early remarked by Mr. Darbey that these offensive qualities of cod-liver oil must necessarily restrict its use very much.

This oil manifests no direct influence on the *circulation* more than a similar quantity of other nutritious food would do. Percival noticed that in persons of an irritable habit the pulse is sometimes accelerated by it, and a glow of warmth is felt diffusing itself over all the body. It appears rather to promote perspiration. No doubt it increases the solid constituents of the blood, and the mass of that fluid also. It has been said to be a frequent cause of hæmoptysis, but, as it is administered chiefly in tuberculous consumption, a disease to which this symptom is incident, the question is evidently one not easy to be solved. It has already been referred to in connection with the alleged congestion of the lung produced by cod-liver oil. An explanation of the occurrence of hæmoptysis under the use of the oil in persons free from pulmonary disease has been proposed by Gamberini. He attributes it to the local action of the oil upon the fauces, by which a vascular engorgement of the mucous membrane is produced, sometimes resulting in hemorrhage.[2]

Taufflieb, however, insists upon the reality of the plethoric, congestive, and even inflammatory phenomena sometimes developed by cod-liver oil, while he admits that they occur most frequently when the oil is administered for pulmonary affections. Nor is the opinion unreasonable. The lungs in phthisis are, owing to the tubercles contained in them, peculiarly liable to intercurrent inflammation, and if, from any cause, a tendency to such an accident exists, it must neces-

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[1] Taufflieb, op. cit., p. 74; and Gaz. Méd. de Paris, 1844, p. 718.

[2] Bull. de Thérap., xliv. 511.

sarily be increased by the use of such a powerful stimulant to nutrition as the one in question. Dr. Theophilus Thompson has shown, by analyses of the blood of tuberculous patients, some of whom were treated with cod-liver oil, and others without it, that in the former a very large increase takes place in the proportion of red corpuscles in the blood.[1] It may, therefore, become a question whether it is always prudent to administer cod-liver oil in phthisis, without some precaution to guard against the plethora, and the consequent danger of hæmoptysis, to which the medicine must render tuberculous patients liable. Iron presents a similar inconvenience, and it does not possess the countervailing advantage of so directly contributing, as cod-liver oil dôes, to the production of fat, and thereby tending to restrict the waste of the nitrogenized tissues.

Bardsley, and, since his time, other observers, have noticed an itching of the *skin*, with prickling heat, and a papular eruption, from the internal use of the oil. The perspiration is generally increased, and a fishy odor exhales from the whole body. The *urine* is commonly augmented, and generally furnishes a lateritious deposit. In females, the *catamenial* flow is apt to be augmented, and when it has been suppressed by disease, is often re-established under the influence of the oil.

Modus Operandi.—From the preceding considerations, as well as from the effects of the medicine in disease, it may be inferred that cod-liver oil is essentially a fat-producing agent. To this quality it owes, in a great measure, its controlling power over scrofulous and tuberculous diseases, the most prominent effect of which is to cause a wasting of the adipose and then of the muscular tissues. It may be stated, in confirmation of this view, that all tradesmen who are habitually in contact with fatty substances, *e. g.*, butchers, cooks, oil-men, tallow-chandlers, &c., are less liable than others to scrofula and phthisis. It is also well known that modes of treatment for phthisis have at various times been vaunted, which consisted chiefly in the use of oily substances, such as asses' milk, cream, butter, fat pork, buffalo marrow, &c. If cod-liver oil has been more efficient than these, it is because it contains principles in which they are deficient, and which facilitate its digestion, either by promoting the secretion of bile, or by otherwise favoring its assimilation, as well as that of the nutritious food which is given in connection with it.

Remedial Employment. *Chronic Rheumatism.*—In Germany, where cod-liver oil was first used extensively for this disease, a large

[1] Lancet, Nov. 1858, p. 552.

number of the most eminent physicians place it in the first rank as an anti-rheumatic medicine. This estimate of its value, says De Jongh, "is not founded upon mere assertion, but is established by innumerable cases of undoubted cure, in which patients had suffered many years from rheumatic disease, and after, in vain, trying every other means, had eventually been restored by cod-liver oil." But, on examination of the subject, this estimate will scarcely be sustained. As long ago as the time of Bardsley, we find that this physician speaks of cod-liver oil as a medicine of "efficacious but limited powers," chiefly in chronic rheumatism with rigidity of the joints.[1] Even earlier, Darbey described particularly the cases to which it is adapted. He says: "Men and women, advanced in years, whose fibres may be supposed to have acquired a degree of rigidity, find surprising effects from the oil. Some who have been cripples for many years, and not able to move from their seats, have, after a few weeks' use of it, been able to go with the assistance of a stick; and, by a longer continuance, have enjoyed the pleasing satisfaction of being restored to the natural use of their limbs, which, for a long time before, had been a burden to them."[2] Taufflieb, also, says that the operation of the remedy is most beneficial when the constitution of the patient is impaired by protracted suffering, slow fever, and insufficient nourishment. Dr. Fuller, moreover, is of opinion that under ordinary circumstances its efficacy is questionable, and he reserves its use for cases in which a cachectic condition predominates.[3] These conclusions are, more or less definitely, the same in substance with those which have been reached by Dr. Müller, of Mulhouse, and which are of sufficient importance to be quoted here. He thus describes the two forms of rheumatic disease which the medicine is adapted to cure: 1st. Musculo-fibrous rheumatism arising in a state of abject poverty, and produced by crowded dwellings, insufficient air and light, an originally feeble or impaired constitution, a scrofulous constitution, and inherited proclivity to the disease. This form of rheumatism begins with dull pains in the limbs, extending gradually to the spine, and as high as the neck, producing stiffness and more or less permanent rigidity of the muscles of the trunk and limbs. It presents no inflammatory phenomena, but is accompanied by œdematous swelling without redness, and may terminate in paralysis. 2d. Fibrous rheumatism, produced by protracted residence in damp and cold localities, and differing from the first variety in being confined to the joints. It however gradually exhausts the

[1] Med. Reports, p. 20.
[2] Percival's Essays, ii. 361.
[3] On Rheumatism, &c. (Am. ed.), p. 298.

strength, and impairs the nutrition of the patient. In these two forms only of rheumatism did Dr. Müller find the oil of service, and hence, the results of his observation entirely confirm those which have already been cited. In other words, cod-liver oil is a remedy, not for rheumatism as such, but for a cachectic state of body, which sometimes sustains and protracts indefinitely the rheumatic disorder. This view explains why, in such cases, the first effect of the remedy is to produce an exacerbation of the pain; it is only at a later period, when the oil has begun to improve the nutrition, that it triumphs over the state of morbid sensibility by enabling the system to get rid of its cause.

Scrofula.—According to Brefeld, no other remedy for scrofula is comparable to cod-liver oil; but he at once lessens the force of his testimony by reckoning rachitis among the forms of scrofula, and the one in which the efficacy of the oil is most apparent. He states, however, and in this his experience accords with general observation, that the medicine is more valuable in affections of the internal than in those of the external lymphatic glands. Heineken and Kopp agree substantially in this estimate; and Bredow, while admitting that the oil is very useful as nutriment, insists that he has never been able to ascribe the radical cure of scrofula to its use.[1] So Phillips, while admitting that he has seen enlarged glands, sinuses, ulcers, lupus of the face, and caries all get better under its use, has yet generally found either that the stomach or the patience failed before the remedy had been carried far enough to produce any considerable amelioration.[2]

Seeing how various and uncertain are the opinions of physicians upon the general subject under consideration, we shall find it profitable to inquire what are the effects of cod-liver oil in the several forms of scrofula. But there is one remark which is applicable to them all. In proportion as the local disease affects a person who has been subjected to bad hygienic influences, and especially to the use of coarse and innutritious food, does the action of the oil appear to be prompt and decided. Where, on the other hand, the disease has become developed in spite of favorable external conditions of living, and particularly when, as often happens, the digestion is very feeble and imperfect, the oil is seldom tolerated, and rarely produces any good effects.[3]

In scrofulous enlargement of the parotid, thyroid, and submaxillary

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[1] Riecke, Die neuern Arzneimittel, p. 515. [2] On Scrofula (Am. ed.), p. 258.

[3] The very singular statement is attributed to Segnitz, that when the oil is given to children predisposed to scrofula, the disease may be developed by its use; that in young children it may bring on atrophy, and that in such cases the teeth usually decay. (*De Jongh*, p. 104.)

glands, and of those seated in the neck, axillæ, and groins, cod liver oil is of little use. In such cases, when caries of the bones exists at the same time, it is not unusual to find the latter disease getting well under the use of the remedy, while the glandular affection remains unaffected. This result is strongly in contrast with what takes place under the administration of iodine, which causes the glandular enlargement to decline, but does not influence the caries. But when scrofulous abscess and ulceration have attacked the glands, and an indolent ulcer with excavated edges remains, or one extending under the skin and between the muscles, nothing promotes a cure so certainly as cod-liver oil. In such cases the patient is frequently anemic, emaciated, nervous, and dyspeptic, but under the use of the remedy speedily recovers that tone of the system which is necessary to his cure. This curative power is signally manifested in healing cold abscesses after their evacuation; the serous is replaced by a purulent discharge, healthy granulations cover the indolent surface of the sore, and cicatrization ensues.

Cod-liver oil has been vaunted as almost a specific for *tabes mesenterica*. Brefeld and various other physicians have found it singularly successful in cases supposed to be of this nature. But when we consider that enlargement of the mesenteric glands must be very great before it can be detected through the tumid abdomen which belongs to this affection, also that such enlargement is usually tuberculous, and, further, that a tumid abdomen is common among scrofulous, and especially rachitic, children, and often results from dropsy caused by enlargement of the liver, we cannot avoid entertaining some doubt respecting the reality of the alleged cures. Unquestionably the medicine has frequently converted the child of pale and emaciated features, shrunken limbs, and projecting abdomen, into one of comely look and fair proportions; but never, it is believed, when the detection of mesenteric tumors through the parietes of the abdomen has rendered their existence certain.

In *scrofulous ophthalmia*, particularly in granular inflammation of the conjunctiva, blepharitis, and ulceration of the cornea, cod-liver oil has been highly recommended, particularly when these affections were of long standing, and had not improved under a merely local treatment. But general experience has not fully confirmed these recommendations. Owing to the statement of Lombard, and other Swiss physicians, that such affections yield promptly to the remedy in question, Lebert made an extensive trial of it in cases of the same kind, but with unsatisfactory results. In some, it is true, a marked improvement took place slowly and gradually, but in nearly half of

the whole number the medicine produced no sensible effect at all upon the course and symptoms of the disease.[1]

Caries, and Strumous Osteitis.—In all forms of idiopathic strumous caries, cod-liver oil is a most valuable remedy. This is a disease which seldom improves if abandoned to the resources of nature. The swelling, softening, and disintegration of the bony structure (although it is not due to the deposit and softening of tuberculous matter), the ulceration of contiguous soft parts, external abscess, and hectic fever, with marasmus, generally form the steps that lead to death. From 1824, when cod-liver oil began to be used as a remedy for this affection, a large number of cases of its cure have been recorded. Taufflieb reports twenty-one as having been treated by himself. In thirteen of them there was confirmed caries; in eight others, there was simple scrofulous swelling of the bone and periosteum without softening or ulceration. Of the first class, ten were cured; the remaining three who were not benefited, were of persons advanced in years. Of the second class, all recovered. The more chronic and torpid the disease, the more efficacious did the oil appear to be, and it always improved the general health before the local affection. Lebert gives a more qualified estimate of the success to be hoped for from this treatment. Indeed he declares that he found it fully successful in only one-third of the cases. It was most useful when caries attacked the epiphyses of the long bones, and less so in caries of the shafts of these, and of the flat bones. He is also of opinion that its efficacy in vertebral caries is still doubtful, and that there is no proof of its acting beneficially in necrosis, or of its hastening the expulsion of sequestra. But a most important influence which it exerts, is to prevent new developments of scrofulous disease in other parts of the osseous system, by its salutary influence upon the blood and nutrition.[2]

Cod-liver oil has been employed with signal advantage in the treatment of white swelling and other forms of *chronic arthritis.* Lebert obtained such excellent results in these affections by its means, that he is disposed to look upon its use as one of the most useful achievements of modern medicine. Taufflieb reports eighteen cases which came under his observation. In eight of them the hip-joint was the seat of the disease. In most of these cases the improvement is stated to have been progressive and the recovery perfect. Lebert found it much more useful when the disease originated in the bone itself, than when it began in the synovial membrane. On the other hand, it

[1] Maladies Scrofuleuses, p. 331.

[2] Ibid., p. 546.

appeared more successful in the cure of fistulæ and abscesses around joints, than in affections of the joints themselves. Among the latter, arthritis of the ankle-joint was most distinctly benefited, and the like affection of the hip-joint, the least so. Lebert prescribed not more than two or three tablespoonfuls a day of the oil, but required it to be continued for many months, indeed for a year or even more.

Rachitis.—Physicians who have made use of cod-liver oil in this affection, are unanimous in according to it extraordinary curative powers. Since the first publication upon the subject by Schenk in 1826, proofs of its efficacy have accumulated on every side. In France a knowledge of its virtues were obtained accidentally by Bretonneau, from a Dutch merchant, whose child was affected with rachitis. Soon afterwards, the remedy was tried by Trousseau with unlooked for success, and by him its virtues were more widely published.[1] The cases in which he used it included children with imperfect ossification of the bones, enlargement of the cranium with persistence of the fontanelles, tardy or premature dentition, enlargement of the liver, and abdominal dropsy. Sometimes after four or five days of treatment, the pains in the limbs cease, and at the end of a fortnight, bones which before were flexible, acquire a good degree of firmness. Sometimes, indeed, the treatment fails, either because the digestive organs do not become habituated to the oil, or because it cannot be assimilated, or because it it impossible to make the little patients take it regularly. In softening of the bones occurring in adults, the oil sometimes produces a surprising cure.[2]

Diseases of the Skin.—The benefits of cod-liver oil in cutaneous diseases, appear to be confined chiefly to those which are engrafted upon a scrofulous or a cachectic state of the system. When an original inflammatory element prevails, the oil is worse than useless.

Lupus, which is eminently a disease of scrofulous origin, is, more perhaps than any other, curable by this medicine. Emery treated seventy-four persons affected with lupus, twenty-eight of whom are said to have been cured, while, of the remainder, those who continued under treatment were greatly benefited. When the medicine was fully tolerated, he prescribed it in doses which were gradually increased until they amounted to a pint or more of the oil in a day.[3] Dr. Terlinck, of Ghent, has described the case of a man in whom this disease occupied the sternum, neck, and left cheek. He commenced by taking half a pound a day of the oil, and gradually increased the

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[1] Journ. de Médecine, 1844, ii. 321. [2] Beylard, Bull. de Thérap., xliv. 41.
[3] Bull. de Thérap., xxxv. 373.

dose until it reached three pounds a day. The treatment, which ended in a perfect cure, lasted six months, during which time two hundred and sixty-five pounds of cod-liver oil were taken.[1] The necessity of such enormous doses is far from being apparent, for an equally aggravated case with that just mentioned, was cured by Mareska, with doses of two or three tablespoonfuls a day.[2] Dévergie, whose large experience entitles his opinion on this subject to respect, pronounces this medicine the most efficacious of all that are employed in the treatment of lupus, and believes that of itself, even, it is often competent to the cure, if given in the dose of from three to ten spoonfuls a day for a period of three, six, or more months. He, however, usually associates the oil with iodide of iron, iodide of potassium and wine of gentian, prescribing at the same time sulphurous baths, good food, and regular active exercise. As long as the disease improves, no external application is made, but when it becomes stationary, the chloride of zinc caustic is resorted to, alone, or else is preceded by the local use of oil of cade every day, of a caustic solution of iodine every two days, or of cod-liver oil night and morning.[3] By this treatment, we are assured, the former and usual duration of the cure is abridged one-half.

Bennett, Guérard, Brefeld, and others, report the cure of *tinea favosa* by *cod-liver* oil, but it is probable that the term has been incorrectly applied by these writers to *impetigo* of the scalp, and *chronic eczema.* Favus requires a very different treatment for its radical cure, although this may often be hastened by the use of cod-liver oil and other strengthening medicines. The other affections mentioned may be advantageously treated by removing the crusts with a poultice, clipping the hair short, anointing the scalp with cod-liver oil, and directing an oil-skin cap to be constantly worn. Dr. Bennett states that by a method of this sort, the average duration of the cure is of "tinea favosa" about six weeks. Dr. David, of Canada, has also found this remedy of service as a local application in *tinea capitis*, *psoriasis*, &c.,[4] by keeping the affected parts constantly saturated with the oil; and a precisely similar method is reported by Malmsten, of Stockholm, to have been very successful.[5] Dr. Banks has published a case of congenital *ichthyosis* in a scrofulous child ten years of age, which was completely cured by the use of the oil internally and externally;[6] and

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[1] Edinb. Month. Journ., Aug. 1852, p. 231.
[2] Abeille Méd., ix. 209.
[3] Maladies de la Peau, p. 579.
[4] Bull. de Thérap., xliv. 87.
[5] Times and Gaz., July, 1855, p. 8.
[6] Dublin Quar. Journ., Aug. 1851, p. 80.

Dr. O'Connor states that he has restored to health two cases of this affection by the external application of the remedy.[1]

Phthisis.—The first application of cod-liver oil to the cure of tubercular consumption appears to have been made by Kolkmann, in 1824. It was used by H. Richter, in 1835, after which its employment became general in Germany. To Dr. Bennett we are mainly indebted for its introduction into England and this country for the same purpose. In his Report of the results attending its first trial, it is stated that "individuals presenting emaciation, profuse sweats, constant cough and expectoration, as most prominent symptoms, with a degree of weakness that prevents their standing alone, after a few weeks' use of it are enabled to get up with ease, and walk about, with a visible improvement in their general health, and an increased amount of flesh." The moist, gurgling râles are exchanged for dry, blowing sounds, and sometimes all the physical signs of caverns disappear, leaving only slight dulness on percussion, and increased vocal resonance.[2] The same account, precisely, of its effects, was soon afterwards given by Dr. C. J. B. Williams,[3] whose competence to testify in a case like the present, no one will deny. The power of the medicine in staying the demon of destruction is, he remarks, sometimes marvellous. "We repeatedly find forms and degrees of disease that former experience has taught us to be utterly hopeless and speedily fatal, retarded, arrested, nay, sometimes even removed and almost obliterated by various processes of restored health." At the same time Dr. W. refrained from pronouncing in regard to the permanence of the cure which was thus so happily obtained. The same year, in the First Report of the London Hospital for Consumption,[4] it is stated that in about eighteen per cent. of the cases treated the disease was arrested, in about sixty-three per cent. it was improved, and in nineteen per cent. it went on unchecked. It was now also observed that occasionally the weight increased without an amelioration of the symptoms, and also that sometimes relapse occurred followed by a rapid progress to a fatal issue. The larger experience of a series of years diminished somewhat the enthusiasm and confidence which the new remedy had originally inspired, and we find that in 1853, Dr. Bennett, himself, thus briefly states its value: "Its effects in phthisis are, to nourish the body, which increases in bulk and in vigor; to check fresh exudations

[1] Lancet, Jan. 1856, p. 96.

[2] Bennett on Cod-Liver Oil. Edinb. 1848.

[3] Lond. Journ. of Med., Jan. 1849, p. 1.

[4] Lond. Month. Journ., Nov. 1849, p. 239.

of tubercular matter; and to diminish the cough, expectoration, and perspiration."[1]

The great and enlightened experience of Dr. Walshe has led him to conclusions which we now proceed to quote. The reader will observe, that while he concedes to the oil all of the nutrient qualities which have been claimed for it, he is not prepared to regard it in any sense as a cure for tubercular consumption.

"1. That cod-liver oil more rapidly and effectually induces improvement in the general and local symptoms than any other known agent. 2. That its power of *curing* the disease is undetermined. 3. That the mean amount of permanency of the good effects of the oil is undetermined. 4. That it relatively produces more marked effects in the third than in the previous stages. 5. That it increases weight in favorable cases with singular speed, and out of all proportion with the actual quantity taken; that hence it must in some unknown way save waste, and render food more readily assimilable. 6. That it sometimes fails to increase weight. 7. That in the great majority of cases, where it fails to increase weight, it does little good in other ways. 8. That it does not relieve dyspnœa out of proportion with other symptoms. 9. That the effects traceable to the oil in the most favorable cases are: increase of weight, suspension of colliquative sweats, improved appetite, diminished cough and expectoration, cessation of sickness with cough, and gradual disappearance of active physical signs. 10. That in some cases it cannot be taken, either because it disagrees with the stomach, impairing the appetite (without itself obviously nourishing), and causing nausea, or because it produces diarrhœa. 11. That in the former case it may be made palatable by association with a mineral acid; and in the latter prevented from affecting the bowels by combination with astringents. 12. That intra-thoracic inflammations and hæmoptysis are contraindications to its use, but only temporarily so. 13. Diarrhœa, if depending on chronic peritonitis, or secretive change, or small ulcerations in the ileum, is no contraindication to the use of the oil; even profuse diarrhœa caused by extensive ulceration of the large bowel, is not made worse by it. 14. That the beneficial operation of the oil diminishes, *cæteris paribus*, directly as the age of those using it increases. 15. That the effects of the oil are more strikingly beneficial when a small extent of lung is implicated to an advanced stage, than where a relatively large area is diseased in an incipient stage. 16. That where chronic pleurisy or chronic pneumonia exists on a large scale, the oil often fails to relieve the pectoral symptoms.

[1] The Pathology and Treatment of Pulmonary Tuberculosis, p. 64.

17. That it often disagrees, when the liver is enlarged, and probably fatty. 18. That weight may be increased by it, the cough and expectoration diminish, night-sweating cease, the strength which has been failing remain stationary, under the use of the oil, and yet the local disease be all the while advancing."[1]

This admirably exhaustive summary of the knowledge which is possessed of the subject to which it relates, confirmed, as it has been, by the conclusions of other competent observers,[2] shows a wide difference between the anticipations which were indulged respecting the virtues of cod-liver oil and the sober realities of experience. But enough remains to prove that among all the remedies that have been proposed for pulmonary consumption, none can be compared with this in efficacy. More than any other, it mitigates the symptoms of the disease, and delays its march; while in some cases it appears permanently to arrest the degeneration of tubercles already deposited, and so to improve the nutrition as to prevent the formation of new ones.

As the employment of cod-liver oil in phthisis is so general, both in England and in this country, it was to be expected that the influence of the medicine in postponing death would be visible in the bills of mortality. Accordingly, Dr. G. B. Wood remarked that during the first years after its introduction, a most striking difference was observed, and the number of deaths diminished surprisingly.[3] This result was anticipated by Dr. Walshe.[4]

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[1] A Practical Treatise on the Diseases of the Lungs, &c., 2d ed., Lond., 1854, p. 531. The passage quoted in the text is slightly abbreviated by the omission of several sentences of minor importance relatively to the present question.

[2] Dr. E. Smith, Lancet, Nov. 1857, p. 473.

[3] Trans. of the Coll. of Physicians of Philadelphia, March, 1854.

[4] Op. cit., p. 533. In Philadelphia, the ratio of the annual mortality from consumption to that from all causes, is as follows, beginning with 1836:—

1836, 1 : 7.3	1842, 1 : 7.7	1848, 1 : 8.	1854, 1 : 8.6
1837, 1 : 7.	1843, 1 : 7.7	1849, 1 : 10	1855, 1 : 7.8
1838, 1 : 7.5	1844, 1 : 6.9	1850, 1 : 9.3	1856, 1 : 8.2
1839, 1 : 7.1	1845, 1 : 7.6	1851, 1 : 10.	1857, 1 : 7.
1840, 1 : 6.2	1846, 1 : 7.6	1852, 1 : 8.6	1858, 1 : 6.
1841, 1 : 7.2	1847, 1 : 8.3	1853, 1 : 6.9	

It will be seen that the ratio of mortality from consumption declined only from the year 1847, whereas the use of cod-liver oil began five years before. It will also be observed that this ratio experienced the most marked declension in the years 1849, 1850, and 1851, after which it again rose, although the use of the oil probably became more general at the same time. The improvement in the ratio of mortality in the second decade, as compared with the first, is probably due to the rapid increase of the population by immigration from the country, and from beyond the seas. This increase is illustrated by the aggregate mortality from all causes, which in 1836 was 5448, and in 1856, had reached 12,334, and in 1858, was 10,697. During this period, a very

In the foregoing remarks phthisis has been spoken of as if it were a disease which uniformly follows the same course. But it must not be forgotten that there are cases of acute tuberculization of the lungs, which terminate fatally in a few weeks, and that there are others in which the tuberculous deposit is local and limited, or occurs at long intervals in successive crops. In acute phthisis, cod-liver oil, like every other remedy, is totally unavailing. On the other hand, in that form which occurs in persons of a lymphatic temperament, and whose functions, especially those of nutrition and circulation, are feeble and sluggish, the greatest advantage may be hoped from the systematic use of the oil. But much will depend upon the extent of the disease. A cavity of moderate size, confined to the upper lobe of one lung, is infinitely more curable than scanty but disseminated tuberculous deposits in both lungs. Probably the best among the demonstrable results of cod-liver oil are an arrest of the signs of progressive tuberculization, and the gradual contraction of pulmonary cavities.[1]

In other diseases, involving more or less deterioration of the nutritive function, cod-liver oil is often of signal service. *Chronic bronchitis* is one of these, whether it succeeds the acute affection and occupies both lungs, or whether it results from chronic pleuro-pneumonia, and is confined to a single lung. *Chronic pleurisy* itself, when debility hinders the absorption of the pleuritic effusion, may be sometimes benefited by this remedy conjoined with iron and a general tonic regimen. *Laryngismus stridulus*, depending upon a weak and irritable condition of the system,[2] and *diabetes*, are also said to have been cured by it.[3]

Substitutes for Cod-liver Oil.—Dr. Radclyffe Hall, physician to the Hospital for Consumption at Torquay, used *neat's-foot* oil as less apt to disagree with the stomach. It was more laxative than the cod oil.[4] Dr. Theophilus Thompson found that *cocoa-nut* oil increased the red corpuscles and the fibrin of the blood almost as much as cod oil.[5] Mr. Leared proposed the use of the *oleine* of cod-liver oil, supposing

large number of adolescents and adults was added to the population, and tended to diminish the proportion of those who, from innate or acquired debility, are the chosen victims of consumption. We suspect that the gold of California, which everywhere has fostered the growth of cities at the expense of the rural districts, is the real cause of the slightly diminished ratio of mortality from consumption during a portion of the last ten years.

[1] For illustrations of arrested phthisis the reader is referred to the cases published by Quain, Lancet (Am. ed.), pp. 31, 109, &c.; Greenhow, ibid., Dec. 1854, pp. 502, 542.

[2] Ed. Month. Journ., April, 1850.

[3] Lancet, Sept. 13, 1851.

[4] Bull. de Thérap., xliii. 196.

[5] Brit. and For. Med.-Chir. Rev., Jan. 1856, p. 249.

that the latter disagreed with the stomach, chiefly on account of the presence of margarin.[1]

Oil procured from the razor thorn-back, whale oil, almond, olive, and poppy oils, fat pork, and other highly carbonaceous substances, have been also used as substitutes for cod-liver oil, but with very partial and equivocal success.

ADMINISTRATION.—A great many formulæ have been devised for disguising the taste and smell of cod-liver oil. Not only do they seldom succeed in their intention, but they are too expensive for the exhibition of a medicine which must be taken so frequently and for so long a time. Percival mentioned, long ago, that people of the lower classes do not generally object to its taste. This is true to some extent, even now; and children often learn to take it readily. Percival suggested the addition of a little liquor potassæ and mint-water to each dose.

The best of all the expedients for concealing the taste of this useful medicine is the one mentioned by Bardsley, viz., *table beer*.[2] A conical-shaped wineglass should be half filled with beer, ale, or porter, the oil poured upon its surface, and some froth of the liquor having been added, the whole should be quickly *tossed* down the throat. Wine or brandy may also be used, but they are less eligible.

It has also been proposed to mask the taste of the oil by forming it into a bolus with arrowroot, and swallowing the morsel in a wafer. But the dose is too bulky. Gelatin, and also membranous capsules, have been made to contain the oil, but their cost is objectionable.

The taste of the medicine is rendered less distinct by coating the mouth, before taking it, with a little currant or other jelly, or chewing a morsel of peppermint or cinnamon candy, before and after swallowing the dose. But of such expedients chewing a piece of smoked herring is the best.

If the oil excites nausea, the patient should lie down immediately after swallowing it; or a few drops of naphtha may be given with each dose. Sometimes a few days' preparation with hydrocyanic acid, or subnitrate of bismuth, will enable the stomach to retain the oil.

It should never be taken immediately before a meal, but in the middle of the morning and of the afternoon, and at bedtime.

A small dose should always be given at first, and gradually increased to a tablespoonful or two, three times a day. More than this is generally superfluous, and sometimes injurious.

In regard to the methods of administering the oil by *clyster*, and by

[1] Times and Gaz., July, 1855, p. 58.

[2] Med. Reports, p. 20.

inunction, it is enough merely to name them. The former cannot long be tolerated or be useful, and the latter, except in certain cutaneous affections, is objectionable for its uncleanliness.

POTASSÆ CHLORAS.—Chlorate of Potassa.

Description.—Chlorate of potash may be prepared by passing chlorine gas through a warm and concentrated solution of carbonate of potassa. By this means chloride of potassium and chlorate of potassa are generated, and as the liquor cools the former remains in solution, while the latter is deposited in the form of oblique rhomboidal crystals. This salt is white, inodorous, of a cool saline taste, is perfectly neutral and anhydrous, and is but little changed by exposure to the air. On decomposition by heat it yields 39 per cent. of its weight of oxygen. Water at 60° F., dissolves only fifteen parts of the salt, but it is very soluble in hot water. According to Hutchinson, 25 grains are soluble in an ounce of hot water. Chlorate of potassa does not precipitate albumen, and is said to be soluble in all of the animal fluids without decomposing them or undergoing any change itself.

History.—In 1786 this salt was discovered simultaneously by Berthollet and by Higgins. The former, who alone recognized its real composition and qualities, named it hyperoxymuriate of potassa (*muriate suroxygéné de potasse*). It was first employed in medicine at the suggestion of the chemists, who presumed that the oxygen which it contains so abundantly would tend to counteract the putrefaction, which, according to their theories, characterized certain diseases, and especially syphilis. Among the medical writers, at the beginning of the present century, who adopted these opinions were Rollo, Garnett, Cruikshank, Chisholm, Alyon, and Odier. Rollo boasted of the success of the medicine in scurvy, nervous fever, diabetes, and dysentery, as well as in syphilis,[1] and so persuaded was he of its singular virtues as to declare that it "merits a trial in hydrophobia."[2] Ferriar states that he found it efficacious in true scurvy, and he thought that the *soreness of the gums* was sooner healed by it than by ordinary remedies.[3] But the medicine did not, apparently, fulfil the promises made in its behalf, and except that about 1815 it was proposed by several German physicians as a remedy for neural-

[1] Sprengel, Hist. de la Méd., vi. 423. [2] On Diabetes Mellitus, ii. Pref. xiii.
[3] Med. Hist. and Reflect. (Am. ed.), p. 388.

gia, as it had originally been by Chisholm, and that Ferriar's suggestion of its use in scorbutic sore mouth was acted upon by some Swedish practitioners, it appears to have been almost entirely neglected or forgotten. In 1831, it is true, Dr. O'Shaughnessy proposed the injection of a solution of the salt into the veins of cholera patients in order to revive the dark and morbid blood,[1] but it does not appear that the suggestion was carried out. From that time the medicine seems again to have been almost forgotten, until in 1843 Dr. Hunt drew attention to it once more by a paper which he read before the Medico-Chirurgical Society of London, on the treatment of "Cancrum oris" by its means.[2] From that time to the present, examples of its success have continued to be published, in the treatment of atonic ulcers of the mouth, and analogous affections. Among these publications the monograph of M. Isambert is the most complete.

Action on the System.—It was early noticed that chlorate of potassa, when taken internally, gives to the venous blood a beautiful arterial tinge,[3] and Dr. O'Shaughnessy observed the same effect when a solution of the salt was thrown into the veins of animals.[4] Chisholm long ago said that its operative effects are frequently not obvious. When, however (he continues), these effects are evident, the pulse, the tongue, the gums and palate, the palms of the hands, the urinary secretion, and the blood, are most affected by it. The pulse becomes less frequent and full, the surface of the tongue and the gums are of a florid red; the secretion of urine is prodigiously increased, large doses produce a sense of constriction in the stomach, and the blood is remarkably florid.[5] M. Gustin found that two drachms of the salt taken at bedtime occasioned the next morning a sense of constriction of the mouth, and slight nausea; the gums felt rough, the saliva was somewhat increased and more fluid than usual; the urinary secretion was not augmented, and the appetite was unusually good.[6] These statements are but partial, and do not entirely agree. More positive conclusions may be drawn from the observations of Isambert and others who have experimented with this salt. M. Isambert found that no sensible effects were produced upon himself by doses of from fifteen to sixty grains; he then gradually increased the quantity taken daily from two to five drachms, and as gradually diminished it again to thirty grains.

The larger doses occasioned copious salivation, with a saltish taste

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[1] Lancet, Dec. 1831, p. 368.
[2] Med. Chir. Transactions, xxvi. 142.
[3] Stevens, On the Blood, p. 156.
[4] Lancet, Dec. 1831, p. 368.
[5] An Essay on Malignant Pestilential Fever, 2d ed., i. 502.
[6] Bull. de Thérap., xlviii. 437.

in the mouth. The salt was readily detected in the saliva. Under its operation the teeth became thoroughly cleansed. The appetite was uniformly increased, and sometimes was ravenous. When it was not well dissolved some pyrosis was occasioned. No purgative effect was observed by Isambert nor by Blache, but Hutchinson states that in drachm doses the medicine purges young children.[1] The first named gentleman found the alvine evacuations somewhat greenish, as if they contained bile. The chlorate could not be detected in them. In large doses it proved decidedly diuretic, and a painful sense of weight in the loins was felt. The urine continued strongly acid, and deposited a larger quantity than usual of uric acid, urates, and rosacic acid. O'Shaughnessy was the first to state that chlorate of potassa passes off unchanged by the urine.[2] Wöhler and Stehberger afterwards confirmed this statement,[3] and subsequently also Gustin, but the experiments of Isambert have been more definite in their results. They show that within five minutes after the medicine is taken it may be detected in the saliva, and within fifteen minutes in the urine, and also that the elimination of the salt continues for a period of from fifteen to forty-eight hours. The maximum rate of its discharge is attained in an hour or two. The salt was detected in the milk of nursing women, the tears, the nasal mucus, and the perspiration. It was also found, in a small proportion, in the bile of children who died while using it medicinally.

Uses. *Mercurial Salivation.*—In a note to Jourdan's Pharmacopœia, published in 1840, vol. ii. p. 289, it is said, "Eyr [? Sir James Ayre] used twenty-five grains of chlorate of potassa in four ounces of water, of which three tablespoonfuls a day were given, for ulcers of the mouth following excessive salivation."[4] This is the first indication which we find of the salt having been used as a remedy for the effects of mercury. In 1846, Mr. John Allison, from the analogy which he presumed to exist between anæmia and the mercurial cachexia, and his belief in the power of chlorate of potassa to cure the former disease, was induced to prescribe this medicine for mercurial salivation; and fortunately the experiment was perfectly successful.[5] Meanwhile M. Herpin, of Geneva, learning its virtues in ulcerative stomatitis, conceived the idea of applying it to the cure of mercurial sore mouth, and accordingly made some trials of it, which were also successful,[6] as were those made by Blache,[7] Demarquay,

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[1] Times and Gaz., Aug. 1856, p. 192.
[2] In 1831, vid. supra.
[3] Strumpf, Handbuch, ii. 632.
[4] Herpin, Chlorate de Potasse, p. 31.
[5] Lond. Med. Gaz., 1846, p. 953.
[6] Bull. de Thérap., 1854, xlviii. 26.
[7] Ibid., p. 120.

Aran,[1] Foucart, Venot,[2] Vidal,[3] Perrin,[4] Richard, and Isambert.[5] Among these writers Aran is the only one who states that the remedy, although generally successful, is by no means infallible. In England, Mr. Hutchinson, of the Metropolitan Free Hospital, called attention to its prompt success in two cases of mercurial salivation, and in the following year published several others of a like description.[6] In the United States, Dr. Gallaher, of Pittsburg, used it both internally and locally with entire success.[7] Under the operation of the medicine the purplish color of the gums is exchanged for their proper ruddy hue, the pain subsides, with the swelling and salivation, and there only remains the ulceration of the edge of the gums, which gradually, however, heals. M. Ricord has expressed the opinion that not only does chlorate of potassa cure ulcers occasioned by mercury, but that if administered simultaneously with that medicine it prevents salivation from taking place.[8] This opinion has been confirmed by M. Laborde.[9] In a case of profuse salivation resulting from an attempt to commit suicide by swallowing about an ounce of caustic *ammonia*, M. Fonssagrives arrested the discharge by means of a solution of chlorate of potassa after numerous other remedies had failed.[10]

Non-mercurial Salivation.—This medicine would appear to be very efficacious in controlling the salivary secretion, even when it proceeds from simple inflammation. Such a case has been recorded by Fonssagrives, of a man in whom this flux was excited by the action of ammonia upon the mouth. The medicine diminished the discharge, from its first administration, and rapidly effected a cure.[11]

Ulcerative Stomatitis.—In this affection, which commences "by small ulcers either on the inside of the cheek or lips, or at the point of junction of the mucous membrane of the cheek and gums, or with the gums themselves, separating them from the teeth," the efficacy of chlorate of potassa, in doses of from twenty to sixty grains a day, was first illustrated by Dr. Hunt and Mr. Hawkins, and shown to be a prompt and certain remedy when employed at the commencement of the attack.[12] Not unfrequently the ulcers are large, and are covered with a pultaceous pseudo-membranous deposit, assuming an almost

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[1] Ibid., p. 437.
[2] Ibid., li. 88.
[3] Abeille Méd., xiii. 221.
[4] Brit. and For. Med.-Chir. Rev., Jan. 1857, p. 262.
[5] Etudes, etc., sur le Chlorate de Potasse, p. 31.
[6] Times and Gazette, Nov. 1855, p. 471, and Aug. 1856, p. 174.
[7] Am. Journ. of Med. Sci., July, 1857, p. 64.
[8] Bull. de Thérap., li. 181.
[9] Ibid., liv. 115.
[10] Ibid., lii. 231.
[11] Abeille Méd., xiv. 356.
[12] Med.-Chir. Trans., xxvi. 142.

gangrenous appearance, and exhaling a fetid smell. The gums are swollen and spongy, and readily bleed. It is important to observe that these ulcers have a very slight tendency indeed to heal, and, therefore, a treatment which will cause them to do so is of great value. Such an one the chlorate of potassa may claim to be. Dr. West says that it appears to be almost a specific for this affection,[1] and Dr. J. F. Meigs has seldom found it necessary to employ any other means.[2] With Dr. Risdon Bennett, its use was attended with the best results;[3] Mr. Headland and Golding Bird prescribed it with much benefit;[4] Mr. Babington was equally successful in its employment during an epidemic of the disease at the Coleraine Union Workhouse in 1849;[5] and Dr. Hicks in one (which he incorrectly describes as of aphthæ).[6] To these results may be added the equally favorable ones of Blache, Mazade,[7] Bergeron, Hutchinson, and Isambert. As in the case of mercurial sore mouth, the first effect of the salt is to impart a livelier color and greater vigor to the affected parts; the serrated edges of the false membrane are rounded off, the swelling subsides, and the false membrane itself is cast off between the third day and the fifth, and perhaps is succeeded by another but a smaller one, while the ulcer fills up and tends to heal. Generally the cicatrization is perfect; but sometimes a linear ulcer remains, which it requires the action of lunar caustic wholly to cicatrize. (*Isambert.*) It appears that in this affection the size of the dose is not always a measure of its efficacy, two or three, or twenty or thirty grains, in different cases appear to have been equally efficient.

There is also some doubt whether the remedy is not in a great degree local in its operation. The experiments and observations of M. Laborde appear to render it certain, at least, that the topical application of the medicine is quite sufficient for a cure[8] of the disease more particularly in question, and those of Bouchut,[9] Cerboni,[10] and Mr. Hutchinson,[11] for the cure of ulcers in various parts of the body, confirm this conclusion. Additional illustrations will be found below.

In this connection may be noticed the beneficial effects of the medicine in *scurvy*. As already stated, it was once highly recommended by Rollo as a remedy for this disease, but quite recently we have the evidence of an English naval surgeon in support of its efficacy,[12] and

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[1] Diseases of Infancy and Childhood, 3d ed., p. 432.
[2] Diseases of Children, 2d ed., p. 236.
[3] Lancet, Oct. 1844, p. 114.
[4] Ibid., March, 1846, p. 278.
[5] Dublin Quart. Journ., Feb. 1853, p. 236.
[6] Times and Gaz., June, 1858, p. 611.
[7] Bull. de Thérap., l. 337.
[8] Bull. de Thérap., liv. 289.
[9] Ibid., lv. 429.
[10] Ibid., lvi. 575.
[11] Lancet, Dec. 1857, p. 648.
[12] Times and Gaz., Nov. 1857, p. 476.

Dr. Fountain, of Davenport, Iowa, reports its unequivocal advantages in a mild epidemic of land scurvy, in which the symptoms were for the most part local.[1]

Follicular Stomatitis.—Aphthæ. This is a much slighter affection than the one just discussed, and, in general, tends spontaneously to cure, but its removal is expedited by the administration of the chlorate. This would appear to result from the observations of Mr. Hutchinson. Dr. Hauner, of Munich, reports it as having been successful in seventy cases of the disease in doses of from half a drachm to a drachm given in the twenty-four hours.[2]

Gangrenous Stomatitis.—A case stated to have been of this disease occurred under the care of M. Blache in the course of typhoid fever affecting a child six years of age. At first, the attack presented the usual characters of ulcerative stomatitis, but by degrees a hardened spot formed in the cheek. At this time the chlorate of potassa was administered, and the inflammation spread no further.[3] There is reason to suppose that in this case the affection of the cheek was merely sympathetic with the ulceration of the gums, and that it declined as the latter subsided under the influence of the medicine. In that rare affection, true gangrenous stomatitis, it is probable that the chlorate of potassa would exercise no more influence than the ordinary remedies for the disease, if indeed it were at all operative. It might not be amiss to employ it along with the tonics and stimulants which are the chief dependence in treating this fearful malady.

It is a curious and interesting fact that occasionally chlorate of potassa produces ulceration of the mouth when administered for diseases in which the buccal membrane is unaffected. It was first noticed by Mr. Hutchinson,[4] and cases corroborating his statement have been published by Mr. Traill,[5] a writer in the *Medical Times and Gazette*,[6] and others. These facts prove that the medicine is a powerful stimulant, and that it is curative of the various diseases in which it is administered, by virtue of its stimulant power. It will be remembered that they are all diseases of impaired vitality.

Buccal and Pharyngeal Diphtheritis.—Mr. A. Smith has reported a well-marked case of pseudo-membranous inflammation of the tongue and cheeks occurring in an adult female, and which rapidly got well under the administration of a scruple of chlorate of potassa every four hours.[7] So when a diphtheritic deposit exists upon the velum, tonsils,

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[1] New York Journ. of Med., July, 1859, p. 5.
[2] Edinb. Journ., Oct. 1856, p. 370.
[3] Bull. de Thérap., xlix. 227.
[4] Lancet, March, 1858, p. 265.
[5] Ibid., April, 1858, p. 375.
[6] May, 1858, p. 527.
[7] Bull. de Thérap., xlviii. 558, from Dublin Hosp. Gaz.

and posterior fauces generally, with swelling of the submaxillary glands, the remedy is often promptly efficacious. M. Isambert publishes eight cases of this affection, demonstrating its curability by the remedy under consideration, at least so far as the separation of the false membranes is concerned, after which the nitrate of silver completes the cure. M. Chavane states that he had nineteen cases of this affection which recovered under the use of the chlorate without other treatment, and generally in about four days. The quantity of the salt required for each case varied between three and five drachms.[1] Examples of similar success are reported by Dr. Garasse.[2]

Croup.—The virtues displayed by chlorate of potassa in the diphtheritic affections above mentioned, and especially in those of the pharynx, suggested to M. Blache the idea of employing it in the treatment of membranous croup. It appears, however, that the method had been proposed and practised by Chaussier as long ago as 1819. This physician, after having obtained some amelioration of the symptoms by means of emetics, administered the chlorate two or three times a day in doses of from six to eighteen grains, and continued it for several days until the symptoms ceased, and even afterwards in smaller quantities. (*Isambert.*) At the time when this recommendation of Chaussier was made, various saline or alkaline preparations were in use with a view of producing the solution of the croupal false membrane, such as the carbonate of ammonia, and the sulphuret of potassa. The latter, indeed, was vaunted as infallible. They fell into disuse; but the chlorate of potassa which does not appear to have been employed by any one but Chaussier, is now revived with perhaps a better prospect of continuance. In the wards of M. Blache, at the Children's Hospital of Paris, four cases of membranous croup appear to have recovered under the sole influence of this preparation; and in several others in which tracheotomy also was employed, the results were more favorable than can fairly be attributed to the operation alone. In some cases, also, of secondary croup, the remedy is represented by M. Garasse to have been completely successful.[3] Nearly all of the cases above referred to seem to have been those in which the diphtheritic inflammation extended to the larynx from the fauces, and to have assumed the moderately asthenic type so usual in hospital practice; it may, therefore, perhaps be questioned whether in primitive, laryngeal, or tracheal croup, the medicine would prove as serviceable. If, however, more extended experience should confirm the results already obtained, the introduction of chlorate of potassa into the treatment of croup would be of incalculable value.

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[1] Abeille Méd., March, 1857, p. 71. [2] Ibid., May, 1857, p. 121. [3] Ibid.

In this connection the suggestion made by M. Barthez may be referred to. This physician found that false membrane introduced into a solution of chlorate of potassa or chlorate of soda, but especially into the latter, undergoes softening much more speedily than it does in water alone. He accordingly has proposed to use these solutions locally as well as internally in diphtheritic affections, and in croup, to instil them into the air-passages after the operation of tracheotomy.[1]

Facial Neuralgia.—Chlorate of potassa appears to have been first employed in this affection by Chisholm, who by means of it cured a very aggravated case of *tic douloureux*, which all other remedies had failed to relieve.[2] The dose employed was thirty grains a day. The effect is said to have been wonderful indeed; no other treatment whatever was used, and at the expiration of three weeks' continued exhibition of the remedy, the patient was entirely freed from the complaint. Sachs and Dulk[3] state that, after personal experience with the medicine, they regard it as the surest of all remedies that have been proposed for facial neuralgia; yet they, after all, admit that it is rather a palliative than a cure. Other German physicians used the medicine with good effect, as Knod, Herber, and J. Frank, the last of whom states that by its means he cured a case in which section of the nerve could not be employed.[4] Dr. Copland thinks it not without efficacy in the rheumatic and hysterical states of the disease.[5]

Dr. Watson states that, at the suggestion of Dr. Hunt, he is in the habit of directing a solution of the chlorate of potassa in water (℥j to Oj) as a drink for patients in *scarlet fever* and in the *typhoid forms* of continued fever.[6] He has found in many instances that under the use of a pint or a pint and a half of this solution daily, the tongue, from being furred, or brown and dry, has become cleaner and moist. In all typhoid or so called malignant types of febrile disease, the use of the medicine would appear to be indicated, whether they arise from an original depravation of the blood, or secondarily, from the absorption of the products of decomposition of the tissues. This class of cases includes all in which there is a tendency to gangrene, or in which it actually exists.

The oxygenation of the blood produced by chlorate of potassa has been very ingeniously applied by Dr. Fountain.[7] He first employed

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[1] Amer. Journ. of Med. Sci., Oct. 1858, p. 514.

[2] An Essay on the Malignant Pestilential Fever, 2d ed., ii. 450.

[3] Handworterbuch der prakt. Arzneim., 2ten Theil. 2te Abtheil, s. 536.

[4] Pathologie Méd., trad. française, iii. 297. [5] Dict. of Med. (Am. ed.), ii. 1023.

[6] Pract. of Med. (3d Am. ed.), p. 1002.

[7] New York Journ. of Med., July, 1859, p. 1.

it experimentally in a case of *cyanosis* depending upon organic disease of the heart. After the first few doses of the medicine the peculiar blue color of the skin entirely disappeared, and the dyspnœa was much relieved. Subsequently in a case of profuse hemorrhage into the right pleural cavity, from a wound of an intercostal artery, and in another of hydrothorax, both of which presented striking indications of venous congestion of the heart, this medicine relieved the symptoms in a very striking manner, and sustained life long enough for nature to complete the cure.

Dr. Copland assures us that small doses of the medicine in a draught, or by injection, are very serviceable in the advanced stage of *cholera infantum*, especially when the disease passes into a dysenteric state, with great exhaustion, and offensive stools. In chronic diarrhœa he refers to the same treatment as very beneficial.[1]

At the commencement of the present century, Odier, of Geneva, asserted that he had cured by means of this preparation, not only spasmodic *jaundice*, but even cases which appeared to depend upon a biliary calculus, or some other impediment to the discharge of the bile. M. Isambert mentions that the Genevese physicians, in imitation of Odier, continue to use this salt in the treatment of jaundice, and he relates some cases in which it was prescribed. They do not appear to be very conclusive of its efficacy.

Lombard employed chlorate of potassa in doses of fifteen or eighteen grains every four or six hours in cases of *anasarca* and *ascites* following typhoid fever.[2] Socquet, of Lyons, attributes to the medicine a marked sedative influence in acute articular *rheumatism*;[3] but no estimate of its influence can justly be formed, as in his treatment bleeding and blisters were used at the same time.

In several other diseases, as *syphilis*, *phthisis*, and even *rabies canina*, this salt is reported to have been of service; but of such statements it is unnecessary to speak further than to say, that in some cases of secondary syphilitic ulcerations the internal use of the remedy appeared to hasten their cure. Chisholm speaks of its having cured a *hydrocele* of a year's standing. Mr. Hutchinson is of opinion that *ulcers*, *abscesses*, *eruptions*, &c., connected with a cachectic state of the constitution, are generally benefited by its use.

Locally, a solution of chlorate of potassa has been found very useful in correcting the fetor, and improving the condition of *ulcerated surfaces* in cancer, phagedæna, and ozæna, correcting fetid mucous dis-

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[1] Dict. of Med. (Am. ed.), i. 384 and 612. [2] Med.-Chir. Rev., April, 1841, p. 507.
[3] Bull. de Thérap., xlvii. 255.

charges, &c. A solution made by dissolving a drachm and a half, or from that to three drachms, of the salt in a pint of water, is recommended by Mr. C. H. Moore.[1] Dr. Henry has reported two cases of *ozæna* which had proved intractable to various other means, but were cured by snuffing a solution of one drachm of the salt in four ounces of water,[2] and Dr. Ormerod employed it successfully in a case of the same disease.

Dr. B. Brown, of North Carolina, has used injections of a solution of chlorate of potassa (ʒj to Oss) in cases of *leucorrhœa* attended with ulceration of the os uteri and cervical canal, and enlargement of the muciparous glands of the vagina, and also for simple *ulceration* of these parts without leucorrhœa.[4]

M. Mazade has found that lotions or gargles containing this preparation are very useful in removing *aphthous* or *pseudomembranous ulceration* of the mouth and fauces, occurring during certain epidemics.[5] Indeed, as already remarked, it may be questioned whether in the internal administration of the medicine a portion of its good effect is not due to its local action during deglutition. Gibert has shown this to be probably the case by the results which he obtained in similar affections to the above, by using the salt in substance finely powdered, or gargles which contained it.[6] In like manner Laségue cured *mercurial sore-mouth* by strong solutions of chlorate of potassa, locally applied.[7]

Administration.—Chlorate of potassa is generally administered in solution. The dose for children under three years of age is about *five* grains three or four times a day, and for an adult from *ten* to *thirty* grains. It should first be dissolved in hot water, and then a sufficient quantity of gum and sugar added to suspend the undissolved portion. The best time for its administration is before meals.

As a *lotion*, from one to two drachms may be dissolved in four ounces of water, and, if the sensibility of the part be great, a larger proportion of water may be used.

AMMONIÆ MURIAS.—Muriate of Ammonia. Sal Ammoniac.

Description.—Muriate of ammonia is found native near some volcanoes. It exists also in many coal mines, and in certain mineral

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[1] Lancet, May, 1855, p. 514.
[2] Bull. de Thérap., lii. 430.
[3] Lancet, Oct. 1858, p. 386.
[4] Am. Journ. of Med. Sci., July, 1857, p. 66.
[5] Bull. de Thérap., l. 344.
[6] Ibid., p. 524.
[7] Isambert, op. cit., p. 34.

waters. As intimated below, it was formerly prepared from the soot produced by burning camel's dung. At present it is obtained from the ammoniacal liquors formed in the manufacture of coal gas and animal charcoal. On the addition to them of sulphuric acid, a sulphate of ammonia is produced, and this, when heated with chloride of sodium (muriate of soda), produces, by double decomposition, sulphate of soda and muriate of ammonia, the latter of which is obtained by sublimation.

In commerce, it generally occurs in large cup-shaped cakes having a hole in the centre. It is white, translucent, fibrous, and somewhat tough, and by exposure to the air becomes slightly moist. It is soluble in alcohol, and in cold, but more readily in hot water, and generates cold during its solution. Its taste is saline, pungent, and very disagreeable. On being mixed with the alkaline earths, it disengages ammonia.

HISTORY.—The sal ammoniac of the ancients is supposed to have been rock salt, and to have derived its name from the circumstance of its being procured near the temple of Jupiter Ammon, in Libya. The temple itself was called after the province Ammonia, in which it was situated, a name which signifies sandy (from ἄμμος, sand). In the middle ages muriate of ammonia was known as *sal armoniacum*, or Armenian salt, in reference to one of its commercial sources. The Arabian physicians speak of its preparation from the soot made by burning (camel's) dung; of its application to the eye for the removal of leucoma; of its use to cure relaxation of the palate; and of its power of determining the humors to the surface of the body. They also refer to its being mixed in a liniment of oil and vinegar for the cure of itch.[1]

In modern times there is but little recorded of its use as a medicine until the last century, when it became a favorite remedy with German physicians, and continues to be regarded by them as in many cases, a profitable substitute for mercury, antimony, or iodine.

ACTION. *On Animals.*—Viborg injected a drachm of sal ammoniac dissolved in two ounces of water into the jugular vein of horses. The first effect was to produce excitement, but afterwards the animals appeared singularly depressed. According to Smith's experiments,[2] when from one to two drachms of the salt was applied to a wound in a dog's thigh, the animal gave signs of general distress and debility, vomited frothy mucus, and died exhausted in from twelve to thirty-

[1] EBN BAITHAR, ed. Sontheimer, ii. 563.

[2] De vi et usu salis ammoniaci, 1826, quoted by WIBMER, Wirkung, &c., i. 143.

six hours. On dissection, the mucous membrane of the stomach was ulcerated and gangrenous, and that of the small intestines softened. When Orfila introduced the same quantity of the salt dissolved in two ounces of water into the stomach of a dog, symptoms were produced resembling those just described, in this, that debility appeared immediately to follow the operation, but was succeeded by a state of great excitement with evidences of suffering, convulsions and tetanic rigidity of a high grade. The same quantity of the dry salt was administered to another dog, and the symptoms were identical with those in the first experiment. In neither case were the lesions which Smith describes found in the stomach.

Mitscherlich, who repeated these experiments upon rabbits, observed the same symptoms of depression followed by spasm, and after death a large increase of the mucous secretion of the stomach and intestines, some softening of the epithelium, and slight vascular injection. The blood was unusually liquid, and formed a small clot.[1] These results agree perfectly with Orfila's, and show that the lesions described by Smith were not due to muriate of ammonia. Arnold, who also used rabbits in his experiments, reports that he found some softening and injection of the gastric mucous membrane, but nothing more.[2]

On Man.—At the close of the last century, Gmelin[3] said of this salt, that it is by far the most powerful of saline preparations whether as an internal or an external agent, "for dissolving viscid and stagnant humors and preventing putrefaction." He further stated that it irritates the stomach and bowels, dissolves their *sordes* accumulated by torpor, promotes secretion from mucous membranes and the uterus, and overcomes "obstructions of the mesentery." These views, although couched in the medical dialect of the day, correspond closely with the results of recent experiment. According to Sundelin,[4] it exerts a sedative influence on the system. Indeed, its action on the secretions appears to be partly due to this cause, and to a direct operation upon the blood, whereby it diminishes the plasticity of the latter, and thus promotes glandular secretion and the absorption of fibrinous exudations. By this view of the action of the salt, Sundelin vindicates his classing it among the alterative remedies, and his comparing it with mercury. The more recent, pains-taking, and exact investigations of Böcker, tend to support this theory. He has shown that during the use of the salt, the proportion of urea excreted is augmented; that the stools become somewhat softer, and are largely mixed with mucus;

[1] Lehrbuch der Arzneim., ii. 300.
[2] Archives Gén., xix. 402.
[3] Apparat. Med., Pars II., i. 84.
[4] Heilmittellehre, i. 150.

that it increases the secretion of all the mucous membranes, and slightly that of the skin; and that, in the beginning of its use, at least, it diminishes the proportion of solid constituents in the blood.[1] This writer considers its therapeutical action to depend chiefly upon its quickening the "moulting," or waste (*mauserei*), of the mucous membranes, and to some extent, also, of the skin, whereby these organs are enabled to resume their healthy action, when it has become suspended, or is feebly performed under the influence of inflammation. Hence the remedy is not an appropriate one in the primary and active stage of mucous inflammation, but rather to that later period characterized by morbid secretion, and a sluggish state of the reparative powers. But caution is here to be exercised. If the medicine is too long continued, it may induce a complete destruction of the mucous membrane, instead of promoting its repair. Its protracted use is especially to be avoided in young persons, because in them the repeated waste and renewal of the mucous membrane cannot be borne.

In regard to the effects of very *large doses* of this medicine, they would appear to be less apt to be poisonous to man than to animals. A case of fatal poisoning in man, cited by Mérat and De Lens, we have been unable to find, on reference to the place indicated by these authors, but, in its stead, an account of the detection of the salt in the blood and various secretions of a horse.[2] On the other hand, Oesterlen states that by mistake, one of his patients took *two ounces* of muriate of ammonia at a single dose, without any other result than trifling colic and some watery stools.[3]

Uses.—The following are the principal therapeutical applications of muriate of ammonia. It is recommended in continued *fevers*, to be given about the height of the disease, in order to promote critical evacuations, particularly in cases of a typhoid type. In *eruptive fevers*, and especially in measles, when the eruption is tardy and imperfect, and the patient's system is sluggish rather than feeble, it is much employed by German physicians.

Hoffmann, Tissot, Werlhof, and others of the last century, extol its efficacy, especially in obstinate *intermittent fevers* of a quartan type. (*Gmelin.*) It had, however, ceased almost entirely to be used for this purpose, when, in 1851, M. Aran, finding, in a Memoir of Muys, published at the beginning of the last century, that great efficacy was attributed to the medicine in the cure of these complaints, made use

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[1] Beiträge zur Heilkunde, ii. 150.

[2] Compare Merat and De Lens, Mat. Med., i. 247, and Journ. de Méd. de Leroux, xix. 155.

[3] Heilmittellehre, 4te Aufl., p. 556.

of it in the treatment of thirteen cases, of which five were of the tertian, and seven of the quartan type, and one irregular. Six of the cases were of African origin. The medicine was given in each interval, and after the paroxysm, in two doses, of one drachm each, dissolved in an ounce and a half or two ounces of an aromatic water. Each dose was followed by a cup of coffee without milk. It caused neither headache, uneasiness, sweating, nor urination, and vomiting in two cases only when it was given immediately after the paroxysm. Of the thirteen cases, seven had no return at all of the disease, four had only one fit, and of the remaining two cases, one had a third and the other a fourth paroxysm. These results are certainly indicative of the medicine possessing some, and not a little, power over intermittent fever. But it must be taken into account that the patients were, while under treatment, far removed from the locality in which the disease had been contracted. In 1851–2, M. Jacquot made use of the medicine in treating soldiers of the French army occupying Rome. He gave from two to five drachms of it as the daily dose, and observed that it often occasioned slight colic, looseness of the bowels, sour eructations, and even vomiting, effects which perhaps were not without their influence on the results of the treatment. These results consisted in the abrupt cessation of the paroxysms in six out of twenty-one cases; but in two of the six cases the attacks returned.[1] The locality in this case was a malarious one, the same, indeed, in which the disease had been engendered.

In *bronchial catarrh*, after the first or inflammatory stage has subsided, muriate of ammonia promotes expectoration, and hastens the cure. It is said to be peculiarly adapted to cases which have their origin in a rheumatic or gouty metastasis. In *chronic* inflammations, or *fluxes* of the lungs, bowels, &c., with a tenacious mucous or muco-purulent discharge, it is often the means of affording marked relief. Oesterlen recommends it strongly as a remedy for *gleet*, in doses of half a drachm or more every two or three hours. So in *leucorrhœa*, depending upon an atonic condition of the uterine organs, particularly when associated with a state of general excitability which forbids the use of direct tonics; and in suppression of the *menses*, occasioned by cold, in young women of a torpid, phlegmatic constitution, Sundelin found it a very effectual remedy. "In cases of congestion of the mucous membranes," says Sir George Lefevre, "in *chronic sore-throat*, with elongated uvula, and a flabby state of the tonsils and parts about the fauces, it is very beneficial. In that state of the mucous membrane

[1] Arch. Gén., 1854, 5ème sér., iii. 699.

of the stomach, caused by the action of a variety of medicines, which gives rise to the anorexia accompanying convalescence, I have seen it employed with happy results. The tongue loses its pallor, and acquires a healthier appearance from its use, and it paves the way advantageously for the more decided tonics in the convalescence after gastric fever."[1]

Muriate of ammonia has been reputed of great efficacy in various forms of chronic *glandular enlargement*, from simple hypertrophy and congestion, on the one hand, to scirrhus on the other. It is probably of use only when the enlargement results from retained secretions, or from plastic deposits. It must rather be injurious when tubercle or cancer forms the tumor, for in the latter case, the system is in need not of relaxation but of support. In certain cases of chronic enlargement of the liver with jaundice, and originating from cold, it appears to have been of service. An instance of the sort is reported by Dr. Finn, of Dublin. A female, presenting the symptoms mentioned, had been under treatment for five months, and had been mercurialized without benefit. Within a few days after she began to take muriate of ammonia her disease declined, and she ultimately recovered.[2]

Dr. Eben Watson has represented this preparation to be an efficient remedy for *neuralgia* of the fifth pair of nerves, and refers to two cases in which the pain ceased within a few minutes after it had been taken. He gave it in two or three doses, of twenty grains each, and at intervals of twenty minutes.[3] Muriate of ammonia has been recommended in chronic *arsenical poisoning*, with a view of eliminating the poison from the system.[4]

Externally—this salt has been found of use as an ingredient of *dentifrice* with Peruvian bark. It is said to whiten the teeth. It has also been used as a wash for *gangrenous* parts in a solution of from one to three drachms to a pint of water. A solution in vinegar has been employed for *contused and lacerated wounds*,[5] and to remove the soreness and blackness of contusions.

In all *local inflammations*, particularly of the eye, brain, mamma, testicle, joints, &c.; the cold produced by the solution of the salt may be taken advantage of. Several formulæ are proposed, as 24 parts of water, 8 of vinegar, and 1 of sal ammoniac; or 32 parts of sal ammoniac, 10 of nitre, and 52 of chlorate of potassa, with from four to six

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[1] Lancet, April, 1843, p. 147.

[2] Dublin Quart. Journ., Aug. 1856, p. 231.

[3] Indian Annals, and Bull. de Thérap., xlvii. 543.

[4] Hannon, Schmidt's Jahrbücher, Bd. 69, No. 1, 1851.

[5] Med. Facts and Obs., vi. 66.

times the quantity of water. "Walker found that five parts of this salt with five of nitrate of potash, and sixteen parts of water, lowered the thermometer from 50° to 10° F. A freezing mixture of this kind placed in a bladder has been recommended by Sir A. Cooper as an application (ice-poultice) to hernial tumors." (*Pereira.*)

As an *errhine* the powder of this salt is very efficient in coryza and obstruction of the nostrils.

As a *gargle* in sorethroat it is useful, particularly in the chronic form with dryness of the mucous membrane.

A solution of sal ammoniac is said to form a good *cosmetic* for removing pimples from the face. It is also alleged to destroy *warts* when a strong solution of it is kept applied to them.

ADMINISTRATION.—The disagreeable taste of muriate of ammonia is best concealed by a solution of the extract of liquorice.

Its dose may vary from *five to thirty grains*, or even more, given at intervals of two or more hours. The smaller doses are best adapted to cases of chronic disease in which the alterative action of the remedy is desired.

SARSAPARILLA.

DESCRIPTION.—Sarsaparilla is the root of *Smilax officinalis* and of other species of Smilax. These are all trailing plants with prickly stems, and hence the etymology of the name—*sarza*, a brier, and *parilla*, a little vine.

Several species of smilax are natives of Mexico and the northern part of South America. According to the port whence it is shipped different names are applied to it, as Vera Cruz, Honduras, Brazil, and Jamaica Sarsaparilla. The roots, with or without the rootstalk, are dried and folded in bundles, and are thus found in commerce. The roots are three or four feet long, flexible, about the size of a quill, somewhat wrinkled longitudinally, and with few or no filaments. The epidermis is generally of a brownish-gray color; the inner bark is whitish, brownish, or reddish; the woody part is very thin, and in its centre is a white medulla or pith which abounds in starch. When broken it emits a slight but peculiar odor, which is more evident when it is boiled; and when chewed its taste, which is at the same time mucilaginous and somewhat acrid, excites a flow of saliva. This peculiarity is due to a principle called *sarsaparillin* which resides chiefly in the cortical portion of the root, whence it can be extracted by boiling water, or still better by alcohol. Sarsaparillin is white,

crystallizable, and inodorous, has a bitter, acrid, and nauseous taste in solution; is almost insoluble in cold water, is soluble in hot water to which it gives the property of frothing, and still more so in hot alcohol, ether, and the volatile oils. It is readily dissipated by heat, which accounts for the inertness of the preparations of sarsaparilla made by boiling.

HISTORY.—The Spaniards first brought sarsaparilla to Europe about the middle of the sixteenth century, from Peru, St. Domingo, and Brazil. It is mentioned by Nicolas Massa as early as 1532, and by Prosper Alpinus, the Venetian, in 1591.[1] Astruc says "it is thought" to be a specific for secondary venereal complaints, especially those of a rheumatic form, and Fallopius asserts that although milder than guaiacum, it cures ulcers and fissures of the anus "twice as rapidly."[2] It had, however, fallen into neglect, when, about the middle of the last century, the success of a secret medicine for syphilis which Dr. W. Hunter suspected to contain sarsaparilla, induced him to make use of the drug. He found it to answer his expectations, and having communicated the result to Dr. Fordyce, the latter became convinced of its value, and published an account of his observations.[3] Thenceforth it continued to be recognized as an antisyphilitic medicine, but it has probably been more largely used by charlatans and nostrum-vendors than by physicians.

The following are the usual preparations of sarsaparilla:—

Decoctum Sarsaparillæ. (*Dub.*)—DECOCTION OF SARSAPARILLA.

Take of Sarsaparilla, *five ounces;* Distilled Water, *four pints.* Boil down to two pints and strain. Dose, from four to six fluidounces four times a day.

Decoctum Sarsaparillæ Compositum.—COMPOUND DECOCTION OF SARSAPARILLA.

Take of Sarsaparilla, sliced and bruised, *six ounces;* Bark of Sassafras Root, sliced, Guaiacum Wood, rasped, Liquorice Root, bruised, each, *an ounce;* Mezereon, sliced, *three drachms;* Water, *four pints;* Macerate for twelve hours; then boil for a quarter of an hour and strain. Dose, from four to six fluidounces three or four times a day.

Extractum Sarsaparillæ.—EXTRACT OF SARSAPARILLA.

This preparation is borrowed from the French Codex, and is made by exhausting coarsely-bruised sarsaparilla with alcohol, by displacement, and evaporating to a proper consistence by a gentle heat. Dose, from ten to twenty grains three or four times a day.

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[1] Medecina Ægypt., ed. nova, p. 253.

[2] LUISINI, Aphrodisiacus, p. 805.

[3] Med. Obs. and Inq., 1755, i. 149.

Extractum Sarsaparillæ Fluidum.—Fluid Extract of Sarsaparilla.

Take of Sarsaparilla, sliced and bruised, *sixteen ounces;* Liquorice Root, bruised, Bark of Sassafras Root, bruised, each, *two ounces;* Mezereon, sliced, *six drachms;* Sugar, *twelve ounces;* Diluted Alcohol, *eight pints.* Macerate all the ingredients together, excepting the sugar, for fourteen days; then express and filter. Evaporate the liquid by means of a water bath, to *twelve fluidounces;* add the sugar to it while still hot; and remove from the bath as soon as the sugar is dissolved. Dose, a fluidrachm three or four times a day.

Infusum Sarsaparillæ.—Infusion of Sarsaparilla.

Take of Sarsaparilla, bruised, *an ounce;* Boiling Water, *a pint.* Digest for two hours in a covered vessel and strain. It may also be made by displacement. Dose, from two to four fluidounces three or four times a day.

Syrupus Sarsaparillæ Compositus.—Compound Syrup of Sarsaparilla.

Take of Sarsaparilla, bruised, *two pounds;* Guaiacum Wood, rasped, *three ounces;* Hundred-leaved Roses, Senna, Liquorice Root, bruised, each, *two ounces;* Oil of Sassafras, Oil of Anise, each, *five minims;* Oil of Partridge-berry, *three minims;* Diluted Alcohol, *ten pints;* Sugar, refined, *eight pounds.* Macerate the Sarsaparilla, Guaiacum Wood, Roses, Senna, and Liquorice Root, in the Diluted Alcohol for fourteen days, then express and filter. Evaporate the tincture by means of a water-bath, to *four pints*, filter, add the Sugar, and proceed in the manner directed for Syrup. Lastly, having rubbed the Oils with a small quantity of the Syrup, mix them thoroughly with the remainder. Dose, half a fluidounce three or four times a day.

Of the above preparations, the simple infusion is to be preferred, if the virtues of sarsaparilla alone are to be employed, but the most efficient preparation in the treatment of constitutional syphilis, is the compound decoction.

A favorite form for employing sarsaparilla in Germany, is the decoction of Zittman. (*Vid. U. S. Dispensatory.*) This is of two kinds, the stronger and the weaker. Of the former, the patient is required to drink eighteen ounces every morning before rising, and of the latter, thirty-six ounces every afternoon, and of the strong decoction, again, eighteen ounces every evening, during four or five days! This preparation contains a sensible quantity of mercury.

Action.—The operation of the active principle of the root and that of other preparations of the root itself, when given in equivalent doses, are identical. According to Pallotta, six grains of sarsaparillin occa-

sioned malaise and slowness of the pulse; eight grains, nausea and constriction of the throat; ten grains further produced a sense of general debility, and, at the end of half an hour, perspiration; thirteen grains gave rise to moderate vomiting of a bitter liquid, with irritation and constriction of the throat, faintness and general exhaustion.[1] In like manner, Hancock found that a decoction of four ounces of sarsaparilla occasioned nausea, vomiting, depression of strength, and disinclination to exertion. The pulse, also, was somewhat lowered. Hjort observed, as the effects of a saturated decoction of this root, nausea, anorexia, constriction of the throat, heaviness of the limbs, weariness, and headache.[2] These effects of sarsaparillin and of large quantities of the decoction of sarsaparilla agree in all essential particulars, and do not differ from those which Pereira observed to follow large doses of the powdered root. The effects, however, of medicinal doses of the drug, as might be expected, are not so immediate or decided. They are manifested during a state of disease, rather than in health, and consist of an improved condition of the digestive and nutritive functions, and the gradual subsidence of the morbid derangement. The diaphoretic and diuretic actions ascribed to sarsaparilla appear to be chiefly due to the quantity of fluid in which it is usually taken, and the circumstance of the skin being warm or cool at the time. Böcker concludes from his experiments with this substance, that it is neither diuretic nor diaphoretic, and that there is no evidence of its augmenting any secretion whatever.[3] The absence of decided phenomena during its ordinary administration, and the evidence above adduced to show that its action is not merely negative, entitle the medicine to rank as an alterative. Whether it acts by "purifying the blood," according to the old phraseology, now become the popular one, or in what other manner, has not yet been determined.

USES. *In Syphilis.*—When Fordyce reviewed the use of sarsaparilla in the middle of the last century, he stated that it had fallen into disrepute, and by degrees was almost forgotten, insomuch that some of the greatest masters in medicine asserted that its decoction is no better than barley water. He claims that it restores the appetite and digestion even where the patient has become hectic from a venereal cause, and that it shows its greatest efficacy in relieving pains from venereal affections of the bones. Still, on the whole, he admits that it can be depended upon only when mercury has preceded or is associated with it.[4] Such was also the opinion of Dr. Donald Monro,

[1] GIACOMINI, op. cit., p. 306.
[2] STRUMPF, Handbuch, ii. 330.
[3] Journ. f. Pharmakodynamik, ii. 30.
[4] Med. Obs. and Inquir., i. 171, 180.

who, with Fordyce, contributed to its introduction from Portugal into England. Cullen went still further, and said, "If I were to consult my own experience alone, I should not give this root a place in the Materia Medica; for tried in every shape, I have never found it an effectual medicine in syphilis or any other disease."[1] John Hunter, speaking of the effects remaining after syphilis is cured, and of the diseases sometimes produced by the cure, says: "A decoction of the woods, among which are commonly included guaiacum and sarsaparilla, is one of the first medicines in the cure, and many of the cases yield to it, which gives them the credit of curing the venereal disease. . . . but it was observed at last that those medicines did not cure this disease, till mercury had been given, and in tolerably large quantity. . . . Sarsaparilla appears to have no effect till mercury has done its best or its worst."[2] So Richter says of this medicine, "Miracles are not to be expected from it, and not uncommonly it leaves one in the lurch. Very often it produces only an apparent improvement, and after a time the disease breaks out anew."[3] Nor if we come to a more recent date, does the evidence vary. Ricord tells us that "it is far from possessing all the power which has been attributed to it, and which commercial interests struggle to maintain," and speaking of the class of medicines to which it belongs, he remarks that they may be useful as adjuvants to a mercurial treatment when the cutaneous functions are feebly performed, and that they may be advantageous when mercury would be contraindicated, or must be temporarily suspended. Finally, "in diseases of the bones, especially with suppuration, they are often the sole resource, if not because they are really active and curative, yet because they have a popular reputation, and the patients have faith in them, they, therefore, constitute a *mental* medicine."[4] Of similar import is the statement of Oesterlen: "In syphilis it is of little or no use, yet it is one of those medicines which the judicious and prudent physician will employ rather than do nothing;"[5] and Clarus, after referring to an obstinate case of syphilitic rupia which recovered under its use, remarks that it is of less advantage in affections of the throat and of the bones. "It is true," he says, "that during the treatment the patients improve, but they seldom get quite well. Its most striking effects appear to be in those cases where the patients have led a thoroughly dissolute life, exposed to vicissitudes of heat and cold, drinking deeply, and using the voice vociferously. Such

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[1] Mat. Med., ii. 200.

[2] A Treatise on the Venereal. BUMSTEAD'S Am. ed., p. 477.

[3] Ausfürliche Arzneim., i. 139.

[4] Malad. Vénériennes, p. 619.

[5] Heilmittellehre, 4te Aufl., p. 588.

persons improve rapidly in a hospital, but their improvement is owing less to sarsaparilla than to rest, good food, and a regular life. They soon relapse on returning to their former habits."[1] Finally, Böcker, in his Essay upon this subject, shows by an analysis of the history of syphilis since sarsaparilla was first introduced, that there is no evidence whatever of its having displayed any curative properties in the disease, independently of the water with which it is taken in decoction, and the other more active medicines with which it is uniformly associated.[2]

These citations suffice to show what are the opinions of those who have had most experience, respecting the virtues of sarsaparilla in constitutional syphilis. It is not competent to the cure of this affection, but it tends so far to promote the healthy action of all the functions as to enable it to co-operate usefully with mercury in the secondary, and with iodine in the tertiary forms of the disease, particularly when the cachectic state of the system renders the continued use of the former of these remedies injudicious, and of the latter insufficient.

In other chronic affections of a *scrofulous*, *rachitic*, *rheumatic*, or *gouty* character, which are characterized by a general derangement and impairment of the health, in connection with the local phenomena of some one or more of these diseases, it is very probable that a protracted course of the decoction of sarsaparilla may be beneficial, but as much, perhaps, by the quantity of liquid that is taken, as by any medicinal principle that the preparation contains. It is also to be remembered that the simple decoction of sarsaparilla is very seldom employed alone. The preference is always given to one of those compounds which contain mezereon, guaiacum, or senna; and most frequently the iodide of potassium, or some other active medicine, is administered besides. If a cure ensues under such circumstances, the share which sarsaparilla takes in it must be problematical indeed.

CHLORINIUM ET CHLORINIA, vid. *Irritants.*
COLCHICUM, " *Diuretics.*
DULCAMARA, " *Sedatives.*
GUAIACUM, " *Diaphoretics.*
MEZEREON, " *Irritants.*

[1] Arzneimittellehre, p. 469.

[2] Journ. f. Pharmakodyn., ii. p. 37 et seq.

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THE END.

ERRATA.

Vol. I., page 158, for "*Amygdalæ*," read "*Amygdala.*"
" " 237, after "ACIDUM TANNICUM," insert "*Tannic Acid.*"
" " 413, after "CANTHARIDES," insert "*Spanish Flies.*"
" " 453, 26th line from top, for "*states an*," read "states *that* an."
" " 454, 3d line from top, for "*says*," read "said."
" " 454, 7th line from bottom, dele "*in the food.*"
" " 487, 4th line from bottom, for "*cinchona*," read "cinchonæ."
" " 537, running title, for "*Cornus*," read "Cornus Florida."
" " 750, 15th line from bottom, dele 2d "**Morphia.**"
" " 786, 11th line from bottom, for "*of*," read "on."

Vol. II., " 108, 6th line from top, for "*Ammoniatæ*," read "Ammoniata."
" " 559, 19th line from top, for "*Colocynthides*," read "Colocynthidis."
" " 667, top line, for "*Corota*," read "Carota."
" " 776, 11th line from top, strike out "*Mercurial Ointment*," and the two following lines, and insert—

"OINTMENT OF AMMONIATED MERCURY. OINTMENT OF WHITE PRECIPITATE.

This ointment is made by mixing a drachm of ammoniated mercury with an ounce and a half of simple ointment."