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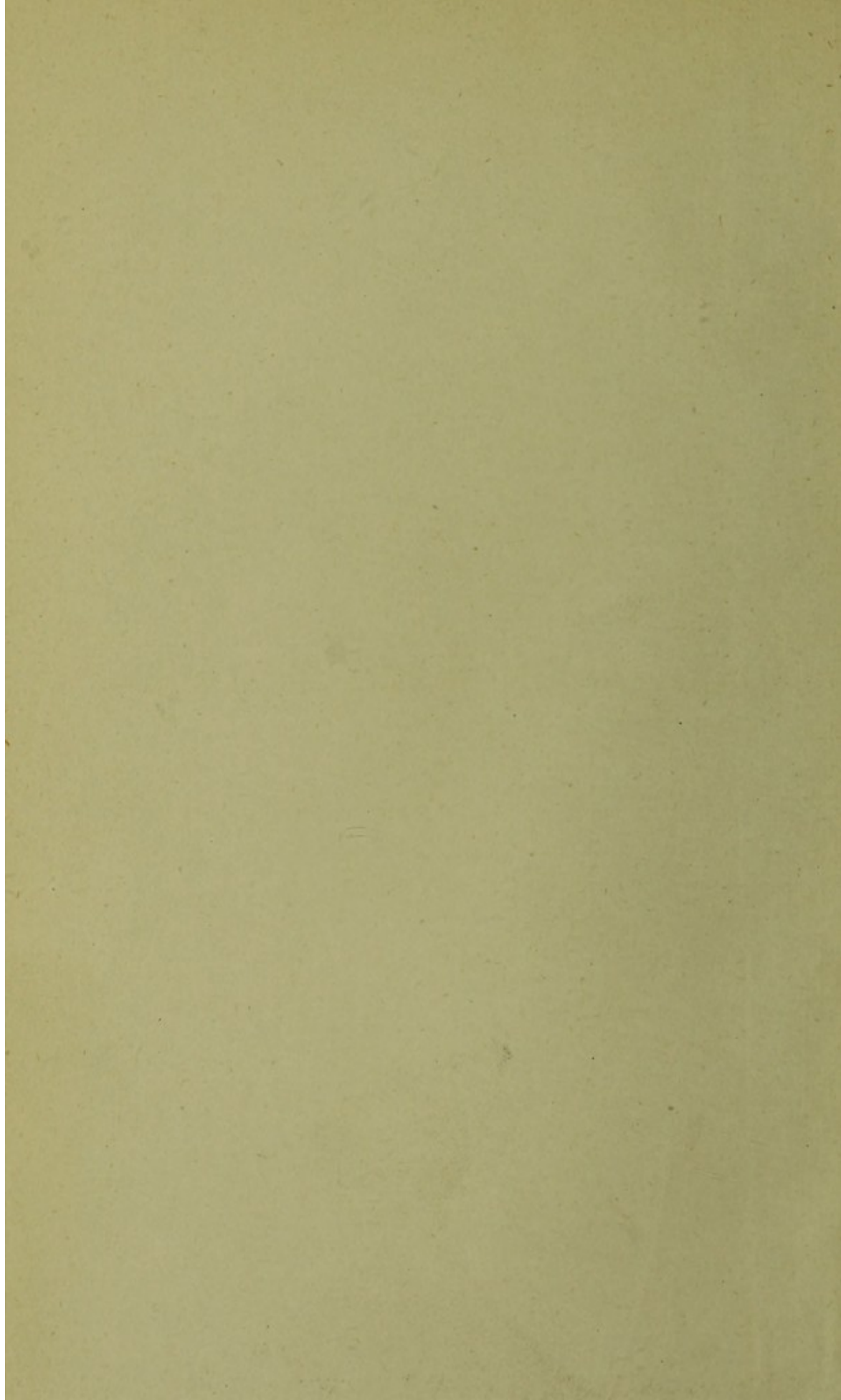
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MANUAL OF HYPODERMIC MEDICATION.

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MANUAL OF

HYPODERMIC MEDICATION



BY

DRS. BOURNEVILLE AND BRICON

TRANSLATED FROM THE SECOND EDITION, WITH ADDITIONS

BY

ANDREW S. CURRIE, M.D., EDIN.

FELLOW OF THE EDINBURGH OBSTETRICAL SOCIETY, ETC., ETC.

LONDON

H. K. LEWIS, 136 GOWER STREET, W.C.

1887

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PREFACE TO THE SECOND EDITION.

THE medical public accorded so favourable a reception to the *Manual of Subcutaneous Injections* that the first edition was exhausted in less than two years. This success imposed on us the obligation of bringing the greatest care to bear on the revision of our work and bringing it, as far as possible, up to date.

To the already long list of remedies employed by the hypodermic method which appeared in the first edition we have had to add a certain number which have been administered subcutaneously during the last two years. Such are—chrysophanic acid, osmic acid, agaricine, anti-pyrine, convallaria majalis, cocaine, cotoine, eucalyptol, ichthyol, kairine, nitro-glycerine, paracotoine, paraldehyde, pereirine, permanganate of potassium, salicylate of sodium, and thalline.

Although we have consulted all the periodicals which we have been able to obtain, and the number of them is considerable, and although we have availed ourselves of the too rare communications that have been sent to us, we renew the appeal which we made on a previous occasion to our readers: viz., that they would point out to us any errors and omissions which they may observe in this new edition.

B. & P. B.

THE SECOND EDITION

The second edition of this work is a complete revision of the first edition. It contains all the material of the first edition, with many additions and corrections. The new material is indicated by asterisks. The work is divided into two parts. The first part contains the theory of the subject, and the second part contains the practice. The work is written in a clear and concise style, and is suitable for use as a text-book or as a reference work.

The first part of the work contains the theory of the subject. It is divided into three chapters. The first chapter contains the general principles of the subject. The second chapter contains the theory of the subject, and the third chapter contains the theory of the subject. The second part of the work contains the practice of the subject. It is divided into three chapters. The first chapter contains the practice of the subject, and the second and third chapters contain the practice of the subject.

The work is written in a clear and concise style, and is suitable for use as a text-book or as a reference work. It contains all the material of the first edition, with many additions and corrections. The new material is indicated by asterisks. The work is divided into two parts. The first part contains the theory of the subject, and the second part contains the practice. The work is written in a clear and concise style, and is suitable for use as a text-book or as a reference work.

THE SECOND EDITION

TRANSLATOR'S PREFACE.

THE *Manuel des Injections Sous-cutanées* of Drs. Bourneville and Bricon has achieved such notable success on the Continent, and, besides giving a great impulse to hypodermic medication, has done so much to advance the science of therapeutics generally, that no apology is, perhaps, required in introducing a translation of it to English practitioners. There is not a superabundance of works in the English language on the subject of which this manual treats, for, with the exception of Dr. Bartholow's well known and instructive treatise, *Manual of Hypodermatic Medication*, the last edition of which was published in 1882, and Prof. Matthew Hay's admirable translation of Eulenburg's essay in Ziemssen's *Handbook of Therapeutics*, nothing has been published in this country or America within recent years. The little work of Drs. Bourneville and Bricon possesses the advantages of being very complete and yet concise, of containing a large number of formulæ, of being well up to date, and, what seems to be a feature of no small importance, it points out the disadvantages which have accrued, or are apt to accrue, from the use of certain drugs by the hypodermic method.

It is with sincere pleasure that I take this opportunity of acknowledging the assistance which many kind friends have rendered me.

In the first place I have to thank Mr. Lewis, my publisher, for introducing the work to my notice and for the suggestion that it should be translated. I also owe him many thanks for other acts of kindness, including his attention to the work while passing through the press.

Drs. Bourneville and Bricon have taken a warm interest in the translation, and have helped me in every possible way. To Mr. Martindale I am indebted for valuable hints and also for permission to borrow formulæ from the *Extra Pharmacopœia*. My colleague Dr. Whitlaw Scott has rendered valuable assistance in revising the translation and correcting proofs. My brother, Mr. R. K. Currie, has helped me to an extent which it is impossible for me to over-estimate, by converting the metric system to the English equivalents and by revising the sheets before they were sent to press.

Numerous authorities have been consulted in the work of translation which it is impossible to mention in detail, but it would be ungrateful on my part were I not to particularise Dr. Neale's invaluable *Digest* and his recently published *Appendix to the Digest*, which have been consulted constantly and in which I have rarely, if ever, failed to discover the information sought for.

In the hope of enhancing the value of the Manual I have added a therapeutic index based on those in Dr. Ringer's *Handbook of Therapeutics* and Dr. Lauder Brunton's recently published work *Pharmacology, Therapeutics, and Materia Medica*, a table of antidotes and antagonisms, a posological table, and a general index. With

these exceptions there is but little added to the work for which I am personally responsible, but it is hoped that these few additions will not be deemed irrelevant. They have been inserted on the principle so nobly expressed by Goethe—

“Vor den Wissenden sich stellen
Sicher ist's in allen Fällen !
Wenn du lange dich gequälet
Weiss er gleich wo dir es fehlet ;
Auch auf Beifall darfst du hoffen,
Denn er weiss wo du's getroffen.”

THE MOORLANDS,
LYDNEY, GLOUCESTERSHIRE.

August, 1887.

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NOTE.—It will be observed that as a rule the formulæ in this translation are in quantities of 16, or multiples of 16 minims. In the French edition Drs. Bourneville and Bricon generally adopt the gramme (the capacity of a Pravaz syringe) as the standard. In the Introduction they say that a Pravaz syringe with a capacity of one gramme is equivalent to 20 drops; but the drop is both an inconvenient and uncertain quantity, varying widely for different fluids, and accordingly the following system has been adopted in the translation. According to the *British Pharmacopœia*, (1885), 1 gramme = the weight of a cubic centimetre of water at 4° C. Now the cubic centimetre is equal to 15·432 grain measures fluid, or 16·975 minims; but it is obvious that 17 would be a very awkward figure to take as the equivalent of the capacity of the Pravaz syringe, there being no figure that will divide 17 without a remainder, and had this figure been adopted there would have been a risk of falling into error where $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$ of a cubic centimetre was ordered. By adopting 16, however, as the standard, these fractions can be used with absolute correctness, and an ordinary English hypodermic syringe can be employed in using the formulæ in the manual.

Where the dose of a solution is stated as one syringe-ful, it is to be understood that 16 minims is the quantity meant.

INTRODUCTION.

HISTORY.*

The first attempts at hypodermic injections appear to have been made by Dr. Rynd (*Dublin Medical Press*, 12th March, 1845); but it is to Dr. A. Wood† (1855) that we owe the popularisation of this method. In England, we may mention, among the first experimenters, Messrs. Wright (whose observations were published in Wood's memoir), Oliver, Bonnar, B. Bell, Charles Hunter (who gave the name *hypodermic* to the subcutaneous method), Fuller, Cadwell, Cowan, Anstie, etc.

The hypodermic method was introduced into France by Béhier and Courty;‡ their example was soon followed by

* We may recall the fact that the injection of remedies into the veins was commonly practised in the 17th century; that the endermic method (Lambert) and the method of inoculation (Lafargue) had numerous partisans in the first half of the present century, to say nothing of the plan of dry injections of M. Bruns (1869). (See Eulenburg, *Percutane, intrac., subc., Arznei-Application*, 1880, pp. 4, 28, 30, 34). Valleix, who had used the endermic method in cases of neuralgia, had also attempted the introduction subcutaneously of remedies by means of acupuncture needles. We may add that physiologists had for a long time practised the hypodermic method (Gaspard, Magendie).

† Dr. Sieveking of London has claimed priority for M. Kurzak of Vienna (*Lancet*, 1861, Vol. I., p. 309). According to Dr. Bartholow, Dr. J. Taylor, in a communication to the *New York Medical Gazette*, asserted that he had used the hypodermic method from 1839, simultaneously with Dr. Washington; this proceeding had been suggested to them by Lafargue's plan of inoculation. They employed Anel's syringe. Langenbeck had also, before Rynd, employed the hypodermic method, but he abandoned it afterwards for the method by inoculation.

‡ They made use of the syringe which Pravaz had devised for coagulating injections of perchloride of iron.

numerous authors :—Hérard, Vella, Vulpian, Follin, Gintrac, Benoit, Fournier, Dupuy, Dolbeau, Gosselin, Becquerel, Bourdon, etc.

In Germany, Drs. Bertrand (of Schlagenbad) and Genth (1857), A. V. Franque, Eulenburg, Lebert, Erlenmeyer, Semeleder, Oppolzer, Zülzer, Südeckum, Von Graefe, Scholz, Hermann, Lorent, Nussbaum, Scanzoni, etc., were the first to practise subcutaneous injections.

In Italy, Gherini of Milan (1861), then B. Guala of Brescia, first employed hypodermic injections. We may quote, moreover, in the same country, the names of Timermans of Turin, Lesi, Porta, Scarenzio, Petrini, Monteverdi, Schivardi, etc.

Dr. Ruppaner was the first to introduce the hypodermic method into the United States (1860); Dr. Bartholow, however, attributes the priority to Dr. Fordyce Barker of New York (1856), then to Dr. Elliot (1857).

We think it will be useful to append here a list of the principal treatises and essays of interest which discuss the hypodermic method in its general aspect.

SUDECKUM—*Subcutane Injectionen medicamentöser Flüssigkeiten*. Inaugural-Abhandlung, Jena, 1863.

GAUDRY—*Injections sous-cutanées*. Thèse de Paris, 1863.

BOIS—*De la méthode des injections sous-cutanées*. Paris, 1864.

ERLENMEYER—*Die subcutanen Injectionen der Arzneimittel*, 1st edit., 1864.

EULENBURG—*Die hypodermatische Injection der Arzneimittel*, 1st edit., 1865.

HUNTER (Charles)—*On speedy relief of pain and other nervous affections by means of the hypodermic method*. London, 1865.

RUPPNER—*Hypodermic injections in the treatment of neuralgia, rheumatism, gout, and other diseases*. Boston, 1865.

- LORENT—*Die hypodermatischen Injection nach klinischen Erfahrungen.* Leipzig, 1865.
- JOUSSET (de Bellesme)—*De la méthode hypodermique et de la pratique des injections sous-cutanées.* Paris, 1865.
- GALLOT—*De la méthode hypodermique en général et des injections sous-cutanées de sulfate d'atropine en particulier.* Thèse de Paris, 1866.
- SCHIVARDI—*La medicazione ipodermica.* Milan, 1868.
- DENIS (A.)—*Considérations et expériences sur la méthode hypodermique.* Thèse, Strasbourg, 1868.
- LESI—*La siringa di Pravaz e le iniezione ipodermiche,* 1868.
- MICHALSLI—*De la méthode hypodermique.* Thèse, Paris, 1868.
- BARTHOLOW—*Manual of hypodermic medication.* Philadelphia, 1st edit., 1870; 4th edit., 1882.
- SALVADOR BADIA—*La curacion de la syphilis por las inyecciones hypodérmicas de bicloruro hydrargyrico segun los métodos de los profesores Lewin (de Berlin) y Letamendi (de Barcelona) con un appendice sobre la medicacion hipodermica en general.* Barcelona, 1873.
- LUTON—*Etudes de thérapeutique générale et spéciale. Injections hypodermiques,* p. 193. Paris, 1882.
- EULENBURG—*Percutane, intracutane und subcutane Arznei-application,* in *Handbuch der allgemeinen Therapie,* von H. V. Ziemssen. Leipzig, 1880, B. I., III. Theil.
- BERNATZIK—*Hypodermatische Methode in Real-Encyclopädie der gesammten Heilkunde.* B. VII., 1881, pp. 21 et seq.
- COCHET—*Contributions à l'étude des injections hypodermiques.* Thèse de Paris, 1883.
- FEDERICO GOMEZ DE LA MATA—*Manual de inyecciones Hipodermicas.* Madrid. This manual is largely composed of articles by us which appeared in the *Progrès médical* in 1883.
- LUTON—*Transfusions hypodermiques* (*Archives générales de médecine,* December, 1884).

SUBCUTANEOUS ABSORPTION.

All authors are agreed in admitting absorption by the cellular tissue; it is constant, regular, and effected with great rapidity,* less rapidly, however, than absorption by the respiratory mucous membrane or by the veins (intravenous injection).

Such is the general rule; but there are certain circumstances in which absorption is modified. It is thus that some remedies, introduced under the skin, may, by their local action, induce inflammatory troubles which disturb the therapeutic and physiological results,† or even prevent these results by opposing absorption. This last result is some times sought for, when, for example, in malignant pustule we endeavour to limit the original situation of the pus by the aid of peripheral injections of iodine.

Absorption by the cellular tissue being recognised as incontestable, it remains to be shewn in what manner it is effected. Here we encounter a great variety of opinions; absorption by the veins, capillaries, lymphatics, by diffusion, etc. In the present state of our knowledge we believe there is no doubt that absorption in the subcutaneous cellular tissue is chiefly effected by means of the lymphatic system, and in support of this opinion we can appeal to no stronger testimony than that of M. Ranvier.‡

* The acceleration or retardation of absorption may be brought about experimentally by section or galvanisation of the great sympathetic (see on this subject, Claude Bernard, *Lecons de Pathologie exp.*, 1872, pp. 285-287). Apart from the influence of the nervous system on the rapidity of absorption, it is to be observed that all substances are not absorbed at the same rate (experiment of Bernard with ferro-cyanide of potassium and lactate of iron). Moreover, the rate of absorption of the same substance varies in direct proportion to its solubility.

† A large number of substances coagulate with albumen.

‡ *Traité Technique d'histologie*, p. 425.

“The fibres and membranes of which the connective tissue is composed, constitute,” he says, “a system continuous of itself in all parts of the organism, furrowing and partitioning, in various ways, a vast reservoir all the chambers of which communicate with one another. The great serous cavities form just as much a part of this system as do the interstices of the loose connective tissue. This reservoir belongs to the lymphatic system, and in all its parts it contains lymph elements. The direct communication of the large serous cavities with the lymphatic vessels is a fact conclusively proved by science; the origin of the lymphatic vessels in the meshes of the loose connective tissue is still an open question, but, *à propos* of the lymphatic system, we may detail a series of facts which tend to prove that they really arise in the interstices of this tissue . . .”*

Regarded from the point of view of the mere administration of drugs, subcutaneous injection, when the substance injected does not excite local troubles, offers in addition to the benefit of rapid absorption, this great advantage that the medicine is absorbed in its entirety without any modification; all which conditions place the hypodermic method far above every other mode of administering remedies.

The experiments of Messrs. Eulenburg and A. Denis† show that *the site* at which the injection is made exercises an important effect on the rate of absorption: moreover, the effects produced by similar doses vary with the region injected. These gentlemen have made some interesting observations which are summarised in the following table:—

1. Temples and cheeks.

* See also, Ranvier, *loc. cit.*, p. 656.

† Lambert, as far back as 1810, pointed out that absorption was more readily effected on the inner surfaces of the thighs and legs, arm, forearm, and anterior surface of the chest.

2. Epigastrium.
3. Anterior portion of thorax.
4. Supra- and infra-clavicular regions.
5. Inner aspect of arm and thigh.
6. Nape of the neck.
7. External aspect of thigh and arm.
8. Forearm.
9. Leg.
10. Foot.
11. Back. (In these two last regions the effect is often nil).

Despite the authority which necessarily attaches to the names of the authors whom we have quoted, we think it right to accept this classification with a certain amount of reserve.

SOLUTIONS.

The details which we give under the head of each drug render it superfluous for us to enter here at great length into the question of solutions, we will therefore confine ourselves to a few general remarks. It is often desirable to make use of fresh and even of specially prepared solutions; distilled water is the best vehicle, provided it is not a question of alterative injections. Solutions in equal proportions of glycerine and water are well borne by the tissues, but other solvents or vehicles can also be employed without inconvenient results, (see distilled water, cherry laurel, ether, alcohol, oils, etc.).

We may add that it is desirable, when possible, to inject fluids at a temperature of about 37° (98.5° F.); and that it is often advantageous to add to the solution a few drops of a solution of carbolic or salicylic acid for its better preservation.

The solutions should be as far as possible neutral; it would, however, be a mistake to suppose that this is absolutely indispensable. In fact, we are often obliged to have recourse to *acid solutions*, which are as a rule more or less painful. Here we must observe that the pain is not generally proportionate to the acidity of the injection; thus, solutions of sulphate of quinine in tartaric acid are more painful than solutions made with sulphuric acid, although the acidity in the latter case is much more intense.

In other instances, the irritating quality of neutral solutions depends upon the substance dissolved, as we shall see when we speak of local irritations. Hence it follows that the mere fact of a solution being neutral is not sufficient to ensure its being free from irritating qualities.

The degree of concentration of the solutions remains to be considered. In regard to substances of very active properties this is of minor importance; but for most substances we are precluded from employing the hypodermic method, either because the solubility of the drug to be used is too slight to permit of its being injected in sufficient quantity without serious inconvenience, or because when the remedy is obtained in the necessary degree of concentration it acquires irritating properties.

In some countries, especially in England, use is made of hypodermic injections extemporised from solutions of gelatine discs containing measured doses of the required drug; these discs are dissolved in a few drops of distilled water. Such are the discs prepared by Samson, Savory and Moore, Wyeth, and by Cian of Venice.

Eulenburg and other authorities discountenance the practice of filtering thick solutions, a custom which, owing to the nature of the medicament, may diminish the activity of the solution. M. Bourdon is equally opposed to filtering old solutions which have become thick or muddy by

the development of cryptogamic filaments: these solutions have in fact to a large extent lost their medicinal properties and should be prepared afresh.

Per-centage solutions are most convenient, and the following may be taken as the type or unity.

Distilled water	. . . . .	100
Salt	. . . . .	1

If we take one gramme ($15\frac{1}{2}$ English grains) of water as equivalent to twenty drops, it follows that a syringe with a capacity of one gramme would contain a centigramme (about one-seventh of a grain) of the active principle, and one drop weighing five centigrammes would contain half a milligramme (a milligramme is equivalent to about $\frac{1}{70}$ of an English grain). But the drop is of all forms of dosage the most inaccurate,* although it is in very common use: it would therefore be preferable to reckon by weight. The various tables published by authors, among others those of Messrs. Réveil, Bouchardat, Yvon, shew remarkable variations even for the same fluid.

We give below the table published in the essay of M. Surun. This table, which we have thought it better to abridge somewhat, shews the solubility of a certain number of substances in one hundred parts of glycerine.†

Bromine	. . . . .	In all proportions.
Iodine	. . . . .	1.90
Bromide of Potassium	. . . . .	25
Iodide of Potassium	. . . . .	40
„ Zinc	. . . . .	40
„ Iron	. . . . .	In all proportions.

The drops given by different instruments are never quite identical.

† This table is quoted by but few authors. Other tables of solubility can easily be referred to in other works, as that of M. Fonssagrives, etc.

Sulphide of Sodium	In all proportions.
Bisulphide of Potassium	25
Cyanide of Potassium	32
„ Mercury	27
Chloride of Ammonium	20
„ Sodium	20
„ Barium	10
„ Antimony	In all proportions.
Perchloride of Iron	„ „
Bichloride of Mercury	1.50
Chlorate of Potassium	3.50
Hypochlorite of Sodium	In all proportions.
„ Potassium	„ „
Arsenious Acid	20
Arsenic „	20
Arsenate of Sodium	50
„ Potassium	50
Sulphuric Acid	In all proportions.
Nitric Acid	„ „
Phosphoric Acid	„ „
Hydrochloric Acid	„ „
Chromic Acid	Decomposes.
Acetic Acid	In all proportions.
Tartaric Acid	„ „
Citric Acid	„ „
Oxalic Acid	15
Boracic Acid	10
Lactic Acid	In all proportions.
Benzoic Acid	10
Ammonia	In all proportions.
Carbonate of Sodium	98
Bicarbonate of Sodium	8
Carbonate of Ammonium	20
Urea	50

Borate of Sodium	60
Alum	40
Sulphate of Iron	25
„ Zinc	35
„ Copper	30
Nitrate of Silver	In all proportions.
Bichromate of Potash	Decomposes.
Permanganate of Potash	„
Acetate of Lead	20
„ „ Copper	10
Tartar emetic	5·50
Tartrate of Potash and Iron	8
Lactate of Iron	16
Tannin	50
Quinine	0·50
Cinchonine	0·50
Sulphate of Quinine	2·75
„ Cinchonine	6·70
Codeine	In all proportions.
Morphine	0·45
Hydrochlorate of Morphine	20
Atropine	3
Sulphate of Atropine	33
Strychnine	0·25
Sulphate of Strychnine	22·50
Brucine	2·25
Veratrine	1

INSTRUMENTS AND OPERATIVE PROCEDURE.

I. INSTRUMENTS.

The first physicians who had recourse to hypodermic

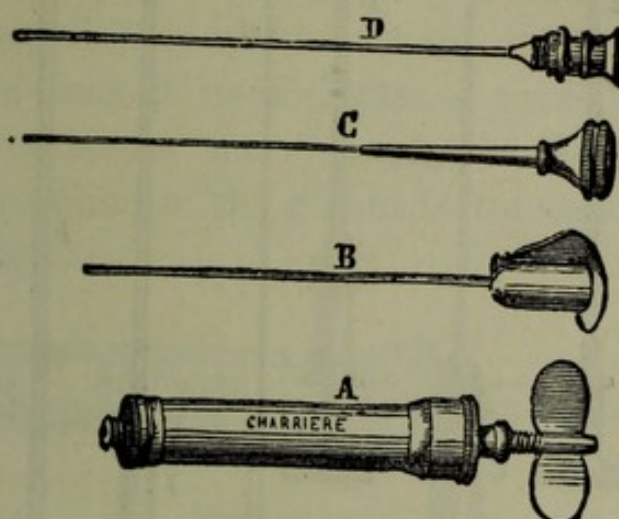


FIG. 1.

medication made use of a variety of syringes, among which

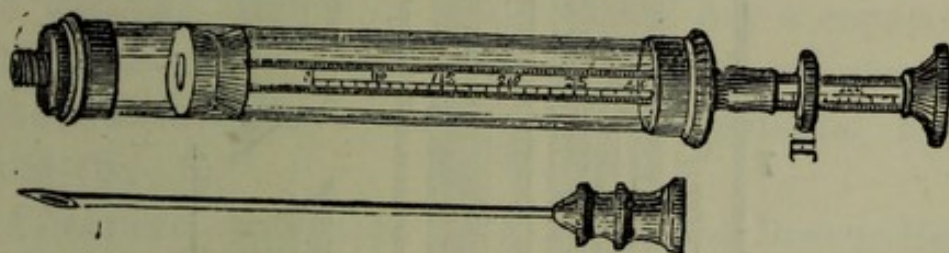


FIG. 2.

we may quote:—1st. Fergusson's syringe, the needle of

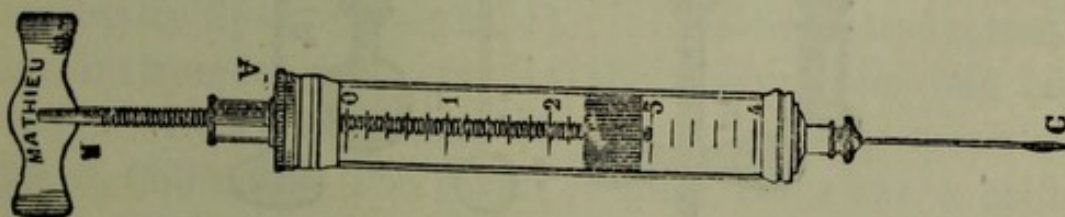


FIG. 3.

which, being of too large calibre, in penetrating the tissues

tears them, and occasions thereby severe pain; this

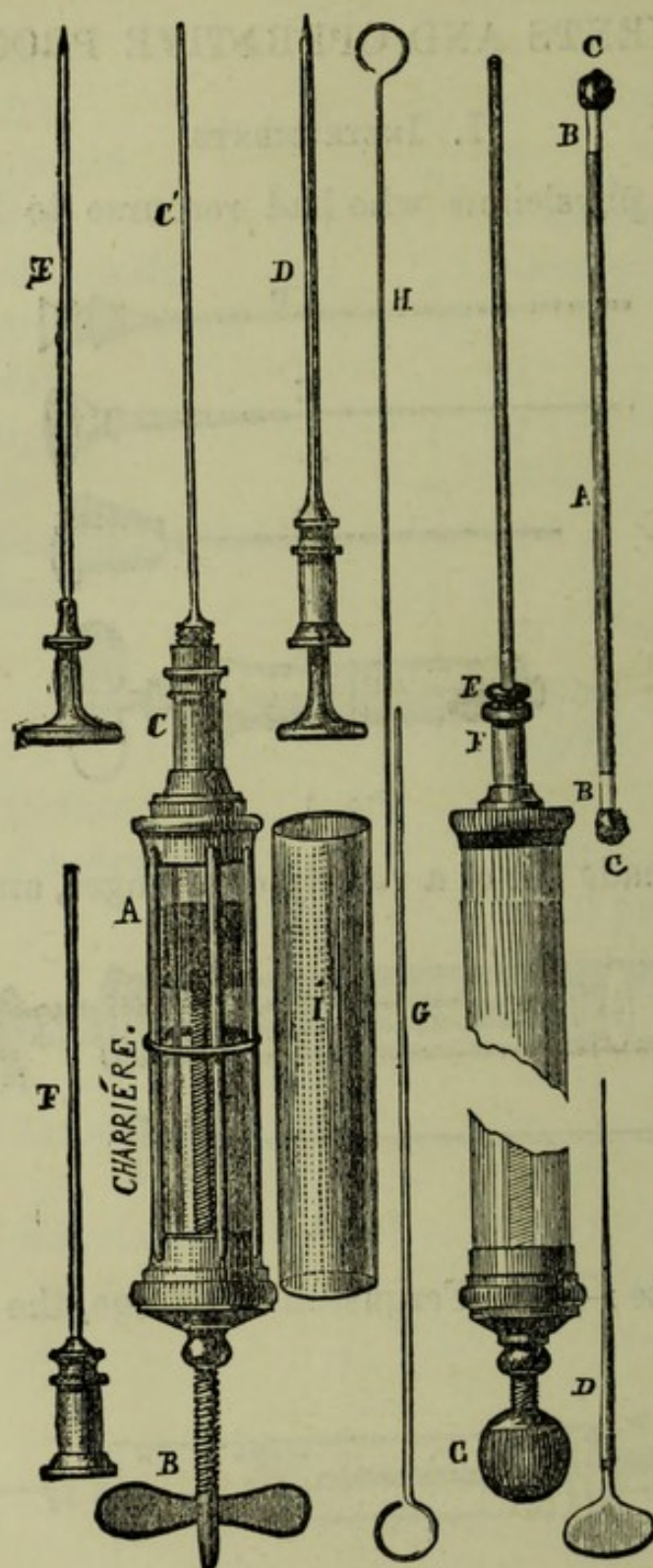


FIG. 4.

syringe, which as a rule is badly graduated, was chiefly

employed by Wood. 2nd. Pravaz's syringe (fig. 1) the piston of which has a screw action, each half turn of the screw expelling from the extremity of the canula one drop of solution. These two syringes, which are not used now, were invented by their designers for the use of coagulating injections of iron perchloride.

Pravaz's syringe as modified by Béhier* (fig. 2) is a trocar syringe; it has, apart from its small capacity, this inconvenience that it necessitates a prolonged operative procedure; moreover, the quantity of fluid expelled by each semi-revolution of the piston is uncertain and varies with the syringe.

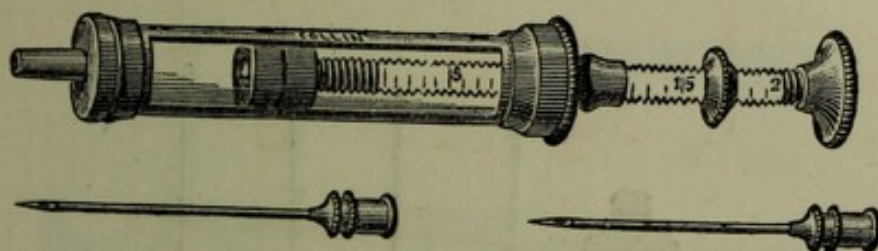


FIG. 5.

The decimal syringe of M. Mathieu has a capacity of four grammes; the barrel of the syringe is of glass and has four circular divisions, each corresponding to one gramme (fig. 3).

M. Charrière abandoned the trocar of the Pravaz-Béhier syringe, and replaced it by a perforated needle, one of its extremities having a sharp cutting point, and furnished at the other end with a screw which fits on to that which terminates the syringe (fig. 4). Since the introduction of this instrument the screw of the piston stem has been replaced by a stem furnished with a running screw-stop (fig. 5, Collin's). The barrel of the syringe has a calibre graduated for one drop of fluid to each millimetre.

* Béhier has himself discontinued its use. The metal cylinder of Pravaz's syringe was replaced by one of glass.

The syringes of Leiter and of Luer (figs. 6 and 7) are

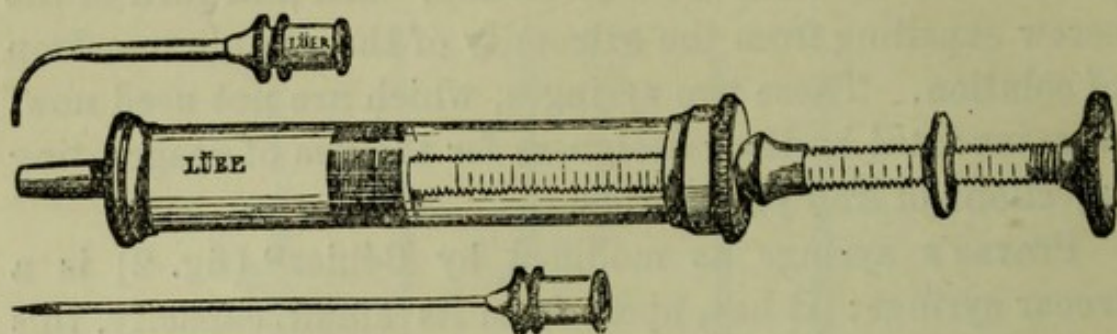


FIG. 6.

glass syringes with a large flat piston stem marked off into divisions which indicate, when it is drawn out, the quan-

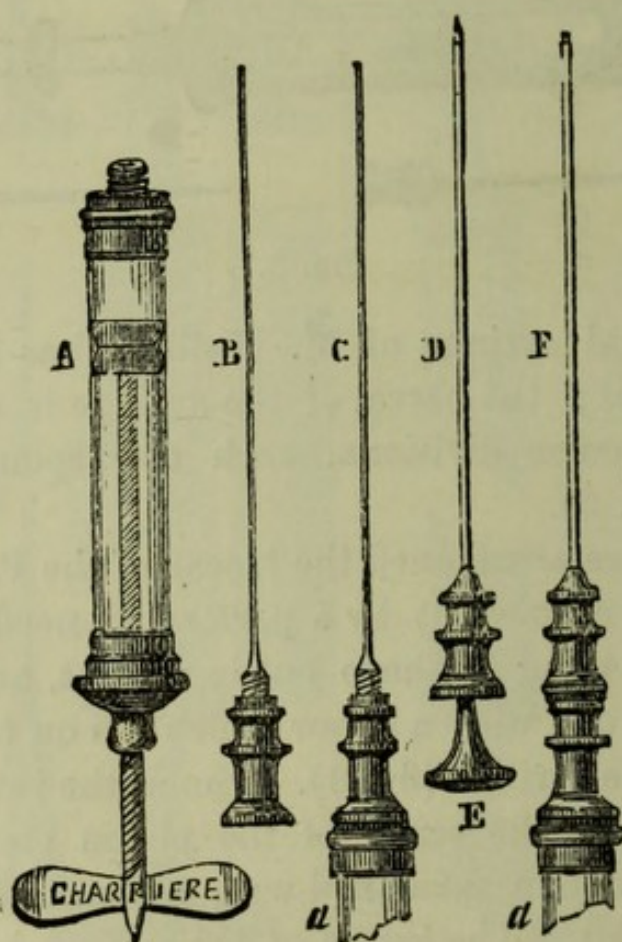


FIG. 7.

tity of fluid contained beneath. The extremity carries a

hollow needle with a harpoon-shaped end. M. Lürer's syringe* is the one most commonly in use in Germany and France.

A syringe which is in very general use, and which is still commonly known as Pravaz's, is composed of a crystal barrel, strengthened by two vertical stems. These stems are united by two nozzles which close the instrument above and below: the inferior nozzle is in the form of a canula, intended to be adapted to the canula of the needle;

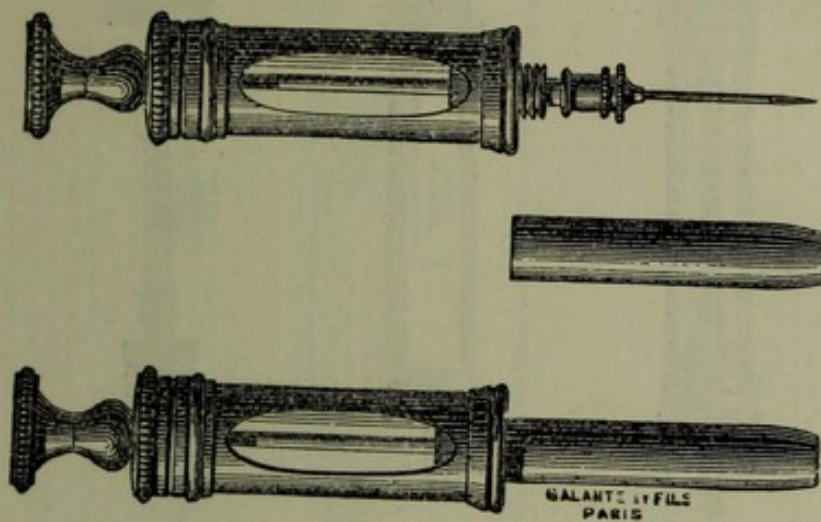


FIG. 8.

the upper nozzle is pierced by a hole through which the stem of the piston passes: this stem is marked with twenty divisions, each of which corresponds to a drop of fluid. The capacity of the syringe is one cubic centimetre or twenty drops.

Sometimes the fluid is expelled by rotation of the piston, for which purpose the stem is furnished with a screw; at others, on the contrary, the piston is worked by pressure, in a straight line, with the finger, on a knob by which the piston is terminated. To the syringe is fitted a canula

* M. Lürer appears to have been the first to have replaced the screw piston by the graduated piston with the running screw-stop, and the screw nozzle by a smooth surfaced nozzle.

ending in a needle of strong steel and with a sloping cutting edge at its extremity.

We need not do more than mention the syringes of Travoy, Danet, Bourguignon, de Graefe, C. Hunter, Liégeois, Coxeter, Young, Bartholow, Gemrig, Ward Cousin, Buzzard, Cutter, Dop; the syringe of Arsonval

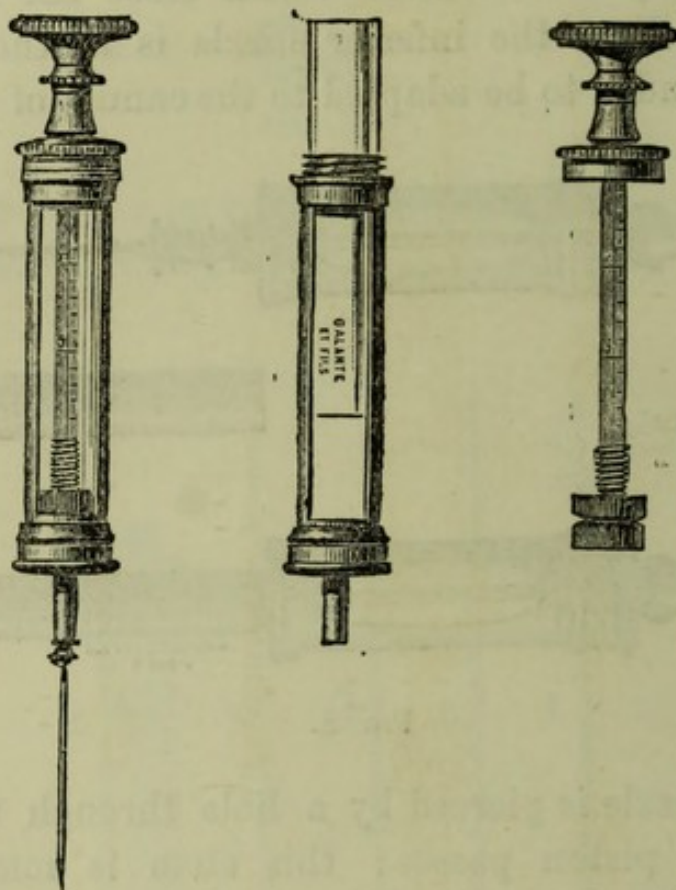


FIG. 9.

(made by Aubry), having the needle perforated at different levels, for submucous injection; the vulcanite syringes of Tiemann, Mules, Galante (figs. 8 and 9),* of Maisonneuve (Fig. 10), of Krause; lastly, the syringes of large capacity, such as the infusor of Hueter, with a capacity of 14 grammes, and that of M. Dujardin-Beaumetz, with a

* The glass cylinder is movable, the needle is protected by a cylindrical sheath, perforated at its extremity. The instrument may be safely carried in the pocket.

capacity of five grammes. Dr. Jennings recommends the use of an instrument with a graduated barrel, furnished with a pipette.*

Some agents act on the syringes and corrode them.

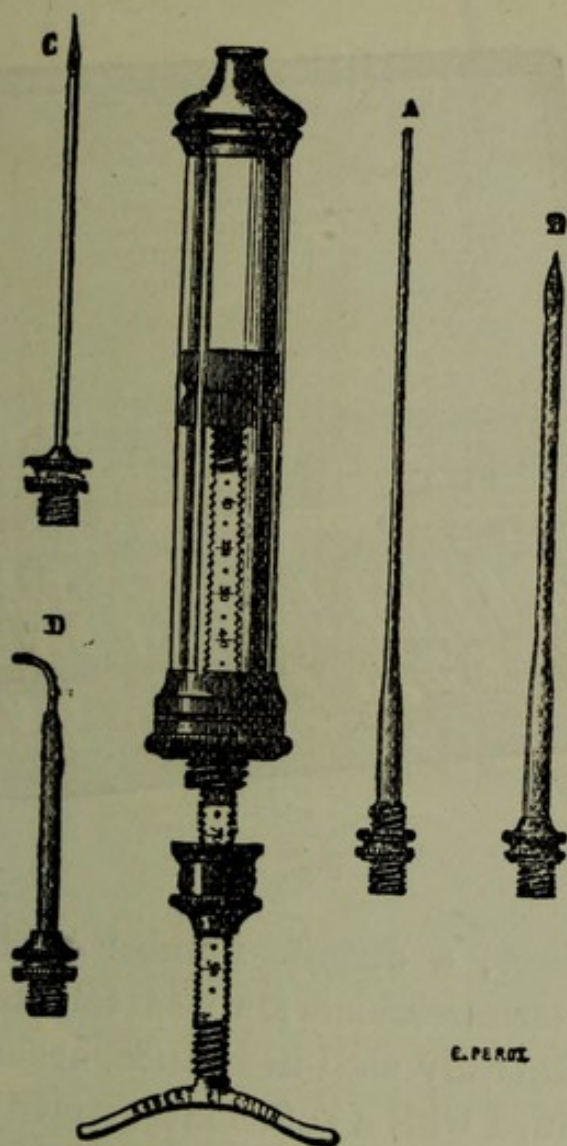


FIG. 10.

Such are the salts of mercury which attack after a time even gold needles.†

In conclusion we may mention the complex cases con-

* *Lancet*, vol. 1, 1884, p. 562.

† Hence the advice of M. Neumann not only to rinse with water after having used the needle, but to blow air through it by means of an india-rubber ball.

taining, besides the ordinary Pravaz syringe, either medicines, or other needles for use in deep injections. Such is that of Messrs. Burroughs and Wellcome who have devised a portable hypodermic case. This contains (fig. 11), be-

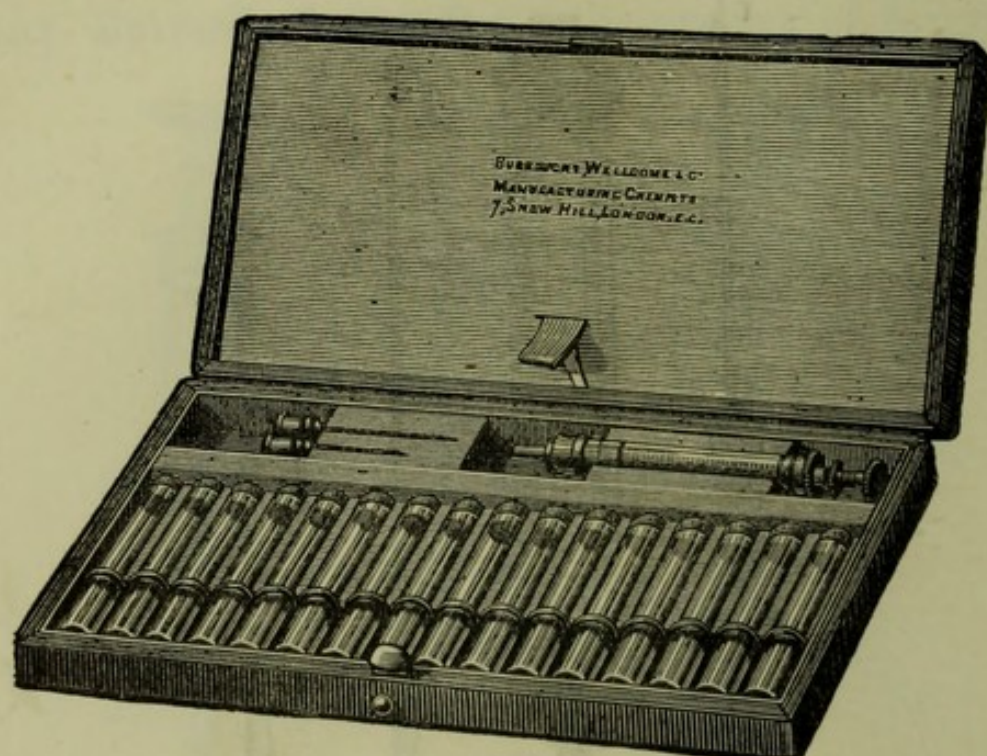


FIG. 11.

sides the syringe, a certain number of tubes enclosing Wyeth's hypodermic tablets; these tablets, which we regret are not generally used in France, are composed of an alkaloid combined with a sufficient quantity of sulphate of soda to obtain the necessary consistence. One of these is dissolved, when required, in a few drops of distilled water. We can see how, by this means, the injection can be more readily effected, to say nothing of the advantages which accrue to the practitioner from always having a collection of the principal alkaloids at his command.

The syringe of M. Delore of Lyons (fig. 12), made by M. Mathieu, has a capacity of 4 grammes (about 64 minims); the piston stem has 40 divisions. To this

syringe can be applied, (1) a needle like those of the ordinary Pravaz syringes; (2) two metal canulæ with a

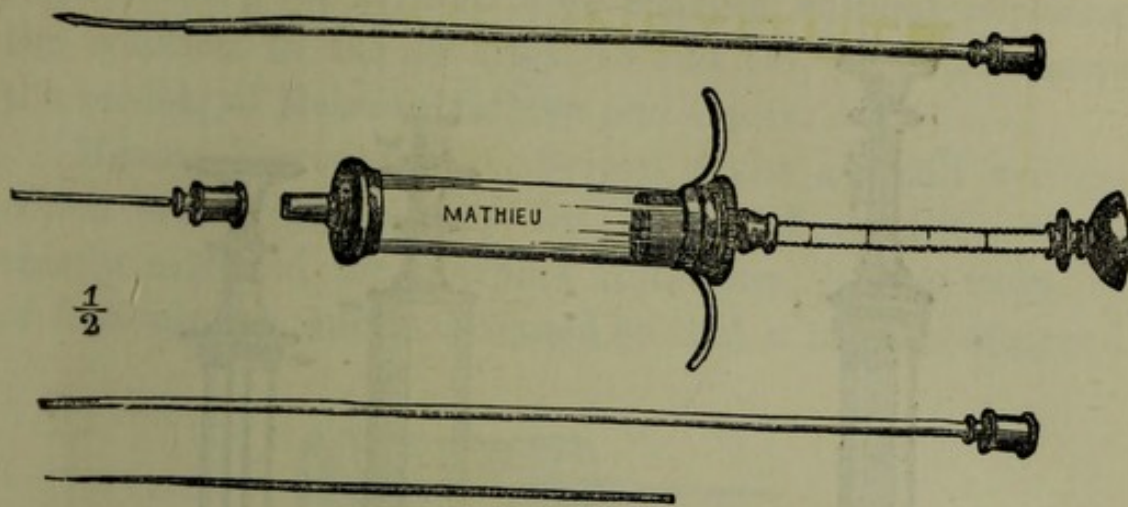


FIG. 12.

length of 13 centimetres; one has a needle perforated in the usual way, the other is made so as to carry a gum elastic sound, and has two lateral perforations. The

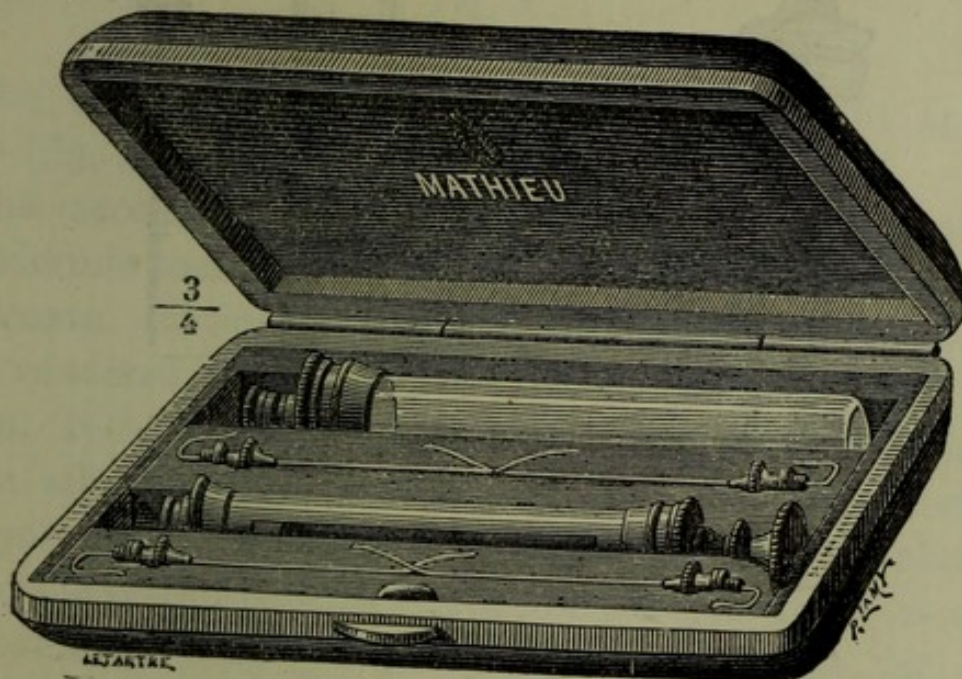


FIG. 13.

syringe is moreover furnished with two wings which impart steadiness to the instrument during the injection. M.

Delore's instrument is made of silver to prevent any chemical action upon it by the solutions. It can be employed



FIG. 14.

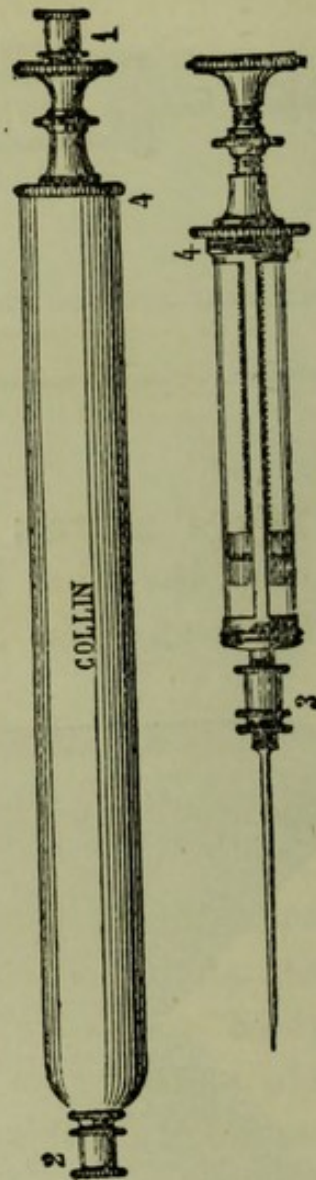


FIG. 15.

like the ordinary Pravaz syringe to practise interstitial injections into the uterine tissue, or it can be used with the canula and gum elastic sound to make ordinary intra-uterine injections.

Recently some makers have constructed syringes which can be adapted to a little vial containing the solutions, thus allowing the syringe to be charged without exposing the solution to the air (figs. 13 and 14). Fig. 15 shows the models of Messrs. Mathieu and Collin.

[Messrs. Ferris and Co., Bristol, make a small syringe which was suggested by Dr. Sheen of Cardiff. It is chiefly intended for morphia injections, has a capacity of five minims, and is designed so that it may be attached

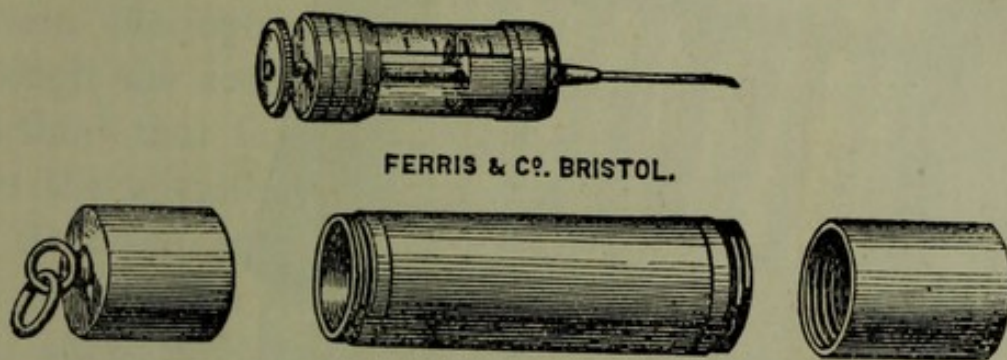


FIG. 16.

to the watch chain, to which it forms an elegant appendage (fig. 16).

The accompanying illustration (fig. 17) represents a hypodermic pocket case designed by Messrs. Burroughs and Wellcome. The case instead of being pasted is sewn, and is thus rendered more proof against the effects of heat and damp. It contains a small syringe of solid silver, which fits into a silver case provided with a cap. This cap answers two purposes :—it prevents drying and consequent shrinking of the piston-packing, an inconvenience which is only too common with syringes that are laid aside for any time, and it is used as a mortar in which the hypodermic tabloids are powdered. In addition to the syringe, the case is provided with several tubes of tabloids containing precise doses of the alkaloids in most general use, such

as morphine, atropine, ergotinine, apomorphine, &c. A writing tablet is also provided. The whole case is in such

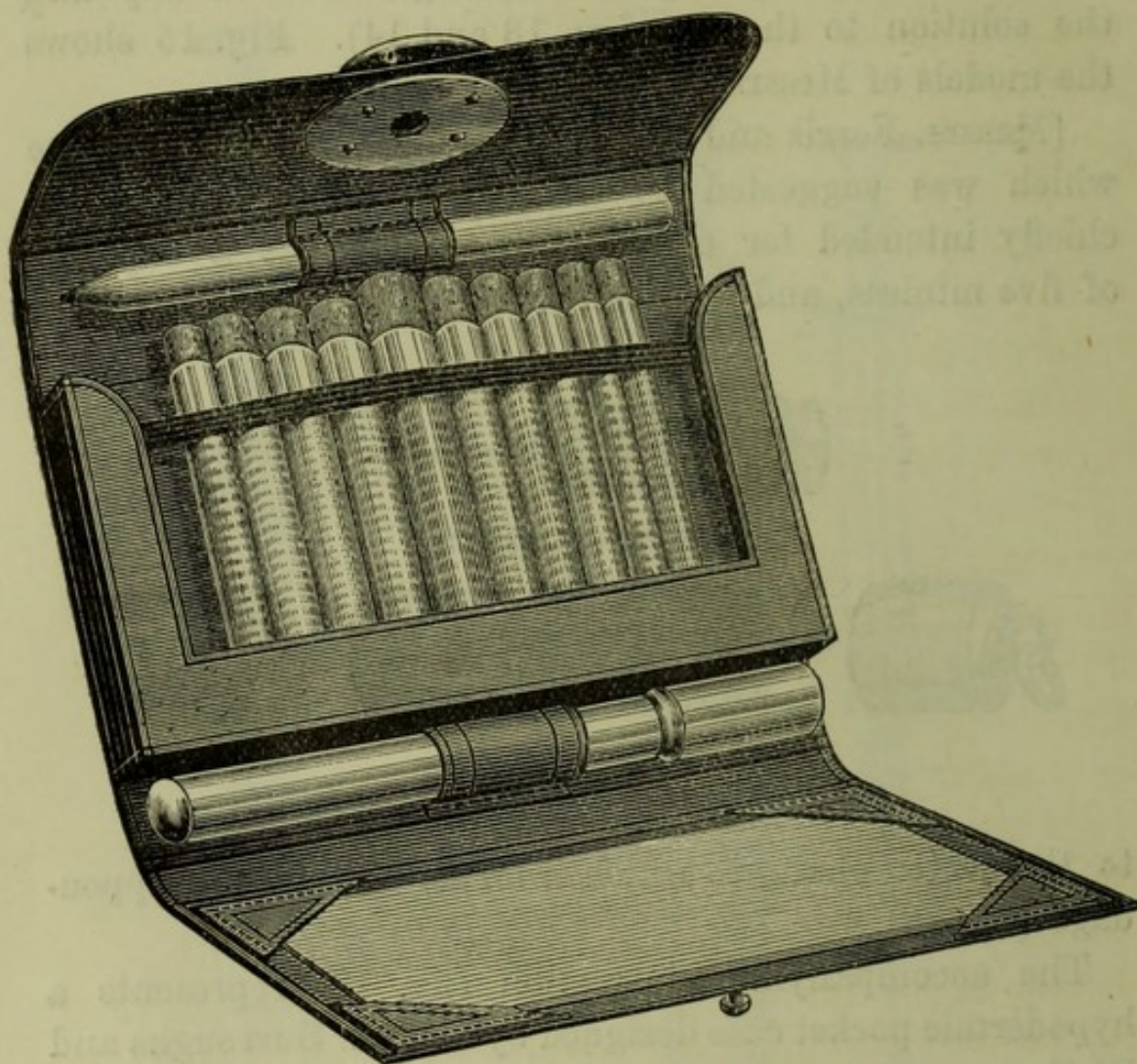


FIG. 17.

small compass that it can be carried in the pocket without inconvenience. *Trans.*]

II. OPERATIVE PROCEDURE.

Before using a needle it is necessary to ascertain its perfect cleanliness and to see that it is in working order. The solution being in readiness, the instrument must be

filled, care being taken to exclude air, and the needle should be anointed with carbolised oil. There are two methods of introducing the needle; some recommend that it should be first introduced by itself and that the syringe should then be fitted on to it; others, on the contrary, and this is the usual practice, adjust the needle to the instrument before insertion.

Some assert that certain accidents which may occur are guarded against by the first method of procedure; that if, for example, the needle has penetrated a vein the operator is warned by the escape of blood through the needle or by its unnatural mobility. We do not think that these accidents need be feared; and in any case the advantages of this method do not compensate for its disadvantages, such as the longer time it takes, the greater risk of tearing the cellular tissue, etc. Those who adopt the other plan push in the needle either slowly or suddenly.

To introduce the needle into the subcutaneous cellular tissue, the operator seizes a fold of the skin between the thumb and index finger of the left hand, so as to put it on the stretch, then he introduces the needle at the base of the fold at an angle of about 45° . This done, he lets go the fold of skin and steadies the canula of the instrument between the thumb and index finger of the left hand to guard against tearing of the tissues by any lateral movement, and with the right hand he expels the fluid by a rotating movement of the piston, or by pressing gently on the crown by which the piston is terminated externally.

If it is desired to inject the full contents of the syringe it must be done gradually, and it is also desirable to pause a few seconds at the fifth, tenth, and fifteenth divisions. The needle is withdrawn in the same direction in which it was inserted. It is necessary to apply the left index finger to

the point of puncture, to prevent the escape of the fluid or its soaking into the skin.*

It only remains to cleanse and if necessary to disinfect the instrument. To effect this it is always desirable to expel the last drops of fluid from the needle, and not to lay it aside without inserting the silver wire, or, better still, a pig's or boar's bristle.

If it is a matter of consequence to make use of well proportioned solutions, it is no less so to ascertain exactly the capacity of the syringe which is used. It must not be forgotten that, in spite of every care on the part of the instrument maker, syringes often differ from one another in their calibre.

To ascertain the capacity of a syringe, it should be weighed, first full of water and then empty; it should afterwards be ascertained by successive weighings that it is of equal calibre throughout,† the syringe containing a definite quantity of water for a certain number of rotations of the piston or of degrees on the barrel.

The syringes which are in most general use contain as a rule one gramme of distilled water (twenty drops).

Local accidents.‡ Like all other therapeutic measures, the hypodermic is not without its inconveniences. They arise sometimes from the drug itself or its excipient,

* Some authors, among others M. Le Moaligou, to prevent the fluid spreading to the deep surface of the skin where the vacuum is produced along the track of the needle, when it is quickly withdrawn, advise that slight pressure should be made for a few seconds above or below the point of puncture according to the direction in which the injection has been made—from below upwards or from above downwards.

† We ascertain thus the quantity in weight of fluid which is expelled by a given movement of the piston.

‡ The principal details given in this chapter are borrowed from an essay by a pupil of one of the authors; Coulombe, *Essai sur les accidents locaux des injections hypodermiques*. Thèse de Paris, 1872.

at others they are due to the inexperience or awkwardness of the operator.

The puncture may of itself be a source of *pain*, which is always slight and transient if the point of the canula is sufficiently sharp and small. Generally this accident is due to the operator, either because the point of the instrument has not completely penetrated the skin, or because the fluid has been injected too suddenly, or again, because the instrument, badly inserted, has torn the fibres of the connective tissue or has transfixed a nerve. *Want of cleanliness* of the canula, perhaps even of the operator, may give rise to serious troubles.

Slight *hæmorrhage*, sometimes caused by the puncture, is of little consequence and may be disregarded. May the same thing be said of the introduction of the canula and subsequent injection into a vessel? As a general rule it may, if the fluid is free from turbidity and non-irritating, and if the dose of medicine injected cannot be productive of poisonous results; for we know that in such a case absorption cannot keep pace with elimination.

Injection of air as a rule is of little consequence. It is quite otherwise, however, when fluid is *injected into the substance of the skin*. In this case besides the pain and the resistance which is offered to the passage of the piston down the syringe, we observe an elevation of the epidermis, closely resembling urticaria spots, and leaving behind, sometimes, a *superficial scar*.

A frequent accident, of less importance than the rest, is *ecchymosis*. This casualty is frequently due to the too great force with which the injection is made, but even with the utmost precaution it is possible to produce ecchymosis in a subject whose skin is delicate.

Too large a quantity of fluid injected at one point may also be the cause of pain, ecchymoses, scars, abscess, etc.

Some advise that the needle should be introduced deeply into the cellular tissue and then slightly withdrawn to make a channel for the fluid, but this proceeding is of doubtful utility. It has also been advised to expel the injection at the level of the superficial fascia (between the subcutaneous tissue and the muscular aponeurosis), the theory being that the fluid injected in this way diffuses itself better, that the fascia is not so sensitive, and that, by adopting this plan, there is little danger of the fluid escaping by the puncture. The advice is good, but it is difficult to carry it into practice.

Another cause of *pain* is the use of injection fluid *at a lower temperature than that of the body*. To obviate this, it is well to make use of solutions the temperature of which is about the same as the body temperature. This precaution is not often observed, and, let us add, without any appreciable injury to the patient.

The escape of part of the injection is due either to negligence on the part of the operator, or to the use of a canula with too large calibre.

If the *choice of situation* for making the injection is not without its importance in regard to absorption, it is not of less consequence in regard to those accidents which may supervene. As a general rule, the farther the injection is made from the trunk, the greater is the liability to local complications. Account must be taken, (1) of the irritation which the friction of garments, walking, manual work, etc., may cause at the punctured point; (2) of the greater or less looseness of the subcutaneous cellular tissue; (3) lastly, it is desirable to avoid, unless for some special reason, (*a*) the neighbourhood of great vessels; (*b*) highly innervated regions; (*c*) those parts where the skin is separated from the bone only by a thin layer of adipose tissue (as, for instance, over the

internal surface of the tibia); (d) the immediate neighbourhood of the joints, except in special cases.

Cachectic individuals, bleeders, diabetics and alcoholics, all subjects predisposed to sundry accidents, require the utmost care in the operative procedure. In another class of cases it is prudent to abstain from making hypodermic injections, or at least to use antiseptic precautions, as in instances of infectious disease, erysipelas, etc.

Accidents may arise from the powders, deposits, fungi,* and crystals which may be formed in too concentrated solutions,† which either exist from the first in the solutions or are developed later on. Finally, the medicine itself may be in fault, if it is only held in suspension, as in the case of calomel, or if it is little or not at all capable of absorption (accumulation of mercury [*emmagasinement*] of M. Luton).

We will not enlarge more on the accidents due to the irritating properties of the liquids or of the substances in solution. Full details will be found in the several notices on particular remedies, as well as in the sections on *Local accidents* and *Solutions*.

A few rare cases of *tetanus*, which were attributed to injections of sulphate of quinine, have been published, but these observations do not appear to be free from cavil.

Injections should never be made on the nose, ears, eyelids, different parts of the neck, scrotum, axilla, groin, fingers, etc., nor on œdematous regions or parts which are the seat of stasis, inflammation, or extravasation.

The local troubles which have occurred, more especially

* Many solutions should be prepared when required; some may be kept an indefinite time by taking the precaution to add a few drops of salicylic or carbolic acid in solution.

† It is sometimes possible in this case to restore the solution to its original condition by heating it in a water-bath at the temperature of the body, but it must not be forgotten that too concentrated solutions of certain salts often give rise to inflammatory troubles.

in the infancy of this method, have often been due to imperfections in the instrument employed, to undue size of the canula, to the irritating property of the drug, and to the faulty performance of the operation. All who have had considerable experience in hypodermic injections find that the number of these accidents diminishes with practice.

TO THE READER.

We thought it would be useful to devote a special paragraph to a resumé of the physiological effects of each drug. We have consulted the best works which have been published down to the present time, avoiding, as far as possible, controverted points. We have often had to quote facts which are as yet somewhat obscure; but we must remark that if, in such cases, our explanation is not quite satisfactory, the fault lies in the contradictory results obtained by various physiologists, either because the substance experimented on by them has not been chemically identical, more or less pure, or unstable, or, perhaps, because of the erroneous interpretation of physiological experiments.*

Many of the formulæ in this Manual must be entirely abandoned. Some leave much to be desired in regard to their composition, or, on the other hand, possess such irritant properties that they cannot be employed; others rank as poisons or have been insufficiently investigated; nevertheless, we did not deem it right to pass them over in

* "I have always for my part, strenuously opposed this deplorable tendency to apply prematurely to pathology the still uncertain deductions of experimental physiology."—*Vulpian*.

silence, (1) because they possess an historic interest, (2) because they may throw light on future investigation.

In all quotations, to avoid responsibility, we have been careful to append the names of authors. When we have made original investigations we have stated our own results in detail. Finally, we are responsible only for a comparatively small number of formulæ.

We may make this general observation, that the practitioner should not depend merely on the normal physiological effects of poisonous solutions, but that he should also in each individual case, and above all in the case of alkaloids, bear in mind that a drug which is not eliminated may induce disastrous results: thus, the administration of active drugs in renal affections should be always guarded against.

We do not deny that, in spite of our utmost care, our undertaking is still imperfect, the field traversed by us embracing, as it does, nearly every therapeutic agent. In order that this work may be rendered more accurate we appeal to all our readers, and assure them that we shall welcome any correction, of whatever nature it may be, provided of course that it is well founded; corrections of names, dates, etc., as well as any criticism or communications regarding fresh discoveries, and we promise to find room for them, if possible, in a new edition.

We have purposely omitted any reference to injections which exert a purely local effect, to alterative interstitial or parenchymatous injections, which, properly speaking, do not fall within the scope of the hypodermic method. Intravenous medicinal injections, as well as injections into the serous and other cavities, and transfusions, do not find a place in this work.

MANUAL
OF
SUBCUTANEOUS INJECTIONS.

A.

ACIDUM ARSENIOSUM. ARSENIOS ACID. (See
Arsenium).

ACIDUM BENZOICUM. BENZOIC ACID.

This acid is slightly soluble in cold water* (1 in 200), more so in boiling water (25 per cent.), in glycerine (10 per cent.): very soluble in alcohol, ether, and spirits of turpentine.

Principal physiological effects.—Arrests fermentation and putrescence. Is eliminated by the perspiration, saliva (as succinic acid), the kidneys (as hippuric acid), and the lungs (when the dose exceeds 15 to 30 grains).

In this dose (which is considerable) it gives rise to no remarkable phenomena. According to Schreiber, in doses of about four drachms, it induces feeling of weight in the head, increased rapidity of cardiac contractions, increased perspiration, and the expectoration of large quantities of mucus. (Benzoic acid is chiefly used as an expectorant and as an excitant).

* [According to Squire (*Companion to Pharmacopœia*, 13th edit., p. 16) borax aids its solubility in cold water—one of borax and one of acid being soluble in 100 of water. *Trans.*]

Local effects.—The solution employed by Rohde caused great pain, but even the strongest solutions, in his hands, never gave rise to abscess or ecchymosis.

Formulæ.—The solution used by Rohde in a case of nephritis with threatened uræmia (1871) was as follows:—

Benzoic acid	.	.	.	10 grains
Alcohol	.	.	.	up to 112 minims.

Dose from 8 to 16 minims (about $\frac{3}{4}$ of a grain to a grain and a half of benzoic acid). Both solution and syringe should be warmed to a temperature of 95° F.

In a case of pneumonia with difficult expectoration, unconsciousness, stertorous breathing, cyanosis, small and frequent pulse, the same author obtained a rapidly favourable result from eight injections in one hour of this solution. About seven grains altogether were injected.

Alcoholic solution of benzoic	} of each 12 minims			
acid (1 to 12)				
Alcoholic solution of camphor				
(1 to 12)				
Alcohol	.	.	.	up to 144 minims.

A syringeful or 16 minims repeated several times (Leyden and Rabow). The solution of camphor in the formula may be increased to 18 minims (Rohde).

We have had occasion to make use of this solution, as well as of the following, several times, neither of them seeming to excite any pain; but it is right to observe that we were treating a case of epilepsy with dementia, and it is probable that the sensibility was dulled. A solution containing equal parts of benzoic acid and camphor caused indurations which persisted for several days; and a solution of benzoic acid in equal parts of alcohol and water produced sometimes puffiness and redness of the skin, at others abscess.

Benzoic acid	.	.	.	25 grains
Alcohol	.	.	.	160 minims
Distilled water	.	.	.	up to 320 minims.

Warm the fluid to 95° F., to insure complete solution of the benzoic acid, and inject at intervals of five minutes, 64 minims in all of the solution (1¼ grains of benzoic acid in each syringeful).

Rohde has employed this solution without success in a case of uræmia.

Therapeutic uses.—In pneumonia, typhus, uræmia, collapse, etc. Benzoate of soda, which is soluble in two parts of water, appears to be possessed of more active properties than benzoic acid, but we do not think it has been administered hypodermically as yet. It has been administered in doses of four scruples to six drachms in diphtheria, phthisis, puerperal fever, etc. [Benzoic acid has been also recommended in the treatment of chronic bronchitis, cystitis, and gout. See Brunton's *Pharmacology and Therapeutics*, p. 880. Neale's *Digest*, 393-5. *Trans.*]

ACIDUM CARBOLICUM. CARBOLIC ACID.

(PHENOL, PHENIC ACID). PHENATES.

Carbolic acid (C_6H_5HO) is closely allied to the alcohols, soluble in 50 parts of water (chemically pure acid is soluble in 20 parts, Binz-Hager),* and in all proportions in alcohol, ether, sulphide of carbon, and glycerine.

Absorption is rapid even through the unbroken skin (Husemann, Hoppe-Seyler). Elimination is rapidly ef-

* Concentrated aqueous solutions can be prepared by mixing equal parts of carbolic acid and glycerine, when water may be added in any proportion.

fectured through the skin, lungs (with characteristic odour of the breath), and the kidneys. In the urine we find carbolic acid transformed into phenol-substitution products:— (a) if introduced into the body in small quantities under the form of sulpho-carbolic acid (phenol-sulphate), non-toxic; (b) if it has been injected in large doses, in the form of another phenol-substitution product, the nature of which has not yet been ascertained (Baumann).

The urine, without necessarily being largely charged with carbolic acid (Saikowski), often assumes a greyish green colour, more especially after absorption from the skin or from a wound; sometimes, but rarely, there is albuminuria, especially after large doses.

Principal physiological effects.—Antiputrescent and anti-fermentative. In a dose of seven grains, it produces in man no serious result. In doses of from seven grains to half a drachm the effects are general excitement, then stupor, vertigo, humming noises in the ears, deafness, languor, sweats, diminution of the pulse rate, fall of temperature, colic, diarrhoea.

In poisonous doses, vertigo, giddiness, tinglings in the fingers, intoxication, delirium, stupor, analgesia, anæsthesia, muscular debility, intermittence and then arrest of the heart in diastole; rarely convulsions, contrary to what we find in animals, collapse, coma, death.

Antidotes.—Saccharated lime (Husemann); sulphate of sodium and other sulphates (Baumann); inhalations of oxygen, bleeding, transfusion (Ferrand).

Local effects.—Sensation of burning, disappearing generally after half an hour; in moderately large doses (Hueter's 2 per cent. solution) production of small ecchymoses, but without abscess.

Carbolic acid	.	.	.	1 grain
Distilled water	.	.	.	up to 112 minims.

Dose, eight to sixteen minims = $\frac{1}{14}$ to $\frac{1}{7}$ of a grain of acid. (*Formulary of Vienna clinique*).

Carbolic acid	.	.	.	2 grains
Distilled water	.	.	up to 112 minims.	

Hueter (erysipelas),* Hirschberg, Aufrecht, Schnitzler (phthisis), Fleischmann (prurigo).†

Carbolic acid	.	.	.	1 grain
Distilled water	.	.	up to 80 minims.	

This solution has been used in traumatic erysipelas; five or six injections of 16 minims are made into the healthy skin around the erysipelatous patch at a distance of 1 centim. (0·39 of an inch) from the red margin and at several points; they are repeated a second time in the same day, and the treatment is pursued until fever subsides and there is arrest of erysipelatous inflammation (duration 3 to 4 days). We have seen it employed with success at Strasbourg, in the practice of M. E. Bœckel.‡

Carbolic acid	.	.	.	.	1 grain,
or	„	„	.	.	3 grains,
or	„	„	.	.	5 grains
Distilled water	.	.	.	up to 112 minims.	

The above solutions have been employed by Jessier (1868) in cases of intermittent fever.

Sulphate of Quinine	.	.	1 grain
Sulphuric acid	.	.	q.s.
Boiling water (!!)	.	.	90 minims.

* Four half syringefuls (32 minims) in the healthy skin round the erysipelatous spot.

† Eight to sixteen minims at the affected part:—one injection every second or third day: total number 3—15.

‡ In an article published in the *Gazette Médicale de Strasbourg*, May, 1875, M. E. Bœckel concludes by saying that these injections often allow of the arrest of severe attacks of erysipelas in two days. Nevertheless, he records in this same article one case of death.

Allow to cool and then add :—

Carbolic acid 4 grains.

Lente has injected 18 to 24 minims and more of this solution without causing abscess.* Carbolic and salicylic acids are in this way often employed to prevent decomposition of hypodermic fluids.

Carbolate of ammonia has been used as a hypodermic injection in typhoid fever (Déclat).

Therapeutic uses.—Intermittent fevers (Jessier,† Déclat, Hueter, Hirschberg, Aufrecht, Motta,‡ etc.); prurigo (Rezek, Fleischmann);§ diphtheria (Trotz, etc.); phthisis and tuberculosis (Schnitzner, Eliacopulos); crural neuralgia, pleuro-pneumonia (Hagen, Kunze); various neuralgiæ (Schrumpf); typhoid fever (Déclat); diabetes, malignant pustule, carbuncle, malignant œdema (Raimbert, Méplain, Verneuil, Trélat, (solution 1 in 50), Marchisio (1879), Giovannetti, Maffucci (1881), etc.); nævus (Badley); acute articular rheumatism|| (Bergonzini, Senator, Kunze and Golbaum); puerperal diseases (Chiarleoni, unsuccessfully); anthrax (Olavide); Ludwig's angina (parenchymatous injection of 2 per cent. solution).

* The formulæ that appear to us most suitable, are those used in the clinics of Vienna, of Hueter, and especially of M. E. Boeckel. Five per cent. solutions are too strong for hypodermic use.

† The observations of Jessier (15 recoveries out of 26 cases) date from 1868; those of M. Déclat, dating from 1869, were published in 1873. M. Ghisiani-Durant wrote in 1884, that he had employed carbolic acid with success hundreds of times in marsh fever (*New York Medical Journal*, vol. xi., p. 614).

‡ The Lisbon professor made injections into the back and splenic regions without general or local mishaps (25 cures, 8 failures). He preferred carbolic acid to sulphate of quinine, especially in hospital practice.

§ Twenty drops of a one per cent. solution.

|| Injections made in the neighbourhood of affected joints; salicylic acid and salicylate of soda *per orem* are preferable to carbolic acid hypodermically.

Skibnewsky's formula.

Carbolic Acid	.	.	.	.	1 part
Distilled water	.	.	.	} of each 2 parts.*	
Alcohol	.	.	.		

ACIDUM CHRYSOPHANICUM OR CHRYSAROBIN.
CHRYSOPHANIC ACID.

Extracted from Goà powder, a product of a tree found in India and Brazil, belonging to the family Leguminosæ. It occurs in the form of yellow needle-shaped crystals, and belongs to the group of the phenols. This acid,† at first only used externally (Balmanno Squire, 1878, etc.), has been administered internally since 1881. It is almost insoluble in water, soluble in hot alcohol (224 parts of alcohol at (186·8°F.), benzol, vinegar, vaseline, acetic acid, and very soluble in alkalies.

Chrysarobin is the principle contained in the Goà powder from which chrysophanic acid is extracted by oxidation. These two bodies differ from one another, but either name is often used to designate the acid.

Principal physiological actions.—Loss of appetite, nausea, vomiting, rigors followed by heat, vertigo, sensation of burning and constriction at epigastrium, diarrhœa; intolerance of the drug in different doses varying with the subject, and according to the degree of habituation. The medium dose is about one-seventh of a grain daily for children, and about half a grain daily for adults (Stocquart).

Local effects.—Even in very weak doses ($\frac{1}{70}$ grain and

* [This is obviously only intended for use in such cases as carbuncle and malignant growths. *Trans.*]

† [It is not properly speaking an acid, but a mixture of proximate principles (Brunton). *Trans.*]

under), chrysophanic acid often causes suppuration, lancinating pains, and swelling.

It was first used hypodermically by Stocquart, of Brussels,* and with success in eczema, lichen, prurigo, psoriasis and urticaria. Its action would be more rapid and as effectual administered externally, or internally by the stomach; moreover, the accidents resulting from the use of subcutaneous injections of this drug only permit of recourse being had to it in extreme cases, and in minute doses ($\frac{1}{560}$ to $\frac{1}{140}$ of a grain); it is important also to avoid injections into parts susceptible of injury, *e.g.*, the nape, etc.

Chrysophanic acid	.	.	$\frac{1}{2}$ to 1 grain
Distilled water	.	.	2 oz. 160 minims.

ACIDUM HYDROCYANICUM. POTASSII CYANIDUM. AQUA LAURO-CERASI. HYDROCYANIC ACID. CYANIDE OF POTASSIUM. CHERRY LAUREL WATER.

Hydrocyanic acid is soluble in water and alcohol in all proportions. Cyanide of potassium is readily soluble in water, in alcohol, and in glycerine (32 per cent.).

Principal physiological effects.—Bitter taste, feeling of heat, burning, and then numbness of the tongue, pharynx, and stomach; salivation; increase in number of respirations, which become most painful; elevation of blood-pressure, slowing of the pulse, spasmodic phenomena.

* Stocquart, "L'acide chrysophanique administré par les voies stomacale et hypodermique dans le traitement des maladies de la peau." (*Annales de dermat. et de syphiligr.*, Janvier, 1884, p. 15).

In larger and poisonous doses, nausea, vomiting, cephalalgia, giddiness and fainting; difficult respiration* (slow or frequent), dilatation of the pupils, lowering of blood-pressure and temperature, feeble then imperceptible pulse; general tonic and clonic spasms; sensory and motor paralysis; coma and death by asphyxia. Cyanide of potassium is much less potent than hydrocyanic acid; it possesses similar properties and is prescribed in doses of from one-seventh to three-quarters of a grain, cautiously increased to two and a half or three grains.

Local effects.—Distilled cherry laurel water possesses distinctly irritating properties;† cyanide of potassium even in very feeble doses (one per cent.) gives rise to pain which is almost as severe as that which would be caused by the injection of an equal quantity of saturated solution of sodic chloride. It does not cause suppuration. Hydrocyanic acid has a somewhat irritating action similar to that produced by morphine. Cherry laurel water, recommended by Luton, is chiefly used as a vehicle for hypodermic solutions (see atropine, morphine, etc.); it forms perfectly clear solutions with morphine which will keep an indefinite time. Cherry laurel water of the German pharmacopœia contains one part of hydrocyanic acid in 1000; that of the French pharmacopœia less than half that quantity.‡

* [In poisonous doses paralyses the respiratory centre, and arrests internal respiratory changes. Brunton's *Pharmacol.*, pp. 199, 514. *Trans.*]

† Messrs. Dujardin-Beaumetz and Lailier have never met with mishaps from the subcutaneous injection of cherry laurel water; its irritating properties were found to be due to acidity from oxidation by contact with air.

‡ Dr. Bartholow has used prussic acid of the United States pharmacopœia hypodermically in doses of two to four drops. He thinks that four drops is too large and even a dangerous dose, and that it is prudent not to exceed that of two drops, which, however, may be repeated frequently, owing to the rapid elimination of the acid.

Medicinal hydrocyanic acid	. . .	10 minims
Distilled water	. . .	60 minims.

From two to six minims = $\frac{2}{7}$ — $\frac{6}{7}$ of a minim of medicinal acid.

Cyanide of Potassium	. . .	1 grain
Distilled water	. . .	up to 112 minims.

Therapeutic uses.—Mental diseases, especially puerperal mania (Macleod);* mania and melancholia (Macleod, Bartholow); eclampsia (Macleod); angina pectoris, gastralgia, functional vomiting (Bartholow). Cherry laurel water in doses of half a drachm, has been injected in lumbago by Estachy.†

Antidotes.—Preyer has asserted that atropine is a physiological antidote to prussic acid. The experiments of Bartholow do not support this view. [Inhalation of ammonia was shewn to be an antidote, as far back as 1822, by Murray, but it is of little or no use administered by the stomach. I would suggest that it may be an efficient antidote administered hypodermically or by intravenous injection. See Christison *On Poisons*, 4th edit., p. 777. *Trans.*]

ACIDUM OSMICUM. OSMIC ACID.

This acid, originally employed in the treatment of tumours by interstitial injection (Winiwarter, Delbastaille, etc.), has been employed by Billroth, Neuber, Eulenburg,

* [This author made use of Scheele's acid. French hydrocyanic acid for medicinal use is ten per cent. *Trans.*]

† [32 minims of aqua lauro-cerasi of the French Codex = 16 minims of the British Pharmacopœial preparation, or about $\frac{1}{3}$ of a minim of the acid. hydrocyan. B.P. *Trans.*]

Lipburger, Merces, and others, in the treatment of obstinate neuralgia with various results.

Crystallised osmic acid . . . 1 grain
 Distilled water . . . up to 112 minims.

The solution should be kept fresh in a vessel of black glass or lead. Prof. Eulenburg has not met with any instance of local or general disturbance from its use, but other authors have reported gangrene of the skin, œdema with greenish discoloration, etc.

Dose.—Eight to sixteen minims of this fluid may be injected = $\frac{1}{14}$ to $\frac{1}{7}$ of a grain.

ACIDUM PHOSPHORICUM. PHOSPHORIC ACID.

According to M. Michalski (*Thèse de Paris*, 1868), phosphoric acid has been employed hypodermically in the treatment of the hæmoptysis of phthisis.

ACIDUM SCLEROTINICUM. SCLEROTINIC ACID.

Sclerotinic acid, isolated from ergot of rye by Dragendorff and Podwisotzky, is a brown substance without taste or odour, faintly acid; it is hygrometric but is not deliquescent. The chief symptoms observed by Nikitin* after the administration of sclerotinic acid, which acts chiefly on the central nervous system, were paralysis, lowering of blood pressure, and enfeeblement of cardiac contractions (in cold-blooded animals); in acute poisoning, fall of

* Nikitin.—*Inaug. Dissert.* Würzburg, 1878, *Ueber die physiol. Wirkung und therap. Verwertung des Sclerotinsäuren Natriums und des Mütterkorns. Pharmakologie Untersuchungen* (Rosbach) Bd. II., Heft. I. and III., Würzburg, 1879.

temperature continuing until death; slowing of respiration and its total arrest, in the event of death, before cessation of circulation; increase in warm-blooded animals of peristalsis. Nikitin found, moreover, that sclerotinic acid induced uterine contractions, whether there was pregnancy or not, and strengthened already existing contractions. Before and during contractions he observed discoloration of the uterus. He attributes the hæmostatic action of sclerotinic acid in pulmonary hæmorrhage to diminution of blood pressure, whilst, in uterine and intestinal hæmorrhages, he thinks the same result is due to anæmia produced by vascular constriction which follows upon injection of the acid.

Rennert used it for hypodermic purposes in an aqueous solution of 1 to 2. These injections, he says, are extremely painful. The solution which M. Prévost of Geneva used, was composed as follows:—

Sclerotinic acid	.	.	3 grains
Pure Glycerine	.	.	44 minims
Distilled water.	.	.	up to 112 minims.

More recently M. Prévost has substituted with advantage carbolic acid for glycerine; the solution thus made keeps good an indefinite time. The formula is subjoined:—

Sclerotinic acid	.	.	.	3 grains
Carbolic acid	.	.	.	$\frac{1}{2}$ —1 grain
Distilled water	.	.	.	up to 112 minims.†

† In 1882 we employed this solution at the Bicêtre in the treatment of epilepsy in a certain number of cases; in doses of $\frac{1}{2}$ to $4\frac{1}{2}$ grains by hypodermic injection, the maximum dose being 9 grains, we observed neither local nor general accidents, and the pain was nil. The therapeutic results were negative in nearly all the cases; in five patients we observed slight amelioration. The duration of treatment varied from 6 months to a year. (See for further details: *De l'emploi de l'acide sclérotinique dans l'épilepsie*, par Bourneville et Bricon, *Progrès médical*, 24th May, 1884).

In these formulæ the Pravaz syringe of one gramme (16 minims) contains $\frac{3}{7}$ of a grain of sclerotinic acid; which is the quantity which Dragendorff and Podwisotzky indicated as the adult human dose.

According to the researches of Nikitin the smallest dose which produced uterine contractions in animals was 0.2 gramme (3 grains). The same author states the fatal dose for man at 155 grains.

Stumpf in the clinique of Ziemssen at Munich, at first employed sclerotinic acid in the doses recommended by Dragendorff and Podwisotzky, but finding this dose insufficient he raised it to 9 grains, repeated at the most 3 or 4 times a day (6 per cent. aqueous solution) by hypodermic injection. Kobert has administered sclerotinic acid in a dose of 16 grains daily. M. Sotschaw (1881) stated that he had obtained better results from the use of sclerotinic acid, in 5 per cent. solution, than from the injection of ergotin in uterine fibroma.

Recent experiments by M. Queirolo (*Italia Medica*, 1884, no. 25) shew that sclerotinic acid in doses of from $\frac{3}{4}$ grain to $2\frac{1}{4}$ grains hypodermically, or 3 ss to 3 j by internal administration, exerts no action on vascular calibre and does not increase the pulse rate. Ganguillet employs sclerotinate of sodium.

Therapeutic uses.—The indications for the use of this drug are the same as those for ergot of rye and ergotine.

[*A propos* of this subject see two important papers on the principles of ergot by Dr. Kobert of Dorpat (*Practitioner*, vol. 33, p. 409, vol. 35, p. 414). He describes 3 active principles in ergot, viz., ergotinic acid, sphacelinic acid, and cornutin. (1) Ergotinic acid is the active principle of Bonjean's extract, of Weenisch's dialysed ergotine, and of the sclerotinic acid of Dragendorff and Podwisotzky. It is 5 times as powerful as sclerotinic acid. Hypodermi-

cally injected it causes paralysis—beginning in brain and spinal cord—paralysis of vaso-motor centre, and lowering of blood pressure. In the largest doses it causes no uterine contractions, and it does not cause gangrene. About 90 per cent. escapes absorption. It is a glucosidic acid. (2) Sphacelinic acid in poisonous doses induces death with symptoms of gangrene. (3) Cornutin is not to be confounded with the ergotinin of Tauret. The latter is quite inert. The former induces uterine contractions both in pregnant and in non-pregnant animals, in non-pregnant animals it also causes vomiting, diarrhœa, and irregular pulse. Abortion could always be produced in dogs and cats by injection of cornutin ($\frac{1}{8}$ grain) without risk to the mother.

Cornutin acts reflexly on the uterus through a spinal centre; sphacelinic acid acts directly on the uterus itself. The latter in sufficient doses never failed to lead to expulsion of the fœtus in dogs and cats, and none of the mothers died. Kobert adds that the only rational preparation of ergot is one which contains all the cornutin and sphacelinic acid but no ergotinic acid; for the latter is very injurious to the stomach, and has no action on the uterus. *Trans.*]

ACIDUM SULPHO-ICHTHYOLICUM. (See *Ichthyol*).

ACIDUM TANNICUM. (See *Tannin*).

ACONITUM. ACONITINA. ACONITE. ACONITINE AND ITS SALTS.

Aconitine occurs in two forms, viz. amorphous and crystallised; it is inodorous, has a bitter taste, is insoluble in glycerine, slightly soluble in water, soluble in acidulated

water, alcohol, ether, chloroform, benzol. All its salts, especially the sulphate, are freely soluble in water.

Principal physiological effects.—Slowing of pulse and respiration, shooting pains in the first division of the 5th nerve, from its centric action on the bulbar region and the deep nuclei of the nerve (Mary); pricking and tingling sensations of the skin, especially of the face, round the nose, of the lips and extremity of the tongue; alteration of the sense of taste (saccharine substances recognised with difficulty); noises in the ears, vertigo, debility and languor.

In larger doses.—Intensification of these symptoms—sense of burning at tip of tongue, feeling of cold, of constriction of extremities, languor, somnolence, sense of weight in the head, pupillary dilatation, increase of urinary secretion, of sweat and of saliva; tendency to syncope.

In poisonous doses.—Nausea, vomiting, convulsions, fibrillary muscular twitchings, loss of the reflexes, motor inco-ordination; extreme prostration, complete anæsthesia, steady fall of temperature and pulse; inaudible voice, muscular paralysis and disappearance of muscular contractility coincidently with loss of motor nerve power* (Mary, *Thèse*, 1880); coma and death by asphyxia.

The *preparations* of aconite are very untrustworthy and their results are most uncertain; this uncertainty depends on the source of the drug and on the part used (preparations made from the fresh root are most active).

* This opinion contradicts the experimental results obtained by Asch-scharumow, Bohm, Gréhant and Duquesnel, Rabuteau, etc., who attribute to aconitine an elective affinity for the terminations of the motor nerves; in small doses, according to these authors, aconitine resembles in its action that of curare in large doses; it acts primarily on the heart (arrest in diastole).

Duquesnel's aconitine is the most active; that of the Germans is 20 to 50 times less powerful.* Aconitine and its salts should only be used with the utmost caution. The first dose should be no more than $\frac{1}{260}$ to $\frac{1}{130}$ of a grain, should scarcely ever exceed $\frac{1}{32}$ of a grain, and only with the utmost caution may be increased to $\frac{1}{13}$ of a grain (!) by degrees in cases where there is no sign of toxic effects.

[Martindale and Westcott (*Extra Pharmacopæia*, 2nd edit., 1884, p. 33) give the following scale of doses for internal administration— $\frac{1}{240}$ to $\frac{1}{60}$ grain—may be carefully increased up to $\frac{1}{24}$ of a grain. They recommend English aconitine (Morson's) which is intermediate in strength between Petit's, the strongest, and Friedländer's, the weakest (*Lancet*, 1882, vol. i., p. 578). Their formula for hypodermic use is subjoined. *Trans.*]

Antidotes.—Richardson has used with success hypodermic injections, and Wood has used, unsuccessfully, intravenous injections of ammonia in aconite poisoning. Finally, "even when the cardiac contractions are gravely affected or have actually ceased, it is possible to re-establish them by the artificial stimulus of electricity."—(Mary).

Local effects.—An alcoholic solution of sulphate of aconitine (1 in 500), first employed by Gubler, produces an in-

* In consequence of a case of poisoning, followed by death, from Petit's (Paris) nitrate of aconitine, Messrs. Plugge and Huisinga undertook experiments to determine the toxic power of various samples of aconitine nitrate. The nitrate of Petit, in white crystals, was hard and difficult of solution in cold water; that of Merk, a yellow-brown powder, was easily soluble in water; that of Friedländer in thick gummy masses, of greyish-white colour, was freely soluble in water. Their experiments shewed that Petit's aconitine was 8 times more poisonous than Merk's, and one hundred and seventy times stronger than that of Friedländer. The German samples of aconitine, moreover, were not always of the same quality.

tense sensation of heat, and occasionally a sense of burning which persists for a considerable time. This local action doubtless depends on the nature of the vehicle used for the solution.

Aconitine 1 grain
Sulphuric acid . . . a sufficiency to effect solution
Distilled water . . . up to 1 ounce, 80 minims.

Sixteen minims = $\frac{1}{35}$ of a grain of aconitine.

Nitrate of aconitine . . . $\frac{1}{2}$ grain
Distilled water . . . up to 2 ounces, 160 minims.

Sixteen minims = $\frac{1}{70}$ of a grain of the salt (Gubler, Mary). Erlenmeyer has used without success the following solution :—

Aconitine 2 grains
Alcohol 140 minims
Distilled water . . . up to 280 minims.

Each minim = $\frac{1}{140}$ of a grain.

Alcoholic extract of Aconite . . . 1 grain
Distilled water . . . up to 64 minims.

Lorent uses this solution in doses of from 4 to 10 minims in rheumatic cephalalgia.

[The following is Martindale and Westcott's formula—

Aconitine (English) . . . 1 grain
Diluted sulphuric acid . . . q. s.
Distilled water to . . . $\frac{1}{2}$ ounce.

Dose one to four minims. *Trans.*]

Therapeutic uses.—Neuralgia—especially of the trigeminal (Gubler); cephalalgia (Lorent, Oulmont, Massini); acute* and chronic rheumatism (Lorent, Eulenberg); arthritis deformans (Lobl); prosopalgia (Pletzer); angina pectoris; whooping cough, etc.

* Rendered superfluous by the introduction of salicylic acid.

Aconite and its preparations have, moreover, been recommended and used in cardiac hypertrophy, tetanus (Wunderlich), intermittent fever, and puerperal fever. In Geneva it is largely used at the beginning of certain acute affections of the respiratory organs, but to the best of our knowledge it has not been used hypodermically by any practitioners except Lorent, who administers the alcoholic extract.

ÆTHER. (See *Ether*).

AGARICINA. AGARICINE.

Agaricine, obtained from *Agaricus Albus*, has been extolled by Seifert, Piering and others, by whom it has been used to check excessive perspirations (phthisical and others) in doses of from $\frac{1}{14}$ to $\frac{2}{7}$ of a grain. It diminishes the frequency of the cough without inducing either nausea or diarrhœa. Sleep is more tranquil and uninterrupted. As its maximum of activity is only attained 5 or 6 hours after administration, it is necessary to give it at various times according to the nature of the disease under treatment. M. Seifert* has sometimes employed it hypodermically.

Agaricine	1 grain
Absolute Alcohol	90 minims
Glycerine	up to 224 minims.

An entire syringe-ful = $\frac{1}{14}$ of a grain, may be used at one time. Seifert discourages the use of agaricine hypodermically, because of the intense burning sensation which

* Seifert, *Ueber die Wirkung des Agaricin gegen die Nachtweisse der Phthisiker* (Wien. med. Woch., no. 38, 1883).

it causes, and also because it offers no advantage over administration by the mouth.

The doses recommended by M. Seifert have since been exceeded by several observers, but the results obtained were not constant. This substance is of much less therapeutic value than atropine.

[See an interesting paper by Dr. Murrell on Agaric in the *Practitioner*, vol. 29, p. 321. Administered *per orem* it is very apt to induce intractable diarrhœa. Dr. Murrell has found it of use in some cases of hæmoptysis. *Trans.*]

ALBUMEN. (See *Injectiones Nutrientes Hypodermicæ*).

ALCOHOL.

Alcohol has been used hypodermically both by itself and also as a vehicle. Without speaking of its use in surgical operations on certain tumours or cavities, alcohol has been largely used as a diffusible stimulant (Zuelzer), in the treatment of local pains (Luton), or as a hæmostatic (Luton).^{*} It produces at the point of contact a smarting sensation which speedily subsides. For hypodermic use, alcohol at a temperature of 90° F. is best. At a higher temperature there is risk of burning the tissues, and, even at this temperature, if the injection is made too near the extremities there is the same risk. At a lower temperature the fluid tends to diffuse and its local effects are proportionately less intense, but then one is administering a stimulating injection with a general action. The doses must be calculated according

* We have not found it superior in action to a saturated solution of sea salt.

to the results that are aimed at: no definite doses can be fixed (Luton).

Alcohol injected under the skin is a good rubefacient, and particularly so at a temperature of 122° F. Its contact is not very painful and it produces neither abscess nor sloughs.

Flood made more than 200 injections of whiskey and coffee in four hours in a case of opium poisoning with complete success; at the same time he injected belladonna tincture in doses of 10 to 20 minims. Ainsworth (1881) injected half a drachm to a drachm of brandy in cases of collapse.* Breisky and Figuero injected brandy with good results in cases of acute anæmia due to puerperal hæmorrhage or traumatism. In short the principal indications for the use of alcohol are found in severe cases of anæmia, in collapse, and in localised pain.

ALCOHOL AMMONIATUM. AMMONIATED ALCOHOL WITH ANISE. AMMONIACAL SOLUTION OF ANISE.

Zuelzer of Berlin has combined alcohol with ammonia in the following formula:—

Essence of anise	.	.	.	.	10 minims
Alcohol at 85°	.	.	.	.	40 minims
Solution of Ammonia	.	.	.	.	50 minims.

Fifteen to thirty minims of this solution in adynamic typhus. He has observed sometimes small abscesses as a result of this injection. Eulenburg has employed injections of ammonia and anise with slight success in several cases of collapse; he injected 5 to 7 drops of ammoniated

* Edward Waren used hypodermic injections of brandy in 1867.

solution of anise, sometimes by itself, at others mixed with an equal quantity of distilled water.*

ALOEES. EXTRACTUM ALOES. ALOINA. ALOES
AND ITS EXTRACT. ALOIN.

M. Luton has had occasion to make use of a watery solution of aloes. This was a solution of one-tenth and contained only those principles that are soluble in water.

Aloes 10 grains
Distilled Water up to 112 minims.

Filter.

16 minims = $1\frac{1}{2}$ grains.

The local effects were almost nil or limited to a simple local hyperæmia which speedily vanished. The injection produced a decided laxative effect on a patient suffering from constipation in typhus: sixteen minims were injected under the skin of the fore-arm. An alcoholic preparation, or better still, one made with glycerine, would be preferable to that made with water. Solutions of the extract of aloes are of no use owing to the local irritation which they produce.

The aloin of Merck, a glucoside soluble in water and alcohol (Stendouse),† has been employed by M. Fronmüller in aqueous solution (1 in 25), as a cathartic, without any local disturbance; its action is obtained in from 3 to 5 hours, except in cases of obstinate constipation. M. Fronmüller thinks that it is indicated in cases of gastric catarrh, cancer, and insanity.

* We have used this injection twice only, but without local troubles.

† Fronmüller, *Ueber Abführen auf subcutanem Wege* (*Memorabilien* xxvii., Feb., 1882).—Aqueous solutions of extract of aloes and of decoctions of senna cause local inflammation.

Dr. Klein alleges that aloin diminishes inflammation and intraocular pressure in glaucoma, acute keratitis, etc. Subcutaneous injections of aloin and of watery extract of aloes have been administered, hitherto without success, by Kohn* in the constipation of insanity. After the injection of strong doses of aloin in animals he observed a hæmorrhagic ulcerative gastritis, and changes in the kidneys resembling those which ensue on poisoning by chromium salts. M. Hiller has experimented with a solution of 16 grains of aloin in 48 minims of warm glycerine: [one to two syringefuls of this solution at one time produced, 5 to 6 hours afterwards, a moderate purgative action with abdominal pain (see SODIUM, foot-note). M. Bozzolo of Turin (1883) was compelled to abandon these injections owing to the severe local disturbances to which they gave rise.

AMMONIÆ LIQUOR. FLUID AMMONIA.

Ammonia has been used hypodermically along with its internal administration, in the treatment of bites by venomous serpents: 30 minims diluted with an equal quantity of water, or, better still, one part of ammonia with four parts of water (Nothnagel and Rossbach). Dr. Willis Cumming has used ammonia injections in a case of alcoholism complicated with sunstroke (1883). Halford and Oré have practised intravenous injections of diluted ammonia in severe cases of serpent bites.†

Monteverdi‡ has used it with equal parts of peppermint

* Kohn, *Zur Wirkung der Aloes* (Berlin. *Klin. Woch.*, xix., no. 5).

† [The translator has used 4 minims of liq. ammoniæ with 6 of water by intravenous injection in syncope from uterine hæmorrhage in several cases with marked and immediate benefit].

‡ Quotation by Eulenburg. Bourguet in 1862 injected dilute ammonia into a pseudo-arthritis of the thigh.

water in a severe case of cholera, and this treatment was successful. M. Trusevich has used fluid ammonia in cases of collapse, both by hypodermic and intravenous injection (2 to 5 minims of dilute ammonia). These preparations had previously been used by Halford, Penfold, Moceiben, Tibbis, Davidson, Cotton, Flint, and others. M. Hirsch of Mayence has used injections of hydrosulphate of ammonia (Schwefelammonium) in the treatment of cholera. This author asserts that he has used it with success, but the theory upon which his treatment was based is quite untenable.

Liq. ammon. sulphurat.	.	.	.	1 dr.
Aquæ destillat.	.	.	.	3 drs.

A solution of equal parts produced sharp pain (sense of burning lasting an hour) and inflammatory phenomena.

Richardson, in a case of poisoning by tincture of aconite (see ACONITE), made an injection of ammonia after the pulse had ceased for ten minutes. This injection (about 40 minims) was repeated 4 times at intervals of ten minutes; four days afterwards all trace of poisoning had disappeared. There was observed at one point of injection a small patch of sloughy skin.

Valerianate of ammonia has also been used hypodermically.

Ammonia and its salts are characterised by such excitant and stimulant properties that they are of the greatest service in the treatment of collapse in the most diverse diseases.

AMMONIA, CITRATE OF. (See *Ammonio-citrate of Iron-pyro-phosphate*).

AMYL, NITRITE OF. (See *Nitris Amyl*).

ANTIHYDROPIN.

Antihydropin is obtained from the *Blatta Orientalis* (cockroach), and is used by the Russians for dropsy.* It has been administered hypodermically by Wyschinski, but with negative results. M. Bogomolow (*St. Petersburg med. Wochenschrift*, 1882, no. 47, p. 404) has used it both as powder and as tincture in 70 cases of anasarca and ascites (cardiac, renal and hepatic affections); in 19 cases there was profuse perspiration, in 61 there was increase of urinary secretion, and in 13 cases catharsis, without irritation or other ill-effects, was induced. In uræmia the author injects a syringe-ful (Pravaz) of tincture.

ANTIMONIUM TARTARATUM. . (See *Emetic, Tartar*).

ANTIPYRIN.

An alkaloid derived from quinoline. The hydrochlorate of antipyrin exists in the form of white powder, of a greyish-yellow colour after exposure to the air, soluble in cold water (16 grains in 1 drachm), more soluble in warm water (16 grains in 10 minims), and in alcohol. It has a bitter taste, less disagreeable and less persistent than that of quinine.

A powerful antipyretic, its properties are identical with those of Kairin, but its action is both more intense and more prolonged, and it produces no alteration in the blood (Huchard, Brouardel and Paul Loyer, Arduin); in the period of reaction there is no sign of rigors, that is when the temperature increases again. It produces sometimes a

* [*Neale's Digest*, 2nd edit., § 156-5. *Trans.*]

moderate amount of perspiration,* vomiting, pharyngeal constriction, and a peculiar exanthem (Pribram, Cahn, and others), but collapse has never been noticed. Antipyrin is possessed of antiputrescent and hæmostatic properties (Arduin, Hénocque). Elimination is by the kidneys and it may be detected 36 hours after its administration (Maragliano).

Antipyrin arrests the fermentation of yeast, and germination (Brouardel and Paul Loyer).

The different results obtained are probably due to varying samples.

Doses.—M. Filehne, who first experimented with antipyrin, gave it in doses of 75 to 90 grains in three instalments at intervals of an hour; other authors have given as much as 135 to 155 grains. It is, however, prudent only to increase the dose by degrees in case of any accident from collapse. In children, Messrs. Penzoldt and Sartorius advise to give at first every hour as many decigrammes as there are numbers of years (a decigramme = $1\frac{1}{2}$ grains). The antipyretic effect would be more rapid and intense after hypodermic administration.

Used by a great many observers, it has chiefly been employed in the treatment of the symptom "fever"; Ranke (1884) was the first to use it hypodermically; he injected from 1 to $1\frac{1}{2}$ c.cm (16 to 24 minims) of solution of one gramme (16 grains) of drug in 8 minims of water. The solution when warmed retains its limpidity after cooling. Made in the gluteal region, these injections only cause transient pain without any inflammatory reaction.

Erb, Hoffer, Huchard, Niepce, Mingazzini, Roussel, and Pàvay, also used hypodermic injections. The first three gave them up on account of the intense pain they caused,

* According to M. Huchard sweats do not occur when the antipyrin is given in divided doses (7 to 8 grains).

the others still continue to recommend them. The solution of M. Mingazzini contains 16 grains in 48 to 64 minims of distilled water; that of M. Huchard is composed of equal parts. The latter has found that the hypodermic method is somewhat painful; in his opinion it yielded less satisfactory results than that by internal administration.

M. Pàvay used a 50 per cent. solution; he has injected three Levin syringefuls (capacity 40 minims) in one hour, or 54 grains of antipyrin. The effects are rapid. After each injection he manipulates for a few minutes the injected part (the gluteal muscles). He has never met with local accidents (sensation of burning, pain, or inflammation); he thinks, moreover, that these injections should invariably be resorted to when from any cause administration by the mouth is inadmissible.

APOCODEIN AND APONARCEIN (HYDROCHLORATES OF).

Hydrochlorate of apocodein (apocodein differs from codein in having one equivalent less of water) is soluble in water, uncrystallisable and precipitable by excess of acid. $[C_{18}H_{19}NO_2]$, a product of the action of chloride of zinc on codein. It is amorphous and has emetic properties. "Sydenham Society's Lexicon." *Trans.*]

Hydrochlorate of apocodein	.	3 grains
Distilled water	.	up to 224 minims.

Sixteen to twenty-four minims = $\frac{1}{5}$ to $\frac{1}{3}$ of a grain. The emetic effect is produced in a few minutes and without fatigue to the patient (Dujardin-Beaumetz). The therapeutic properties of apocodein are the same as those of

apomorphine but to a less degree (Dujardin-Beaumetz). The hydrochlorate of aponarcein is an emetic, but is not in use.

APOMORPHINÆ HYDROCHLORAS. APOMORPHINE
HYDROCHLORATE.

Apomorphine only differs from morphine in having one equivalent less of water. The hydrochlorate is alone used.

Principal physiological effects.—Feeling of weight at the epigastrium; slight headache, acceleration of pulse and respiration, salivation, perspiration, nausea and vomiting. A feeling of comfort rapidly ensues followed by sleep. “Its action is direct on the nerve centre which excites vomiting, and not, as some allege, reflex, whilst its elimination is effected through the gastric glands” (David). Section of the vagi in animals does not in any way modify the action of apomorphine (Vulpian, Harnack, Riegel, David); paralysis of these nerves, induced by atropine, appears on the other hand to diminish its action (David). A condition of almost complete and prolonged asphyxia has no influence on the activity of apomorphine (David). The hydrochlorate has no effect on the secretion of bile in dogs (David). In some animals it exercises an excitant effect which is peculiar to them. This action is centric. The animals which are thus affected do not possess the power to vomit (hare, guinea-pig, rat), or offer a peculiar resistance to the vomitive effect of apomorphine (Harnack, David). In poisonous doses it produces coma, paralysis, loss of the reflexes, etc. (Kohler, Quel).

Local effects.—Hypodermic injections of hydrochlorate of apomorphine have never caused any local disturbance; at the most there have only been observed occasionally

small subcutaneous indurations which rapidly disappeared. The pain is nil or almost nil.

*Doses.** — The emetic doses used hypodermically by various authors are $\frac{1}{16}$ of a grain (Gee), $\frac{1}{13}$ of a grain for an adult, $\frac{1}{43}$ of a grain for a child (Pierce); $\frac{1}{11}$ to $\frac{1}{9}$ of a grain (Siebert, Boehm); $\frac{1}{14}$ to $\frac{1}{7}$ of a grain (Harnack); $\frac{1}{8}$ of a grain (Loeb); $\frac{1}{6}$ of a grain for an adult, $\frac{1}{8}$ for a woman and $\frac{1}{12}$ for a child (Bourgeois); $\frac{1}{7}$ of a grain (Routy); $\frac{1}{16}$ of a grain (Prévost, David); $\frac{1}{7}$ of a grain (Carville, Bourneville). [In one case a fifteenth of a grain caused great prostration. See New Sydenham Society's Lexicon, *Art. Apomorphia. Trans.*]

Hydrochlorate of apomorphine should only be used with the utmost caution in consequence of the peculiar tendency to syncope and collapse which it induces in some subjects (David). The majority of works on therapeutics, and the formulæ of many authors, give as the emetic dose $\frac{1}{7}$ of a grain and even more (Dujardin-Beaumetz, *Clinical Therapeutics*, up to gr. $\frac{1}{4}$) This dose is decidedly dangerous; no emetic has given rise, regard being had to the frequency of its use, to so many cases of collapse and syncope (cases of Riegel and Boehm, Dujardin-Beaumetz, &c.). A dose of $\frac{1}{18}$ of a grain is sufficient for an adult when the preparation is of good quality, and even with this dose Messrs. Prévost and David have observed an instance of alarming collapse in a woman. Loeb has seen collapse after a dose of $\frac{1}{35}$ of a grain in a child.

As the emetic doses vary according to the nature of the apomorphine employed, it seems advisable, as has been suggested by M. Prévost, to test its physiological action before administering it to the human subject.

Mode of use and formulæ.—According to many authors,

* We only give here the doses for hypodermic use; the doses for internal administration are larger.

apomorphine in solution is very unstable ; it has therefore been recommended to be dissolved when required for use. Our friend, M. David,* in his interesting work, undertaken in conjunction with M. Prévost of Geneva, from which we have borrowed largely, speaks as follows of hydrochlorate of apomorphine obtained from M. Duvernoy. "It dissolves with difficulty in cold, rapidly in luke-warm water. The solution after the lapse of a few minutes assumes a green tint. This colour deepens, but without any impairment of the physiological effects of the solution. Our solutions after a year's use shewed no signs of alteration, although we had not adopted any particular precautions. The change of colour is alone noticeable. Our oldest solution is of a dirty emerald green, bordering on yellow ; it is neutral in reaction and its physiological properties have not altered from the first day down to the present time. The solution which we use is $\frac{1}{35}$ of a grain of hydrochlorate of apomorphine in 16 minims of water."

The strength of solution recommended by different authors varies greatly, but a one per cent. solution is most generally used, thus :—

Hydrochlorate of apomorphine	1 part
Distilled water	100 parts.

[Martindale and Westcott give the following formula:—

Hydrochlorate of apomorphine	2 grains
Camphor water	100 minims.

Dose.—2 to 8 minims. *Trans.*]

Bourgeois made use of dilute alcohol and distilled water as a solvent. Some add occasionally a few drops of hydrochloric acid to clear up concentrated solutions.

* *Contributions a l'étude physiologique du chlorhydrate d'apomorphine*, Lausanne, 1875.

M. C. Paul uses glycerine as a solvent. A few drops of acetic acid are sometimes added to preserve the solution, as in the following formula:—

Hydrochlorate of apomorphine	2 grains
Distilled water	220 minims
Dilute acetic acid	3 minims.

(Kolner, 1882).

Therapeutic uses.—Hydrochlorate of apomorphine is prescribed chiefly as an emetic and expectorant (Juraz). Messrs. Riegel and Boehm have strongly recommended its use in children (!). Eichberg (according to Eulenburg) used it with success in an infant $2\frac{1}{2}$ years old suffering from convulsions connected with gastric disturbance; 8 minims of solution ($\frac{2}{3}$ of a grain in 100 minims) in distilled water; gastric diseases and obstruction (Worms, Vulpian, Bourneville); various forms of poisoning (morphine, chloral, and chloroform excepted);* in threatened asphyxia; croup (Chouppe), pneumonia, tonsillitis, and broncho-pneumonia (Dujardin-Beaumetz, Jürgensen), laryngitis stridulus, foreign bodies in œsophagus (Verger); severe hæmoptysis (Zuber, C. Paul), mania (Marthe), hystero-epilepsy (Challand, Laurencin, Gowers, Sabatowsky), emphysema with bronchitis (Vulpian, Rowty, Worms), angina tonsillaris (Zuber, Vulpian, Rowty), croup and diphtheria (Alvis, Monti), influenza (Bourneville), epilepsy (Riegel, Vallender, &c.).†

* As morphine delays the development of the action of apomorphine, and as chloroform and chloral injected intravenously delay the action until awakening occurs, it would be useless—nay more, dangerous—to administer hydrochlorate of apomorphine in poisoning by morphine, chloral, and chloroform, owing to the time which would be lost, if the poisoning were sufficient to produce anæsthesia and muscular relaxation (David).

† Vallender quotes three cases of epilepsy with aura in which subcutaneous injections of apomorphine brought about cessation of the fits.

AQUA DESTILLATA, AQUA. DISTILLED AND NATURAL WATER.

Distilled water is the vehicle in most general use for the preparation of hypodermic solutions, and it is besides the best in all cases when its use is admissible. It has also been administered hypodermically by itself. Its use was proposed in the treatment of cholera by Cantani in 1865,* Michaël in 1879, and M. Beigel who injected it in considerable quantities in this disease in 1866. In the last epidemic of cholera at Yport in 1884, M. A. Bottard made use, with varying results, of the following solution.

Filtered sea-water . . . 3 oz., 160 minims.

The white of one egg

Carbonate of sodium . . . 7½ grains.

Messrs. Bottard, Vallian, and Caron used 5 canulæ at once, injecting 3 or 4 syringefuls of the solution at the same place. The operation was repeated several times daily.

Cantani's formula.

Chloride of sodium . . . 4 grains

Carbonate of sodium . . . 3 grains

Distilled water at 95°-98° F. . . 2 oz., 40 minims.

Samuel's formula.

Chloride of sodium . . . 6 grains

Carbonate of sodium . . . 1 grain

Tepid water . . . 2 oz., 40 minims.

A little morphine, opium, or camphorated oil may be added according to necessity (stage of asphyxia or of collapse).

* Magendie had used it as far back as 1832 in intravenous injections.

M. Potani* in 1869 used it as a substitute for morphine in localised painful affections, neuralgia, hepatic colic, etc. Since then numerous authors, Messrs. Dieulafoy, Luton, and Laffitte, have often injected it with success.

The water is injected in doses of 16 to 32 minims at once; it causes somewhat sharp pain, but never gives rise to after ill-effects, especially if distilled water has been used.

In pulmonary and laryngeal tuberculosis, bronchitis and pleurisy, M. Landouzy injected subcutaneously a syringe-ful of distilled water to which he had added a few drops of hydrolate of cherry-laurel;† the injections were more successful the nearer they were made to the regions where patients complained of experiencing painful sensations—such as burning, pricking, and tingling pains. The perilaryngeal, cervical, subclavicular, intercostal spaces, and parts which were either painful or tender on pressure, were thus injected. As a general rule, paroxysms of cough in phthisical patients were in this way rapidly relieved, and the interval between the paroxysms was prolonged.

Is the effect of hypodermic injections of water in relieving pain to be explained by the hypothesis of M. Vulpian,‡ which certainly has the merit of probability, and was suggested to his mind by the efficacy of certain cutaneous irritants in tabetic pains, the hypothesis, namely, of a centrifugal action on the nerve-centres? Possibly this may be the explanation; but, in any case, M. Luton is of opinion that the subcutaneous

* Drs. Pye-Smith, Burney Yeo, and Griffith had previously used subcutaneous injections of water, and Messrs. Arronssohn and A. Denis, in 1868, of tepid water.

† [Hydrolate is a synonym in the French Codex for distilled water. *Trans.*]

‡ Vulpian, *Maladies du système nerveux*, 1879, pp. 479-481.

injection of water produces a minimum of parenchymatous revulsive action (un minimum de révulsion parenchymateuse);* he has obtained successful results from it in certain localised and recent pains, especially in muscular rheumatism, but in old standing and obstinate cases this treatment has been a failure. "This method," he says, "is obviously inferior to treatment by saline water and alcohol, and, above all, by nitrate of silver solution. Its effects, moreover, are of shorter duration."†

Dr. Pollak has quoted a case of sciatica which was cured by the hypodermic injection of iced water.‡ M. R. Tripier has used with success hypodermic injections of fresh spring water in phthisical and other forms of vomiting; the injections were made into the epigastric region either before or immediately after food (*Lyon médical*, 1881). M. Laffitte attributes the cessation of pain to the compression of the terminal nerve cellules which is caused by the injected fluid. Dr. Edward Warren ("The Treatment of Typhoid Fever," *New York Medical Record*, January, 1876) recommends hypodermic injections of iced water in cases of persistent hyperpyrexia; he found that these injections had an influence on other symptoms besides the temperature. He administered 480 minims by means of multiple injections into various parts of the body, one half being injected in the morning, the rest in the evening.

M. A. Riva§ concludes from his experiments on dogs that the peritoneum is very tolerant of injections of water. M. Calvet observed marked diminution in the proportions

* [The meaning of this phrase cannot be better explained or expressed than by a quotation from Bescherelle and Pons (*Nouveau dictionnaire classique de la langue Française*, Paris, 1865) "Révulsion-Action de détourner la cause d'une maladie vers un autre point." *Trans.*]

† Luton, *Loc. cit.*, p. 61.

‡ *New York Medical Record*, 1883, vol. xxiv., p. 167.

§ *Le iniezioni d'acqua nel peritoneo* (*Salute*, Oct. 11th, 1883, p. 302).

of albumen after hypodermic injections of sea-water, and by the same method he obtained improvement in troublesome glandular affections occurring in scrofulous children. Sea-water, when filtered, caused no pain, and suppuration but rarely.*

* [My friend, Dr. Fergus of Glasgow, drew my attention some years ago to the fact that in many cases acute pain can speedily be relieved by the injection of hot water. The syringe should first be warmed thoroughly, and the temperature of the water should be raised to as high a degree as can be borne without causing actual pain. In one case of colic this method afforded relief from the pain very speedily, but in cases where it was used for the relief of tabetic pains the effect was at the most equivocal.

Water has long been used hypodermically as a substitute for morphine. A list of papers bearing on this subject may be found in Neale's *Digest and Appendix*, § 229.4.

Dr. Cameron Macdowall, of the Indian Medical Service, recommends intraperitoneal, in preference to subcutaneous, injections of warm water in cholera (*Lancet*, vol. ii., 1883, 658). Dr. Tibaldi published the results of experiments made by him on dogs to test the value of the various plans suggested for the dilution of the blood in cases of cholera. These results, published in the *Gaz. Med. Ital. Lomb.*, Nov., 1884, are quoted in the *London Medical Record*, vol. xii., p. 511. Dr. Tibaldi places the highest value on intravenous injections, their effects being produced most rapidly and being most enduring. It was found that absorption from the peritoneum was slow, and even after a lapse of thirty hours fluid remained. This method, however, allows of the injection of a large quantity of water, and in this respect is preferable to subcutaneous injections. On the other hand, the hypodermic method is perfectly safe and readily effected. Arguing from analogy, Dr. Tibaldi considers all these plans perfectly safe. These injections are indicated on the appearance of the algide stage. When the symptoms of this stage are slight and there are no grave asphyxic symptoms the hypodermic method is indicated, and the injections should be made into the upper and inner surface of the thigh, the leg near the popliteal space, or the upper third of the arm. When the asphyxic symptoms are urgent intravenous injection should be practised, the internal saphenous and veins of the forearm being chosen. When for any reason, such as extreme urgency or the difficulty of finding a sufficiently large superficial vein, the intravenous method is contraindicated, intraperitoneal injection should be practised. *Trans.*]

AQUA LAURO-CERASI. CHERRY LAUREL WATER.
(See *Acidum Hydrocyanicum*).

AQUA IODISATA. IODISED WATER. (See *Iodum*).

AQUÆ DESTILLATÆ AROMATICÆ. DISTILLED
AROMATIC WATERS.

These are employed as vehicles and solvents; they do not give rise to local irritation, provided they have not undergone a process of oxidation. Gubler has recommended distilled *eucalyptus globulus* water, M. Delieux, of Savignac, peppermint and cinnamon water (see CINNAMON), and M. Patrouillard, distilled elm water.

AQUÆ MINERALES. MINERAL WATERS.

Various mineral waters, such as those of Bourbonnelles-Bains, Kreussnach, Pougues, and Salins have been suggested for hypodermic transfusion, as well as the bitter water from salt marshes on account of its analogy with blood serum, but none of them, so far as we know, have been employed as yet.

ARBUTIN.

Arbutin, a glucoside extracted by Lewin of Berlin from *Uva Ursi*, is soluble in water.

The leaves of *Uva Ursi* have for a very long time been used empirically as a diuretic, chiefly in catarrhal affections of the bladder. The active principle is arbutin,

which yields by decomposition in the system hydroquinone. [On boiling with dilute sulphuric acid, arbutin is resolved into hydroquinone and glucose. "New Sydenham Society's Lexicon." *Trans.*] The researches of investigators into the action of arbutin are, as yet, contradictory, and fresh experiments are required before expressing an opinion as to the value of this new product. At any rate, arbutin has been used but seldom hypodermically. The dose is 15 grains and upwards.

ARGENTI NITRAS. NITRATE OF SILVER.

Injectations of nitrate of silver, the use of which in surgery (tumours, &c.) is so well and universally known, especially since the investigations of M. Luton, have also been employed for internal medication. The pain which follows hypodermic injections of nitrate of silver is often very sharp, although it is of short duration. "They are irritating to the degree of almost necessarily producing an abscess at the point of puncture; nevertheless, the silver nitrate limits of itself, in a manner, its own action, by the production of a zone of coagulation which it produces round itself. There is no kind of inflammation more limited; in the centre, a slough and a sero-purulent collection which isolates and eliminates it; at the circumference a ring of induration (Luton)," often of almost cartilaginous consistence. The artificial abscess allows of the escape of serous or purulent fluid, carrying with it a slough of cellular tissue, and leaving a cicatrix. M. Luton made use of two strengths of solution—one a tenth and the other a fifth:—

Crystallised nitrate of silver . .	10 grains
Distilled water	up to 56 or 112 minims.

Of this he injected from 4 to 16 minims. A solution of 1 in 5 almost always determines a slough and afterwards an abscess; rarely, the slough is not separated, and it remains encysted in the living tissues, like a foreign body. With a solution of 1 in 10, it is to be observed that the irritation decreases the nearer the injection is made to the trunk; thus, when made at the hip there is no certainty of an abscess resulting. M. Luton does not think that there is any advantage gained by using the weaker solutions. M. Ledentu (*thèse Angelé*) made use of a solution of 1 in 4.

Without referring to the hypodermic use of silver nitrate for surgical purposes, we find that it has been used in this way in cases of neuralgia (Luton, Ruppaner, Bertin and Michalski), rheumatism, gout (Ruppaner), chronic arthritis, tabes dorsalis (Frommhold).

M. Jacobi has suggested the following formula for hypodermic injections of silver salts in neuroses:—

Argenti chloridi	$\frac{1}{2}$ grain
Sodii subsulph.	3 grains
Aq. destil.	up to 112 minims. M.

To be kept in a dark bottle. The dose for injection is 16 minims. This solution does not cause any local disturbance. Prof. Eulenburg has recently made use of pyrophosphate of silver, soluble in 3.85 parts of a one per cent. solution of phosphoric acid, and albuminate of silver ($\frac{1}{14}$ to $\frac{1}{7}$ of a grain in 16 minims).

ARSENIIUM. ARSENIC, PREPARATIONS OF.

Principal physiological effects.—In small doses.—Sensation of heat in oesophagus and stomach, increase of appetite, increase of organic functions, diminution of urea and carbonic acid, lowering of temperature and pulse.

In large doses.—Feeling of constriction of the throat, thirst, epigastric pains, nausea, vomiting, colic, diarrhœa, fever and headache, insomnia.

In poisonous doses.—Diarrhœa, with rice-water stools, sometimes bloody; cramps and aphonia, pallor of the face; debility, irregular and rapid pulse, scarcity and suppression of urine, dyspnœa, cyanosis, unconsciousness, delirium, convulsions, death.

Slow poisoning.—Cutaneous eruptions (eczematous, scarlatiniform, &c.); conjunctivitis, extreme anæmia, loss of hair and of nails, inflammation and ulceration of nasal and laryngeal mucous membranes; paralysis, chiefly of the extensors; dropsy, cachexia, fatty degeneration of most of the organs.

Elimination is by the bile, urine, and perspiration. Its duration is very variable. The physiological effects of arsenic are, further than this, but little known.

Local effects.—Sensation of burning, lasting from 15 to 20 minutes (Eulenburg, Bourneville). Eulenburg and Köbner have not met with any local accidents. Sometimes painful indurations are produced, never exceeding a centimetre ($\cdot 39$ inch) in diameter, accompanied occasionally by slight redness and even by abscess (Bourneville).

Fowler's solution	. . . . .	1 part
Distilled water	. . . . .	2 parts.

Eulenburg* who has recommended this formula, has obtained good results from it in various forms of tremor (paralysis agitans, &c.); Kobner, in lichen ruber, and in a case of diffuse sarcoma of the skin (child of 8 years); Lesser, in lupus (1885); Soltzmann, in chorea, &c., have also used Fowler's solution and distilled water, in equal

* Eulenburg has actually used a solution of 1 in 4, in doses of $2\frac{1}{2}$ to 5 minims, = 4 to 8 minims of Fowler's solution.

parts. One of the authors has used, without success, in the clinique of Prof. Charcot, Professor Eulenburg's solution in four women affected with paralysis agitans; the number of injections was from 16 to 25 (from 15 to 40 minims); they were made on each side of the vertebral spinous processes from the nape to the sacral region. The doses injected ranged from 4 to 10 minims of Fowler's solution.

No particular symptom was observed; occasionally the patients complained of nausea. We have used at the Bicêtre, in chronic cases of chorea, not only Eulenburg's formula but also the following, without meeting with any local accident* (induration, puffing, &c.).

Fowler's solution	. . . .	200 minims
Distilled water	} . of each 100 minims.	
Glycerine		

A syringe of 20 minims corresponds to 10 minims of Fowler's solution.

Fowler's solution	} of each 100 minims.
Tincture of iron malate†	

Dose, from a few minims to a syringe-ful (*Practical formulary of the Vienna clinics*).

Arsenic acid has been used hypodermically by Tichomirow, in the treatment of psoriasis (*Année Médicale*, 1870, p. 357).

Lipp, quoted by Bartholow,‡ has injected from $\frac{1}{7}$ to $\frac{2}{7}$ of a grain of arsenious acid. He observed as a con-

* This has sometimes caused indurations and even abscess.

† This tincture, used in Germany, is a solution of impure malate of iron in spirits of cinnamon (1 in 10).

‡ [Bartholow adds (*Hypodermatic Medication*, 4th edit., p. 345), "Excellent results have since been obtained in numerous instances of cutaneous diseases of an obstinate character by this practice, in the hands of dermatologists, in all parts of the world." *Trans.*]

sequence of these injections, increase of temperature and of pulse rate, impairment of appetite, diuresis, nervous excitement, vertigo, cephalalgia, cough, conjunctival redness, &c. Despite these effects produced by a dose, in our opinion, much too large, M. Lipp does not the less recommend the use of this agent, because the duration of treatment is lessened, the dose is small,* and there is an absence of digestive troubles.

Messrs. Billroth, Czerny, and Karewsky (1884), obtained good results from the hypodermic use of arsenious acid in the treatment of lymphoma. Radcliffe used pure Fowler's solution, but the local irritation produced was so great that it led him to dilute it by one half (the irritation was then less than a half of what it had been before). M. Bogomolow has injected it in doses of four minims as an antipyretic and antiseptic in remittent fever. Bartholow recommends, without appearing to have used it, Pearson's solution, in doses of 5 to 15 minims every second day.

Arseniate of soda	. . .	$\frac{1}{2}$ to 1 grain
Distilled water	. . .	up to 112 minims.

(To be injected in progressive doses beginning with a quarter of a syringeful = 4 minims).†

Therapeutics. — Puerperal fever (Lehmann of Copenhagen), without success; chorea (Radcliffe, 1865, 2 cases successfully; Perroud, Hammond, Lewis Smith, &c.); cholera, algid stage (V. Gräfe); various kinds of tremor (Eulenburg); paralysis agitans (Eulenburg, Bourneville);

* In Italy, Scarenzio, Gamberini, and others, employed hypodermically the strong *mineral water* of Levico, containing less than $\frac{1}{63}$ of a grain per litre of 35½ fluid ounces, in a dose of one to two injections of 16 minims *per diem*; they obtained excellent results in many cases of obstinate skin disease, especially in cases of eczema and impetigo.

† José Ramon, of Torres, and Martinez (*La Crónica Medica*, Nov., 1883) used this solution in psoriasis.

psoriasis (Lewin, Lipp, Tichomirow); lichen ruber (Köbner); chronic eczema (Lipp); neuralgia, epilepsy, and various nervous diseases (Radcliffe), psychoses (Tebaldi).

ASPIDOSPERMIN.

Slightly soluble in water, insoluble in glycerine, soluble in alcohol and ether and in essential and fixed oils, is obtained from the bark of *Aspidosperma Quebracho* (Apocynaceæ), a tree originally found in the Argentine Republic, which is regarded in this country as a febrifuge. It was, we believe, first employed in Europe by Penzold, of Erlangen, who found it had a peculiar action in cases of dyspnœa.

According to M. Burgos, powder of white Quebracho possesses the physical and organic properties of quinquina powder; it is an antiseptic. The decoction is used as a tonic and febrifuge. The phenomena observed after its administration were decreased frequency of the pulse and respirations (Berthold, Picot, Berger, Laquer). Its continued use brought on headache, vertigo, mental hebetude, and profuse salivation (Laquer, Berger). This bark contains abundant tannin and two alkaloids—aspidospermin and quebrachin; the latter alkaloid is analogous in action to curara. According to M. Closson (*Bulletin de l'Acad. des Sciences de Belgique*, No. 2, 1884), "paralysis of the limbs in animals which survive in poisoning by aspidospermin, would be due to an action of the poison on the nervous reflex centres in the spinal cord, the excitability of which is lost before the peripheral nerves, motor and sensory, and the muscles have been attacked by the poison." But with sufficient doses of aspidospermin, the

peripheral nerves are first paralysed, then the muscles lose their sensibility to stimuli to an equal extent.

The sulphate and hydrochlorate are readily soluble, and their solutions are intensely bitter.* The hydrochlorate has been used by Penzoldt and Maragliano. The latter exhibited quebrachin or aspidospermin in asthma, in doses of $\frac{3}{4}$ to $1\frac{1}{2}$ gr., both hypodermically and by internal administration.

Sulphate of aspidospermin . . . 5 grains

Distilled water . . . up to 112 minims.

Aspidospermin in subcutaneous injections is recommended by Eulenberg in the *Medicinal Kalender und Recept Täschenbuch für die Aertze des deutschen Reiches*, 1883.

Messrs. Huchard and Eloy† have made a considerable number of experiments with the alkaloids discovered in quebracho bark by M. Hesse (aspidospermin, aspidospermatin, aspidosarmin, québrachin, hypoquebrachin), quebrachamin excepted, the existence of which is doubtful. These experiments have chiefly had reference to the influence of the alkaloids on the temperature; their antipyretic action is well marked, but uncertain in different cases. They can be classed as antipyretics in the following order:—lactate of aspidospermatin, hydrochlorate of aspidospermin, sulphate of hypoquebrachin, lactate of quebrachin. Most of these alkaloids caused arrest of blood changes.

These observers exhibited hydrochlorate of aspidospermin hypodermically in doses of $1\frac{1}{2}$ to 3 grains. In typhoid fever they obtained a reduction of temperature

* This drug is as yet little known in France, its physiological study leaving much to be desired.

† Huchard and Eloy, *De l'action antithermique des alcaloïdes du québracho* (aspidospermine, québrachine, hypoquébrachine, aspidospermatine), *Union Médicale*, Sep. 27th, 1884.

when quinine had failed. In the hectic of phthisis the results were as uncertain as with sulphate of quinine.

Aspidospermin	. . . . .	6 grains
Sulphuric acid	. . . . .	a sufficiency
Distilled water	. . . . .	up to 112 minims.

Sixteen minims = $\frac{6}{7}$ of a grain of the drug and upwards.

Therapeutic uses.—Aspidospermin and its salts appear to be especially useful in dyspnœa, no matter what its cause may be (Penzoldt, Berthold, Picot, Skoda, Krauth, &c.).

[The statement that quebracho and its preparations may be used in all forms of dyspnœa, must be accepted with caution. It has been used with success in dyspnœa depending on various forms of cardiac disease, *e.g.*, hypertrophy, aortic incompetence, &c. (see *Medical Record*, xii., 71). From the experiments of Harnack and Hoffmann, quoted by Dr. Junker in the *Medical Record*, xiii., p. 184, it appears that “the greatest therapeutic value of quebracho bark consists in its property of reducing the irritability of the respiratory centre. It will prove beneficial in cases of dyspnœa not depending on impeded aëration, *i.e.*, on insufficient oxydation of the blood in the lungs, and not being a mere compensatory symptom; namely, in dyspnœa in consequence of disorders of circulation and of diseases of the heart. In other cases, in which the dyspnœa constitutes a purely compensatory manifestation, any attempt at lessening the irritability of the respiratory centres may, under certain circumstances, be fraught with danger, although this remedy may even then occasionally assist in relieving this distressing symptom. Aspidosamin is an emetic, is more energetic than apomorphine, but does not act in the same way on the brain respiratory centres. *Trans.*]

ATROPINA. ATROPINE. NEUTRAL SULPHATE AND VALERIANATE OF ATROPINE. EXTRACT AND TINCTURE OF BELLADONNA.

Principal physiological effects.—In small doses; dryness of the mouth and throat, dilatation of the pupils;—in larger doses; difficulty of speech and deglutition, facial anæsthesia, blindness, cephalalgia, vertigo, delirium (merry or sad), hallucinations, nausea, slowing, then acceleration, of pulse, scarlatiniform redness of the skin, œdema; in poisonous doses, we find besides, aphonia, muscular spasms, collapse, coldness of the surface, and finally death with arrest of the heart in diastole. Symptoms of poisoning appear in a few minutes (2 to 10). Elimination is effected rapidly by the kidneys, especially in the herbivora.

Local effects.—No accident is likely to occur provided the solution used is perfectly pure, contains neither acid nor alcohol, and is freshly prepared.

Neutral sulphate of atropine . . . 1 grain

Distilled water . . . up to 2 ounces, 160 minims.

Sixteen minims of this solution contain $\frac{1}{70}$ of a grain of atropine sulphate. It is wise to begin with a small dose, say $\frac{1}{140}$ and rarely to exceed $\frac{1}{35}$ of a grain. In the following formulæ, morphine combined with sulphate of atropine, permits us to obtain all the good effects of these two drugs, especially in the treatment of pain and insomnia, and to increase the dose with safety. The following formula is that of Dujardin-Beaumetz:—

Hydrochlorate of morphine 1 grain

Sulphate of atropine $\frac{1}{10}$ grain

Cherry laurel water up to 224 minims.

Sixteen minims of this solution contain $\frac{1}{14}$ of a grain of morphine, and $\frac{1}{140}$ of a grain of atropine. M. N. Gueneau de Mussy makes use of the following solution:—

Hydrochlorate of morphine . . 5 grains
Neutral sulphate of atropine . $\frac{1}{10}$ grain
Distilled water . . . up to 112 minims.

Sixteen minims contain $\frac{1}{70}$ of a grain of sulphate of atropine, and $\frac{1}{3}$ of a grain of the morphine salt. It is wise to begin with two to four minims. The combination of morphine with atropine has long been extolled by various authors, including Brown-Séquard (1860), Gross, Harley, Lazzati, Frankel, Lubanski, Fourcault, Ollivier, Prévost, etc. Atropine in combination with morphine has, moreover, been praised and used with good results by Messrs. Aubert, Gayet, and L. Tripier before the days of surgical anæsthesia. Its use previous to anæsthetising obviates the danger of syncope and secondary inconveniences, such as vomiting.* The formula should be such as that of Dujardin-Beaumetz, but the doses of atropine and morphine are to be doubled. Sixteen to twenty-four minims of this solution should be injected 20 to 25 minutes before administering the chloroform.†

Some authors (Scholz, Sœmann, Timermans, etc.), make use of valerianate of atropine hypodermically

* [Dr. Crombie (*Practitioner*, Dec., 1881) recommends the subcutaneous injection of morphine after beginning the chloroformisation. See also a note on this subject by the translator (*Lancet*, vol. i., 1882, p. 1031). It is imperatively necessary to examine the urine before adopting this method, because if it is resorted to in *Bright's disease* two dangers may be encountered, viz., an increased risk of chloroform asphyxia and of uræmia. *Trans.*]

† See Colombel, *Etude expérimentale et clinique sur un nouveau procédé d'anesthésie mixte (atropine, morphine et chloroforme)*, thèse de Lyons, 1884.

Tichborne (1879) recommended salicylate of atropine. Extract and tincture of belladonna have also been administered hypodermically, but abscess has been met with after their use.

Therapeutic uses.—The salts of atropine are chiefly indicated in neuralgia, asthma,* nocturnal incontinence of urine, constipation, chorea, poisoning by fungi, intestinal obstruction, vaginismus, tetanus, epilepsy, phthisical sweats, vomiting (of pregnancy, hysteria, etc.); but atropine is of marked service as an anti-sudorific, an antisialagogue, and for the relief of pain. Atropine has besides been used hypodermically as a hæmostatic, M. Tacke (*Berlin Klin. Woch.*, 1881, no. 6) attributing to it a much more certain action than to ergot of rye.

Antagonisms.—The experiments of M. J. L. Prévost have shewn a mutual antagonism between atropine and muscarin, but he thinks the antagonism between these two substances has not been conclusively proved. An antagonism between calabar bean, physostigmine (Bourneville, Frazer), and pilocarpin (Langley, Luchsinger, Straus), on the one part, and atropine on the other is generally admitted. As for the antagonism between morphine and atropine, it has not yet been adequately proved.

[See an important paper by Dr. Talfourd Jones in the *Brit. Med. Jour.*, 1885, vol. ii., p. 581, on hypodermic medication. The preparation of morphine which he recommends for hypodermic use possesses many advantages. It is readily prepared, inexpensive, and keeps well. The mode of preparation is as follows:—half fill an ounce stoppered bottle with ordinary water; put into the bottle

* [Atropine must not be used in asthma when there is dryness of the tongue and mucous membranes generally, with absence of bronchial secretion. If employed in such cases it might give rise to most alarming symptoms (see "Dobell on Asthma," 1886, and "Brunton's Pharmacology," p. 215). *Trans.*]

40 grains of acetate of morphine, and drop into it 4 minims of B.P. acetic acid. Then fill the bottle with water, and a clear, pale solution will be obtained of the same strength as the Pharmacopœial preparation. The same authority recommends an atropo-morphine solution, made by the addition of two grains of atropine sulphate to the ounce of morphine solution. Twelve minims = 1 grain of morphine, and $\frac{1}{20}$ of a grain of atropine. Dr. Talfourd Jones came to the following conclusions as to the use of atropo-morphine. “ (1) Fairly small and moderate doses of atropine slightly increase the hypnotic properties of morphine. (2) Atropine in medicinal doses increases the anodyne properties of morphine and this increased anodynia is more marked in local than in distant injections. (3) Atropine in moderate doses counteracts the depressive action of morphine on the heart, and lessens the tendency to sickness, giddiness and faintness; and, by its influence on the circulation and on the skin, it also tends to prevent the clammy sweat, the pallor, and the coldness that morphine not infrequently induces. (4) In small doses it does not influence, to any appreciable degree, the action of morphine on the respiration; but when given in fair medicinal doses, and *à fortiori*, in larger doses, it increases the number of respirations per minute, and augments their depth.” *Trans.*]

AURI CHLORIDUM. CHLORIDE OF GOLD.

We borrow from the work of M. S. Badia the following formula:—

Chloride of gold	.	.	1 grain
Distilled water	.	.	1 ounce, 80 minims.
(Letamendi).			

Dose, 16 minims ($= \frac{1}{35}$ of a grain). This solution has been recommended in the treatment of certain syphilitic symptoms. Chloride of gold has also been used successfully by M. Moricourt in hysterical anæsthesia in a solution of 1 part in 500 or 1 in 1000.

B.

BELLADONNA. (See *Atropine*).

BICHLORIDE OF MERCURY. (See *Hydrargyrum*).

BROMINE.

Soluble in 40 parts of water, in alcohol, ether, carbon bisulphide, chloroform, glycerine. Bromine has scarcely been used hypodermically except by Goldsmith (1863) in cases of hospital gangrene, who injected one drop doses in the immediate neighbourhood of the wound.* After 48 hours the wound had lost its characteristic appearance.†

BROMIDE OF CAMPHOR—(see *Camphor monobromide*).

BROMIDE OF ESERINE—(see *Calabarine*).

BROMIDE OF LITHIUM—(see *Lithium*).

BROMIDE OF POTASSIUM—(see *Potassium*).

BROMOHYDRATE OF CAFFEINE—(see *Caffeine*).

BROMOHYDRATE OF CONINE, OF CONICINE OR CICUTINE—(see *Conine*).

BROMOHYDRATE OF QUININE—(see *Quinine*).

* [Bromine has been also used hypodermically in erysipelas, *Neale's Digest*, 43-5, Brinton, *Ranking's Abstract*, vol. 21, 1863, p. 188. It may be of use also in diphtheria. *Trans.*]

† Frommüller has used tannin and iodide of potassium by hypodermic injection in these cases.

C.

CAFFEINA. CAFFEINE AND ITS SALTS.

Caffeine is soluble in 80 parts of water, and in 50 parts of alcohol.

The salts of caffeine are very unstable. Caffeine in combination with sodium salts is readily soluble; these double salts are soluble in 2 parts of boiling water, and remain in solution after cooling.

Principal physiological effects.—*In small doses*, ($1\frac{1}{2}$ grains); increase of functional activity of the brain without any kind of trouble; increase of force of circulation and of vascular tension.—*In doses of 6 to 16 grains*, by subcutaneous injection, in a healthy man; moderate slowing of cardiac contractions, increased fulness and tension of the pulse (Riegel, 1884).—*In large doses*; increase or diminution of pulse rate, lowering of blood pressure, elevation of temperature (Binz), headache, tremor of the hands, nausea, vomiting, drowsiness, tinnitus aurium, muscæ volitantes, priapism, frequent desire to micturate, hallucinations, vertigo, acceleration then diminution of the respirations. Increase of reflex excitability. *Poisonous doses* in animals induce general paralysis, arrest of the heart in diastole, death. Disappearance of grave toxic phenomena, when it takes place, does so rapidly.

Elimination takes place by the urine without modification, and by the bile (Strauch). The sulphate, hydrochlorate and hydrobromate decompose in water; the citrate is merely a mixture of caffeine and citric acid (Jehl, 1879).*

* Lloyd (1881) obtained a definite combination of these two substances.

Local effects.—The solution of Pletzer causes sharp pain. Most of the solutions produce a sense of burning due to the addition of acid or alcohol.

Caffeine	1½ grains
Alcohol	6 minims
Distilled water	up to 96 minims.

Caffeine	18 grains
Concentrated acetic acid	40 minims
Distilled water	up to 1 ounce, 6 drachms, 24 minims.

(*Pletzer*).

Pure caffeine (citrate or hydrobromate of caffeine)	1 grain
Alcohol	up to 56 minims
or Distilled water	up to 112 minims.

For stronger solutions it is necessary to add a sufficiency of sulphuric or hydrochloric acid; sixteen to forty-eight minims of the aqueous solution are equivalent to $\frac{1}{7}$ to $\frac{3}{7}$ grain of caffeine (*Eulenburg*).*

Pure caffeine	1 grain
Distilled water	20 minims
Alcohol	up to 40 minims.

(*Eulenburg*).

Citrate of caffeine	1 grain
Pure glycerine	up to 32 minims.

(*Lorent*).

Citrate of caffeine	1 grain
Glycerine	32 minims
Distilled water	up to 64 minims.

(*Erlenmeyer*).

* Taken from the *Medicinal Kalender und Recepttaschenbuch f. die Aerzte des deutschen Reiches*, 1883.

Caffeine	6 grains
Salicylate of sodium	4½ grains
Distilled water	up to 16 minims.

Dissolve with the aid of heat; sixteen minims contain 6 grains of caffeine.

(*Tanret and Dujardin-Beaumetz*).

This last formula as well as the following will not cause any local accident or pain. It has been used with benefit by Messrs. Huchard and Lermoyez in the treatment of cholera in doses of 3 grains to 4½ grains of caffeine every two hours.

Benzoate of sodium	59 grains
Caffeine	50 grains
Distilled water	up to 224 minims.

Sixteen minims contain 3½ grains of caffeine.

Cinnamate of sodium	20 grains
Caffeine	25 grains
Distilled water	up to 112 minims.

Sixteen minims contain 3½ grains of caffeine.

[INJECTIO CAFFEINÆ HYPODERMICA.]

Caffeine	20 grains
Salicylate of sodium	17½ grains
Distilled water to	1 drachm.

Dose.—1 to 6 minims; contains 1 grain in 3 minims. Particularly recommended for alcoholic and morphine intoxication, also for hemicrania (Martindale and Westcott). *Trans.*]

Garrison injected a strong infusion of coffee in a case of morphine poisoning. M. Pallen has injected with success liquid extract of coffee in two cases of acute morphinism.

Therapeutic uses.—Neuralgia (Eulenburg, Anstie, Pletzer); migraine (Lorent, Eulenburg); insomnia in chronic alcoholism without delirium tremens (Anstie); melancholia, hysteria, cholera (Oser); strangulated hernia (Guzman); heart disease (indications for use same as for digitalis) (Riegel).*

Caffeine and its salts have been strongly commended as diuretics; daily doses of 7 to 12 grains of the citrate and hydrobromate induced such abundant diuresis that general œdema disappeared in a few days (Gubler).† Its constant use not inducing cumulative effects permits of its being administered for whole months (Gubler). According to Riegel, who used it in 8 cases of pleurisy and 4 of nephritis, caffeine appeared to be inferior in its action to other diuretics.

Messrs. Nothnagel and Rossbach find that a dose of $4\frac{1}{2}$ grains of caffeine produces no appreciable effect in man. M. Zuelzer condemns the use of caffeine as an excitant, on account of its insufficiency in small, and the cardiac irregularities caused by large, doses.

[Caffeine has been recommended in the treatment of asthma by Thorowgood. (See Neale's *Digest*, 399, 5, and the *Lancet*, 1879, vol. i., p. 220. Its action on the temperature is the reverse of that of quinine. *Medical Times and Gazette*, 1878, vol. ii., p. 604. *Trans.*]

* It is well to begin with small doses and, if necessary, to increase them rapidly. Its greatest effect is obtained by small doses frequently repeated. It acts more rapidly than digitalis without producing cumulative effects (Riegel).

† The older formulæ presented this inconvenience that it was necessary to make many injections to attain these doses.

CALABARINA. PHYSOSTIGMINA. PHYSOSTIG-
 MATIS EXTRACTUM. CALABARINE. PHYSOSTIGMINE.
 EXTRACT OF CALABAR BEAN.

Physostigmine is slightly soluble in acidulated water, and very soluble in alcohol, ether, and chloroform. Most of the salts of eserine are soluble in water. The solution of sulphate of eserine on exposure to air and light assumes a violet-red colour, more or less intense, the transformation into red eserine being much less active in the case of eserine than of its sulphate. The salicylate of physostigmine is soluble in 150 parts of water and in 12 parts of alcohol. The solutions of this salt are yellow, but become red under the influence of light. Calabarine (Harnack and Witkowski) is insoluble in ether.

As in the case of conine (see CONINE) the results of various investigators are very contradictory, and this is doubtless due to the varying composition of the preparations employed and also to the varying proportion of alkaloids contained by the calabar bean. Nevertheless, the preparations of calabar bean act alike on the eye, the salivary glands, the intestines, heart and respiration; their action on the spinal cord depends on the proportion of physostigmine or calabarine.

Chief physiological effects of physostigmine.—Pallor, then redness of the skin, abdominal pains, vomiting, embarrassed respiration, vertigo, feeling of extreme languor, myosis, salivation, sweats, slowing of the pulse (Fraser, toxic phenomena observed in himself). Watery and muco-sanguinolent diarrhœa, slowing and finally cessation of respirations. Complete paralysis and collapse (Evans). Death by asphyxia. Paralysing effect on the central nervous sys-

tem; stimulating then paralysing effect on the peripheral nerves.* A dose of $\frac{1}{140}$ to $\frac{1}{70}$ of a grain is sufficient to induce poisonous symptoms in man (Harnack).† In a case of epilepsy with idiocy, physostigmine administered in doses of $\frac{1}{140}$ of a grain three days in succession, increased alarmingly the number of the fits. Elimination is effected by the saliva and bile.

[The following authorities may be consulted on this subject, Christison, *Edinburgh Med. Jour.*, March, 1855; Frazer, *Ranking's Abstract*, 1868, vol. i., 131; Ringer, *Lancet*, 1877, vol. ii., p. 912. See also in Scoresby Jackson's *Note-book of Materia Medica*, an account of the late Sir. R. Christison's personal experience of the poisonous effects of physostigma, and a resumé of Dr. Frazer's results. *Trans.*]

The mutual antagonism between physostigmine and atropine is admitted by most authors, but is denied by Messrs. Frohlich and Rossbach. Some authors have also asserted a reciprocal antagonism between physostigmine and strychnine.

Calabarine produces in the frog tetanic symptoms (Harnack); it has been used hypodermically by Dr. Bartholow.

Local effects.—Sulphate of eserine produces very sharp pain which lasts from one to six hours. (Suarez y Cruz).

* According to Harnack there is no action on the peripheral nerves, but a direct action on the muscular fibre, voluntary and involuntary.

† In veterinary medicine, eserine has frequently been employed, (Peters, Cadiot), especially in the treatment of colic in the horse. According to M. Cadiot, the dose of sulphate of eserine for the horse should be from $1\frac{1}{2}$ to nearly 3 grains. This author used a one in twenty solution. In the dog, the dose is from $\frac{1}{10}$ to $\frac{1}{14}$ of a grain. In canine chorea eserine seems to do more harm than good.

Extract of calabar bean . . . 2 grains
 Distilled water . . . up to 80 minims.
 Ten minims = $\frac{1}{4}$ of a grain.
 (Watson).

One injection every two hours. (The dose may be increased to $\frac{3}{7}$ of a grain).

Extract of calabar bean . . . 2 grains
 Distilled water . . . up to 112 minims.

One to two syringefuls may be given = $\frac{2}{7}$ to $\frac{4}{7}$ grain of extract. (*Pharmacopœia of Vienna Clinique*).

Extract of calabar bean . . . 1 grain
 Glycerine . . . up to 64 minims.
 (Rosenthal).

This solution has been used by M. Silbermann (1880) in two cases of tetanus in young children (one case of cure).

Physostigmine . . . 1 grain
 Alcohol . . . q. s.
 Distilled water . . . up to 128 minims.
 Sixteen minims = $\frac{1}{8}$ of a grain.
 (Erlenmeyer).

Eserine . . . 1 to 5 grains
 Distilled water (acidulated?) . to 112 minims.

Four minims = $\frac{1}{28}$ to $\frac{1}{8}$ of a grain
 (*Phar. of Vienna Clinique*).

Eserine and its sulphate may be injected in doses of from $\frac{1}{24}$ to $\frac{1}{18}$ of a grain,* (Bouchut), a dose which may

* These doses, and consequently the following, are perhaps too large; we find indeed in the memoir of M. Bouchut (*Recherches théor. sur l'action de l'éserine dans la chorée*, 1875), that doses of from $\frac{1}{60}$ of a grain of eserine to $\frac{1}{30}$ of a grain of sulphate of eserine produce either a slight degree of paralysis of the diaphragm, or some embarrassment of the same muscle (pp. 10 and 11).

be renewed 3 or 4 times daily, owing to the rapid elimination of the drug. Anger, in a case of tetanus, injected from $\frac{1}{5}$ to $\frac{1}{3}$ of a grain daily; in another case (Delamarre, *Thèse*, Paris, 1876) $\frac{2}{7}$ of a grain were used in each injection till a dose of nearly 3 grains *per diem* was reached.

Salicylate, or hydrochlorate of

physostigmine . . .	1 grain
Distilled water . . .	up to 1 ounce, 80 minims.

Eight minims of this solution, that is to say, one half of a Pravaz syringe containing 16 minims, are equivalent to $\frac{1}{70}$ of a grain of physostigmine salt, (Eulenburg, *Medicinal Kalender*, 1883, Lewin). We can besides employ the gelatine discs of Savory and Moore containing $\frac{1}{70}$ of a grain of calabar bean.

[The following formula is from Martindale and Westcott's work:—

INJECTIO PHYSOSTIGMATIS HYPODERMICA.

Extract of calabar bean . . .	10 grains
Rectified spirit . . .	10 minims
Rub together till smooth, and add	
Gum acacia . . .	10 grains
Mix, and add gradually	
Distilled water to . . .	$\frac{1}{2}$ ounce.

Dose.—3 to 12 minims. *Trans.*]

Therapeutic uses.—Ptosis (Schelske), enuresis (Fronmüller), poisoning by strychnine (Newman), tetanus (Watson, 1866, Monti, Rottrock, Franzolini, Duffy, Suarez y Cruz, Th. Anger, Reulos), chorea (Harley, Ogle, Bouchut, Cadet de Gassicourt and Suarez y Cruz), trismus neonatorum (Eschenburg).†

† From 1 to 5 drops of a watery solution ($\frac{1}{4}$ of a grain in 64 minims of water) of extract of calabar bean.

In veterinary medicine the sulphate of physostigmine has been used for horses suffering from colic induced by surfeit and chronic dyspepsia (Dieckerhoff) in doses of from $\frac{1}{2}$ to $1\frac{1}{2}$ grains, in a solution of:—

Sulphate of physostigmine	.	1 grain
Distilled water	.	up to 112 minims.

Lindqvist recommends the same salt in doses of $\frac{2}{7}$ of a grain in the horse; to that of $\frac{2}{7}$ grain for 160 ounces body weight in the dog (maximum dose). It is especially useful in colic in the horse, dyspepsia and gastric atony in the ox. Möller recommends its use in doses of $\frac{3}{4}$ of a grain to $1\frac{1}{2}$ grain, in constipation due to a paretic condition of the intestines in the larger domestic animals.

Bromide of eserine, soluble in water (especially warm water) and in alcohol, insoluble in ether, chloroform, fixed and volatile oils, slightly soluble in glycerine, possesses all the properties of eserine and its salts; it is perfectly neutral and produces no local irritation. Its solution is more stable than that of the other salts of eserine (Duquesnel). We do not know whether it has been used hypodermically.

CALOMEL. (See *Hydrargyri Chloridum*).

CAMPHORA. CAMPHOR.*

Soluble in alcohol, ether, the volatile and fixed oils, and in acetic acid. It is a feeble antiseptic.†

* See also BENZOIC ACID and ETHER.

† [Koch's experiments shew that in its action on the development and growth of anthrax bacilli camphor is nearly of the same power as carbolic acid; it hinders in the proportion of 1 to 2500, and prevents their development in the proportion of 1 to 1500. *Brunton's Pharmacol.*, p. 77. *Trans.*]

Principal physiological effects.—Slowing and reduction in force of the pulse (Pirogoff), increase in blood pressure in mammalia; reduction of temperature, increase and then decrease of respirations. Cephalalgia, incoherence in talk, hallucinations, generally of a pleasant character (Purkinje), or, from the first, lassitude, mental prostration, yawning, insensibility and loss of consciousness (Alexander, Malewski), convulsions, paralysis of nerves of sensation, of the bladder and rectum, coma and death.

If the dose has been large without being lethal, *e.g.* from 30 to 80 grains, there is only the stage of exaltation.

Local effects.—Sharp pain without consecutive local accidents.

Camphor	.	.	.	.	5 grains
Sulphuric ether	.	.	.	.	40 minims
Distilled water	.	.	.	.	up to 80 minims.

(Eulenburg).

Camphor	.	.	.	.	5 grains
Oil of sweet almonds	.	.	.	.	up to 112 minims.

(Dupuy.—Binz, Zuelzer, and *Pharmacopœia of Vienna Clinique*).

Luton has used the camphorated brandy of the Codex. Eulenburg praises camphorated brandy in doses of 16 to 32 minims, equivalent to $1\frac{1}{2}$ to 3 grains of camphor, and Jürgensen recommends camphorated oil in acute anæmia.

Therapeutic uses.—Like the preparations of ammonia, camphor is chiefly indicated in adynamia with extreme prostration.

CAMPHORA MONOBROMATA. MONOBROMATED CAMPHOR.

Sparingly soluble in water, soluble in alcohol, ether, fixed and volatile oils, sulphide of carbon, and glycerine.

*Principal physiological effects.**—Diminution in number of heart beats and of respiratory movements; lowering of temperature, drowsiness.† Clonic convulsions and tremors of the limbs (attributed by Lawson to lowering of the animal temperature). The prolonged use of bromide of camphor produces emaciation and abolition of the pharyngeal reflexes (Petrovitz); it does not appear that habituation to this drug can be established. Elimination is by the kidneys (Pathault, Rabuteau).

Local effects are almost nil.

Monobromide of camphor	.	3 grains
Alcohol	. . . . .	26 minims
Glycerine	. . . . .	up to 48 minims.‡
(Bourneville).		

Doses.— $1\frac{3}{4}$ to $4\frac{1}{2}$ grains according to Hammond; from $7\frac{3}{4}$ to 36 and 62 grains.

[This dose is much too large. Bartholow recommends it in 5 grain doses for whooping cough in children. No English authority, so far as I know, states the dose at more than 10 grains. *Trans.*]

* The physiological effects of bromide of camphor have been especially investigated by Drs. Bourneville and Lawson.

† Linhart, Berger, and others deny, wrongly as we think, that camphor bromide has any hypnotic action. M. Linhart regards it as an excitant of the nervous system.

‡ The large proportion of alcohol and its viscosity have led to its condemnation by several authors. By combining camphor bromide with other vehicles, or, perhaps, even by other proportions of the above it may be possible to obtain a solution free from this objection.

M. Valenti y Vivo, arguing from some experiments made on dogs, alleges that there is an antagonism between strychnine and camphor bromide.

Hypodermic injections of camphor bromide have only been employed by one of the authors, and that very exceptionally. The necessity of multiplying punctures to attain to a sufficient dose, the insolubility of monobromated camphor in water, and the nature of the vehicle for solution will always be objections to its general use.

CANNABIS INDICÆ TINCTURA. TINCTURE OF INDIAN HEMP.

Principal physiological effects.—Sense of warmth, tingling and pricking, weight of head, tinnitus aurium, oppression, uneasiness, constriction of the throat, dryness of the mouth, nausea, vomiting, diarrhœa.* These symptoms are not always observed.

In larger doses.—Indian hemp is a powerful nervous excitant, there is very great activity of the intellectual faculties, mirthful and sometimes furious delirium, sense of physical and moral well-being, and of lightness, illusions and hallucinations, chiefly visual, increased acuteness of hearing, the movements of locomotion are spasmodic or inco-ordinated, sleep sometimes disturbed by nightmares.

In poisonous doses.—Stupor, coma allied to that of narcotism, anæsthesia and analgesia, rarely there is a manifestation of cataleptic phenomena, lassitude, cephalalgia. The opinions of authors are contradictory as to the effect of cannabis indica on the circulation and temperature. The

* M. Villard has neither observed constipation nor diarrhœa; we have, however, observed this latter symptom, simultaneously with vomiting, in one of our friends.

bronchial, urinary, and sweat secretions are increased; the salivary is diminished. Indian hemp is an aphrodisiac in small, and an anaphrodisiac in large doses; it causes uterine contractions.

Chronic poisoning.—Physical and mental enfeeblement, listlessness and melancholia, very marked emaciation, stiffness and sometimes tremblings of the limbs, slowness of movements.*

Hunter was the first to use injections of Indian hemp; according to Tamhayn, he also used it subcutaneously in several cases of tetanus. In one case of chronic miliary tuberculosis, where the prolonged use of morphia had been productive of no result, Prof. Eulenburg obtained by injections of cannabis tincture calmer sleep, and a perceptible diminution of cough and pain. He made use of a solution of equal parts of cannabis tincture and distilled water in doses of 10 to 15 drops. From this dose no unpleasant symptoms were observed. Cannabis indica is scarcely ever used now as a hypnotic; but M. Frömmüller uses the tannate of cannabine for this purpose.

Tincture of Cannabis Indica	} equal parts.
Distilled water	

From 2 to 5 minims. This solution readily produced abscess.

[It is to be observed that the French cannabis indica is not identical with that of the *British Pharmacopœia*, the latter being made by solution of the extract in spirit, the former from the leaves. Dr. Strange of Worcester has ob-

* The following works may be consulted for further details, viz., those by M. Moreau of Tours, by Messrs. Voisin and Liouville, and especially the admirable work by M. Villard, "Du Haschisch, étude clinique, physiologique et thérapeutique," Paris, 1872. See also the "Paradis artificiels" of Ch. Beaudelaire.

tained good results from the use of *cannabis indica* in the early stages of mania with delusions. Fronmüller has obtained excellent results from the use of Merck's Cannabin Tannicum in cases of nervous insomnia.* *Trans.*]

CANTHARIDIS TINCTURA. CANTHARIDINA.

TINCTURE OF CANTHARIDES. CANTHARIDINE.

Slightly soluble in water and cold alcohol, readily soluble in boiling alcohol and in ether, chloroform, alkalies and fixed oils.

In a moderately large dose, or slightly under a grain, cantharides powder induces intense vesical tenesmus, gives rise to a sense of tickling of the glans penis, and burning heat in the renal and vesical regions.

In very large doses (16 grains and upwards), besides frequent calls to urinate, it leads to ischuria and anuria, albuminuria, painful erections,† gastro-enteritis, considerable acceleration of pulse and respiration, tinglings, narcotism, dyspnœa, paralysis of the respiratory centre, and general convulsions. Cantharidine is eliminated by all the fluids of the body, but it manifests its action on the surfaces only by acidity of the secretion. It circulates in the blood current in the condition of an alkaline cantharidate under which form it loses its irritant action (Centissoon). The lethal dose of cantharides powder is about 30 grains (Orfila, Schroff); the fatal dose of cantharidine is 100 times less. Tincture of cantharides has been used by Ruppaner in doses of 25 drops (!) in a case of sciatica; the injection was made in the neighbourhood of the great trochanter. It was followed

* See *London Med. Record*, vol. x., p. 452, and Braithwaite's *Retrospect*, vol. xc., p. 174.

† According to Schroff the action on the sexual organs is due entirely to the essential oil of cantharides.

by violent pain and the sciatica was relieved, but four days afterwards an abscess formed which discharged naturally. In this case the remission was longer than that obtained by opiates and atropine. Luton after a dose of 20 minims only observed redness and slight induration.

Cantharidine	.	.	.	1 grain
Chloroform	.	.	.	up to 112 minims.

Dose.—One-fourteenth to one-seventh of a minim = $\frac{1}{1400}$ to $\frac{1}{700}$ of a grain of cantharidine without producing local vesication. Used in the local treatment of pain (Laboulbène),* and in the treatment of chronic nephritis (Laboulbène, Quinquaud).

CAYAPONINE.

An alkaloid obtained from the *Cayapona globulosa* (Cucurbitaceæ); a drastic purgative much used in veterinary medicine in Brazil. In a one per cent. solution administered by the mouth, a few drops are sufficient to produce in a short time copious stools without colic. Gubler injected $\frac{1}{12}$ of a grain in one per cent. solution, without producing purgation, in a case of lead poisoning; at the moment of injection nothing abnormal was observed, but afterwards a large painful tumour formed, an œdematous thickening with large ecchymosed aureola surrounding the puncture; the skin presented a slight rose tint. From the centre of the tumour, which persisted for seventeen days, there radiated branching nodosities.

* Account must be taken here of the action of the chloroform.

CEDRINE.

An amorphous product readily soluble in water, obtained by M. Tanret from the seeds of *Simaba cedron* (Simarubaceæ),* a tree growing originally in Columbia and Costa Rica. In its native country the cedron is in repute in intermittent fevers, serpent's bites, and rabies. It is possessed of tonic properties, and has also been used in chronic diarrhœa, septicæmia, gout, neuralgia, intestinal worms, and also to arouse uterine contractions. In a dose of $\frac{1}{16}$ of a grain injected hypodermically it produced vertigo in an adult. Its febrifuge virtues are indisputable (Restrepo). Cedrine has been injected hypodermically by M. Restrepo (Dr. Dujardin-Beaumetz's clinique), with comparative success in ague.

CHLORAL HYDRAS. HYDRATE OF CHLORAL.

Physiological effects.†—Feeling of lassitude, irresistible drowsiness, sleep, sometimes preceded by a stage of excitement, especially in drunkards, slowing of the pulse and of respiration, and pupillary contraction; preservation of sensibility and reflex excitability, which disappear, however, after large doses; lowering of the temperature. Death by arrest of respiration and sometimes of the heart in diastole. The surface of a wound painted with a 15 per

* Cedron was used in the Charité hospital by Rayer in 1852, in intermittent fevers, who discovered its febrifuge properties. Restrepo, *Etude du cédrón, du valdivia et de leurs principes actifs, la cédrine et la valdivine*, Thèse, Paris, 1881.

† The action of chloral is not due to hypothetical decomposition in the economy into chloroform and an alkaline formiate. Moreover, the physiological actions of chloral and chloroform are different.

cent. solution becomes covered by a thin slough. In chronic chloralism, cutaneous eruptions, intellectual troubles, marasmus, etc.,* are produced.

Antagonisms.—Picrotoxine (Crichton Browne); nitrite of amyl (Trafford, Dabury, Bussat). [Electricity, atropine, and strychnine have also been recommended in the treatment of chloral poisoning. *Trans.*]

Local effects.—Porta, in 69 injections of chloral, has met with 29 instances of local disturbance (phlegmon, abscess, sloughs, lymphadenitis, lymphangitis). One of the authors has used chloral hypodermically in a certain number of cases; he has observed pain of short duration, and sometimes redness and thickening; moreover he has had occasion to examine the skin in two of his patients; in one he could find no lesion attributable to the chloral, in the other, at the point of puncture he found an ecchymotic patch of 8 to 12 millimetres diameter; at this point the cellular tissue was more than usually adherent. At other points, he observed, besides adhesions of the cellular tissue, indurations in the form of a nucleus with sanguineous effusion (ecchymoses). Finally, in 3 or 4 places, besides the lesions already described, there were in the centre of the indurations small lenticular abscesses. In this case the cellular tissue was partially infiltrated. May not the lesions found at the autopsy have been due to this cause? Other punctures had left no trace.

Chloral 7 grains

Water up to 16 minims.

Chloral $2\frac{1}{2}$ grains

Glycerine up to 16 minims.

(Dujardin-Beaumetz.)

* [See a most interesting essay on this subject by Dr. Rehm, *Chronischer Chloralmissbrauch*, in the *Archiv für Psychiatrie und Nervenkrankheiten*, xvii. Bd., Heft. i., p. 36. *Trans.*]

Hugel has administered chloral hypodermically, as a hypnotic, in aqueous solutions (equal parts, and one of chloral to two of water) without producing narcotism. The same pain was produced at the seat of injection and in the surrounding parts. Five half per cent. injections caused ulcerations in the parts operated on. Chloral has, moreover, been given in combination with morphine (Vidal, Estachy). (See MORPHINE).

Therapeutic uses.—Chloral acts more rapidly and certainly as a hypnotic than morphine without producing the ill-effects of the latter. It is therefore especially indicated in the treatment of insomnia. It has been used in cholera (Higgison and Hall), tetanus (Bourneville), eclampsia (Rückard, Froger, Purefroy), neuralgia (Namias, solution 1 to 2),* psychoses (Urtel, aqueous solution, equal parts of chloral and water), poisoning by strychnine (Crothers, Charteris, Faucon, in 1882, solution in 1 to 3 given in doses proportional to the quantity of strychnine absorbed).

[Playfair recommends chloral as the remedy *par excellence* in rigid os in the first stage of labour, “especially where rigidity is associated with spasmodic contraction of the muscular fibres of the cervix.” He recommends it more strongly than chloroform in the early stages of dilatation where there are severe inoperative pains, inasmuch as chloral has no tendency to annul uterine contractions. He gives it in 15 grain doses every 20 minutes. It might

* Many authors, among others M. Gontier, (*Thèse de Paris*, an essay of particular interest) condemn subcutaneous injections of chloral on account of its caustic action, of the necessity of multiplying punctures, and, in short, of the local troubles which have been observed so often. M. Vulpian has, in consequence of the result of intravenous injections in dogs, indicated the possibility of producing hæmaturia. In view of its causticity, chloral has the inconvenience of necessitating the use of very dilute solutions.

with advantage be used hypodermically in such cases, and the unpleasant local effects would be minimised, if not entirely obviated, by practising deep intra-muscular injection in the gluteal region—see note on Ergotine. *Trans.*]

CROTON CHLORAL HYDRAS. HYDRATE OF CROTON CHLORAL.

Slightly soluble in water, more so in glycerine, also in water combined with glycerine, and in alcohol. It is not well adapted for hypodermic administration. Croton chloral is a hypnotic like chloral, from which, however, it differs physiologically and physically.* It has been injected under the skin of the gluteal region by Worms in two cases.

Croton chloral	.	.	.	.	4 grains
Glycerine	.	.	.	.	up to 16 minims.

Sharp pain resulted from the injection but no hypnotism. In one case there was marked swelling with decided redness over an area of 6 centimetres (2·34 inches). In another there was a slough of 2 centimetres diameter (·78 inch).

Croton chloral	.	.	.	16 grains
Warm glycerine	.	.	.	} of each, equal parts up to 352 minims.
Cherry laurel water	.	.	.	

(*Léoni*).

Sixteen minims represent $\frac{3}{4}$ of a grain of croton-chloral nearly. Most authors have given up injections of croton-chloral on account of its irritant action.

* Weil, *Croton-chloral hydrate, ses propriétés, son emploi*. Thèse, Paris, 1875.

CHLORIDES OF MAGNESIUM, MERCURY, SODIUM. (See *Magnesium, Hydrargyrum, Sodium*).

CHLOROFORMUM. CHLOROFORM.

First employed hypodermically by Hunter, who discontinued its use on account of the acute pain and intense inflammation to which it gave rise. It was injected again, chiefly in neuralgia of the trigeminal, by Drs. Bartholow, Weir Mitchell, and Mattison. Dr. Bartholow injected from 10 to 12 minims; great pain was induced but the attacks discontinued. He practised the injections in the upper lip, compressing the point of puncture for some seconds which prevented any local inflammation and its consequences; he did not then find more than a slight puffing along the track of the needle and a transient hardness of the tissues. After an injection of 15 minims in himself, this author experienced slight pain and local anæsthesia extending from the inguinal region to the foot; this anæsthesia persisted for nearly 3 months.

Dr. Mattison, after an injection of half a drachm of chloroform, noted a sharp pain lasting four minutes, puffiness round the puncture, and narcosis for two hours; the neuralgic attacks recurred. M. Collins injected successfully 30 to 40 minims in cases of old-standing sciatica. M. Cérenville (1876) observed in one of his patients after injections of chloroform, which were not painful (50 minims in posterior portion of middle of thigh), complete anæsthesia of the limb; in another case he observed a painful induration. At the beginning of his experiments M. Cérenville injected a syringe of without inconvenience. Afterwards he used small doses with equally good results. In cases of sciatica of long standing,

which had resisted every other mode of treatment, he obtained success by this method, but it must be observed that he found it necessary to make a larger number of injections than Collins.

M. Besnier (1878) has praised injections of pure chloroform in doses of 8 to 16 minims in the treatment of all local pains, no matter what their cause may be (neuralgiæ etc.); he never observed general symptoms, and locally only a slight inflammation. According to him the pain should be easily borne or absolutely nil; the operation, when properly performed, should cause neither induration nor nodosities.

Injections of chloroform have also been recommended by Messrs. Dujardin-Beaumetz, C. Paul, Hamelin, Landouzy and Durau who record results which are closely analogous to those obtained by M. Besnier. M. Féréol has endeavoured, with negative results, to substitute injections of chloroform for injections of morphine in patients suffering from neuralgiæ, cancer, hepatic colic, lumbago, etc. The injection was not more painful than that of pure water, and never produced any local accident (phlegmon, induration, sloughing). Dr. Dujardin-Beaumetz has stated that since he has used chloroform injections with greater frequency, the sloughs due to these injections have become less and less frequent, and that in fact they are only produced when the injection is badly performed.

M. H. Fournier (clinique of Dr. Dujardin-Beaumetz) has tried hypodermic injections of chloroform in the treatment of insomnia. A dose of one drachm was generally sufficient, but no fixed rules can be laid down, and on one occasion it was necessary to give two drachms. Sleep is not associated with anæsthesia.* These injections do not give rise to symptoms of general excitement, which

* Chloroform sleep is accompanied with cerebral anæmia.—(Arloing).

inhalations of ether and chloroform produce. They are not followed by accidents when they are well performed.

Dr. Doc of Boston has used with benefit hypodermic injections of chloroform in herpes zoster. M. G. Guillot, after M. Dop of Toulouse, has used injections of chloroform in toothache; the injections were made into the gum, and produced no local ill-results.* M. Blocq has published a case where submucous injections of chloroform into the gum caused very grave results; according to M. Guillot, however, the accidents observed in this case were probably due to impurity of the chloroform employed.

CICUTINA. (See *Conina*).

CINCHONIDINA. (See *Quinina*).

CINCHONINA. (See *Quinina*).

CINNAMOMUM. CINNAMON, DISTILLED WATER AND TINCTURE.

Distilled cinnamon water has been proposed as a vehicle for solutions (Delioux of Savignac). Cinnamon possesses all the properties of aromatics; it has the power of exciting uterine contractions. It is often prescribed for chronic diarrhœa. Tincture of cinnamon has been used by Luton as a local stimulant in cancer.

CITRATES OF AMMONIA, CAFFEINE, AND MORPHINE. (See *Iron ammonio-citrate*, *Caffeine*, *Morphine*).

* For further details see the paper published by our friend M. Guillot in the *Progrès médical*, no. 12, 1883. *Injections chloroformiques sous-muqueuses*.

COCAINA. COCAINE AND ITS SALTS.*

Extracted for the first time from coca leaves by Garneke (1855), by Percy (1857), then by Niemann (1859), this alkaloid occurs in the form of white colourless needles, of a faintly bitter taste and sparingly soluble.

The hydrochlorate of cocaine is of a yellowish white colour; crystallises in rhomboidal needles, and dissolves readily in water. It produces local anæsthesia.

Principal physiological effects.—Dilatation of the pupils, by paralysis of the filaments of the great sympathetic (Berthold), elevation of the temperature in small doses, lowering after large and poisonous doses (minimum or maximum of temperature variation one-half to one degree after injection) (Nègre), increase in pulse volume, increase in respiratory movements followed by irregularity, lowering, followed quickly by increase, of blood pressure (Laborde). Vertigo after doses of $\frac{2}{7}$ to $1\frac{1}{2}$ grains (Von Anrep, 1880); experiments made on animals by the subcutaneous and intravenous methods have established the fact that, in large doses, cocaine produces hyperexcitability, epileptiform convulsions (from its action on the brain and spinal cord), general analgesia and mydriasis (Moreno y Maiz, Rondeau and Glay, Laborde, Vulpian). According to M. Berthold, there is similarity of action between cocaine and atropine; injection into the jugular vein of an animal of $\frac{4}{7}$ to $\frac{5}{7}$ of a grain of hydrochlorate of cocaine produces considerable fall of blood pressure without a previous rise.† Elimination is by the kidneys.

* In the case of cocaine as in those of antipyrin and kairin, it is impossible to quote in a manual the large number of works to which these various substances have given rise.

† As with many other substances, the physiological effects of cocaine are still matters of dispute which we cannot stop to consider.

Hydrochlorate of cocaine . 4 grains
 Distilled water . up to 112 minims.

(Croston, 1884).

An injection of 4 minims ($= \frac{1}{7}$ of a grain) at intervals of 3 to 5 minutes round a tumour of the face. The first injection was the only painful one. Operation for removal of the tumour was commenced after the third injection, and completed in about 10 minutes.

Since then several medical men have used solutions of cocaine hypodermically in similar cases, among others Messrs. Hall, Halsted, Ceci (5 per cent. solution, 1885), etc.

According to Dr. Dujardin-Beaumetz, there have been observed after injections of cocaine practised on persons in the erect posture, vertigo, syncope, and sensorial illusions with cerebral excitement.

Messrs. Morselli and Buccola (*Bulletin général de thérapeutique*, April 30th, 1885) have in the medico-psychological clinique of Turin submitted to systematic treatment (in one case for two months) patients affected with melancholia. The doses injected were from $\frac{1}{35}$ to $\frac{1}{7}$ of a grain of cocaine (pupillary dilatation,* rise of temperature—sometimes from one to two degrees—acceleration of pulse and respiration). They found marked amelioration from this course of treatment.

Hydrochlorate of cocaine . 1 grain
 Distilled water . up to 112 minims.
 16 minims $= \frac{1}{7}$ of a grain.

(Nègre).

Puncture and injection were alike absolutely painless. After 2 or 3 hours there were observed pain and redness

* According to M. Livierato of Geneva, hypodermic injections do not produce mydriasis.

corresponding with a slight puffiness (Nègre), never with abscess or true inflammation.

In 1884 Messrs. Baratoux and Burchard availed themselves of the local action of cocaine (1 in 50, or 1 in 25 solution) to open abscesses and whitlows. Wilson removed a lipoma under the anæsthetic action of cocaine.

The experiments of M. Nègre shewed that after hypodermic injections in man, made on the dorsal aspect of the forearm, anæsthesia is constant at the site of puncture, and extends in most cases over an elliptical area of which the puncture forms the upper limit. Anæsthesia lasted about ten minutes, and diminished progressively from above downwards, but most notably downwards.*

Dr. Da Costa (*Medical News*, December 13th, 1884) had formerly observed after the hypodermic injection of a few centigrammes, and even of a few milligrammes, of cocaine, diminished sensibility at the point of injection and round about; but he thought that this diminished sensibility was of small importance. He obtained no benefit from subcutaneous injections in the treatment of neuralgia.

M. Frignani (*Revista clinica di Bologna*, Feb., 1885) has used with benefit in the dysphagia of phthisis solutions of cocaine (9 per cent.) hypodermically; 4 injections per diem.

Messrs. Hall, Nash, and Cartwright have used a submucous injection of hydrochlorate of cocaine (20 to 30 per cent. solution) for tooth extraction (*Lancet*, December 20th, 1884). According to M. Brasseur, hydrochlorate of cocaine by submucous injection has at the best given but doubtful results in cases of toothache.

Dr. Franchotte made use, on himself and another, of hypodermic injections of cocaine (2 per cent.) for migraine.

* Nègre, *Etude sur le chlorhydrate de cocaine*. Thèse de Montpellier, 1885.

He experienced 5 minutes after the injection of 2 centigrammes ($\frac{2}{7}$ grain) a sense of well being, and obtained complete relief from the hemicrania, but the migraine recurred, although in a milder form (*Annales de la Société de Médecine d'Anvers*, March, 1885).

Hydrochlorate of cocaine has also been combined with morphine (Rusconi) and bichloride of mercury (Plevani). See also MORPHINA and HYDRARGYRUM.

[Prof. Mosler has obtained excellent results from the use of Salicylate of Cocaine in the treatment of asthma. He injects $\frac{4}{7}$ of a grain in 5 per cent. solution. *Trans.*]

CODEINA. CODEINE.

Soluble in 80 parts of water, in alcohol, and in ether.*

The hydrochlorate and the phosphate of codeine are alone used.†

Hydrochlorate of codeine . . . 1 grain

Distilled water . . . up to 128 minims.

16 minims = $\frac{1}{8}$ of a grain.

(*Erlenmeyer*).

Erlenmeyer has used it, without apparent benefit, in neuralgia; Reissner in mental diseases in doses of $\frac{3}{4}$ grain to $1\frac{3}{4}$ grains, and Piedvache has used it with success in two cases of neuralgia in solution of 1 in 20 (25 to 30 divisions of syringe-barrel).

Phosphate of codeine is soluble in 4 parts of water, and contains 70 per cent. of codeine. This salt should be administered in doses twice as large as those of morphine.

Very exceptionally there are inflammatory troubles at the point of injection. According to M. Yvon, this salt

* For its physiological effects, see the article MORPHINA; consult also Claude Bernard, *Leçons sur les Anesthésiques*, 1875, p. 184.

† Frommüller, *Zur Wirkung des Phosphorsäure Codeins* (*Med. chirurg. Rundschau*, 1883, no. 10).

administered hypodermically in a dose of $1\frac{1}{2}$ grains produced no therapeutic result.

[Codeine has also been used in gastrodynia, cancer, and insomnia. It is very useful in some forms of cough, and particularly so in diabetes. In one case of obstinate bronchial asthma I have found it more effectual than any other drug in quieting the paroxysms and inducing sound refreshing sleep. *Trans.*]

COLCHICINA. COLCHICINE.

Administered first by Lorent in gout, in doses of $\frac{1}{35}$ of a grain, it produced such painful and inflammatory effects that he discontinued its use. He did not observe any effect on pulse and respiration. M. Heyfelder used it with success in articular rheumatism and various neuralgiæ, amongst others in sciatica.

Colchicine 1 grain

Distilled water . . up to 1 ounce, 80 minims.

Sixteen minims for one dose = $\frac{1}{35}$ of a grain.

Injection causes a sharp burning pain. In one-third of the cases there were signs of local inflammation.

Colchicine has also been employed in chronic rheumatism, in similar doses, by M. Badia of Barcelona, and by M. Hirsch in acute articular rheumatism, five drops of a 1 in 10 solution once to thrice daily. The local phenomena were insignificant.

According to M. Laborde crystallised colchicine should be included in the category of those proximate principles which require to be administered by centigrammes and not by milligrammes (*Soc. de biologie*, 5 April, 1884). In doses of one centigramme ($\frac{1}{7}$ grain) it produces in man nausea and vomiting.

CONDURANGO, DECOCTION OF.

The injection of decoction of condurango* has yielded encouraging results in four cases of gastric and œsophageal cancer. It is especially useful in gastric catarrh.

CONINA, CONINÆ HYDROBROMAS. CONINE (CONICINE, CICUTINE), HYDROBROMATE OF CONINE.

Conine is insoluble in water, soluble in alcohol and ether.

Principal physiological effects.—These are very variable; dejection, sadness, general tremors, dyspnœa, rapid pulse, increase, then diminution and finally loss, of reflex irritability; slowing of the pulse and respirations; analgesia; paralyzing action on motor nerves, which lose their excitability.† The vagus nerve which is the first to suffer is also the first to recover.

Pure conine has no physiological action on the motor and sensory nerves; it affects motion and sensation only by its action on the nerve centres (Tuloup). Respiration is most rapidly affected, the heart is the last to die; the organs of sense, the digestive and calorific functions are little affected (Tuloup); affections of sight, collapse, and death by asphyxia. The hydrochlorate and hydrobromate of conine are stable salts. Their action is similar to that of conine, but more energetic. In short, it is very difficult

* See or its history and bibliography among the lately published works, the essay of M. Hoffmann, *Klinische Beobachtungen über die Wirkung der Condurango-rinde bei Carcinom*, Basle, 1891.

† Contrary to the opinion of M. Tyriakan, who attributes this action to a species of essential empyreumatic oil, as yet ill-defined, extracted from German conine by M. Mourrut.

to estimate the action of conine* and of its salts, because of their instability and irregularity of action.

The poisonous dose of conine varies from $\frac{3}{4}$ of a grain to 8 grains according to the preparation used (Van Hasselt-Heukel); according to Messrs. Tuloup, Bochefontaine and Tyriakan, as much as $7\frac{1}{2}$ to 8 grains may be given in alcoholic solution to dogs without a fatal result.

The hydrobromate of conine may be prescribed, according to M. Tyriakan, in a small dose of $1\frac{1}{2}$ grains, which may be repeated several times a day till 15 grains or more have been taken. According to M. Tuloup it is well to begin with $1\frac{1}{2}$ grains of hydrobromate of conine, to be taken twice in the 24 hours; the dose should not exceed 4 to $4\frac{1}{2}$ grains. Young children have borne doses of $\frac{1}{7}$ to $\frac{2}{7}$ grain without evil effects — convulsions or diarrhoea — merely apathy and weakness of the limbs.

Elimination is rapidly effected by the skin and lungs. There is possibly a physiological antagonism between strychnine and conine, but it has not been demonstrated.

[The dose of conine and its hydrobromate should not exceed $\frac{1}{2}$ to 2 grains. According to Brunton it is useless in tetanus and strychnine poisoning. *Trans.*]

Local effects.—In no case was pain or inflammation of the cellular tissue observed (Jousset); on the other hand Messrs. Tyriakan and Tuloup assert that it is possessed of caustic and irritant properties. The hydrobromate has no local irritant action (Tyriakan).

* According to M. Bochefontaine, *conium maculatum* contains two active principles, viz., conina (conicine, cicutine) paralysing the central nervous system, and another alkaloid resembling curara. Two hydrobromates are to be distinguished, one of an amber colour comporting itself like conine; the other of a mother of pearl tint, acting like curara. It was the latter which M. Prévost used.

Conine 1 grain
 Rectified spirit . . . 90 minims
 Distilled water . . up to $1\frac{1}{2}$ ounces, 48 minims.
 Sixteen minims = $\frac{1}{48}$ grain.

Conine 1 grain
 Proof spirit 144 minims
 Distilled water . . up to 288 minims.

From 4 to 16 minims = $\frac{1}{72}$ to $\frac{1}{18}$ of a grain (*Pharmacopœia of the Vienna Hospitals*).

Hydrobromate of Cicutine 1 grain
 Alcohol 3 minims
 Cherry laurel water . up to 48 minims.

Sixteen minims of the solution contain $\frac{1}{3}$ of a grain of the salt. (*Dujardin-Beaumetz*).

Hydrobromate of conine . . . 1 grain
 Distilled water 20 minims.

Dose, 1 to 3 minims (*Martindale*).

Therapeutic uses.—Asthma (Pletzer, D'Heilly), pulmonary emphysema and angina pectoris (Erlenmeyer, Lorent), pneumonia and pleurisy (Lorent), tetanus (Stewart), fever (Wertheim), blepharospasm (Eulenburg), whooping cough (see *Annuaire Bouchardat*, 1877, p. 33), bronchitis and spasmodic laryngitis (Méga), tic douloureux (Chaussier, Duméril), chorea (Welch, Harley).

Conine and its salts have, moreover, been used by Busch as narcotics (aqueous solution of 1 in 480), and they have been praised by Messrs. Tuloup, Tyriakan, and Dujardin-Beaumetz in the treatment of convulsive cough, dyspnœa, laryngismus stridulus, various forms of spasm, tetanus, eclampsia, epilepsy, hysteria, and neuralgia.

[Sir Crichton Browne recommends conine in acute mania. *Trans.*]

CONVALLARIA MAJALIS. LILY OF THE VALLEY.

Convallaria majalis, recommended by various authors as a cardiac remedy, has been used hypodermically in a few cases by Dr. Smith Andrew ("Cases illustrating the action of convallaria on the heart." *Archives of Medicine*, VIII., p. 293). [I have not been able to find a reference to this essay in the English journals. *Trans.*]

CORNUTIN. (See *Acidum Sclerotinicum*).

COTOINE.

Cotoine was isolated by J. Jobst of Stuttgart in 1875. It is the active principle of coto bark, (obtained from a family as yet ill-defined, Laurinaceæ or Terebinthinaceæ); crystallises in yellow quadratic needles, is fusible at 130° C. (Würtz); is soluble in boiling water, alcohol, ether, and chloroform; is slightly soluble in cold water, in benzole, and in essence of petroleum, and has a bitter taste.

According to Pribram it is an antiputrescent and antizymotic, but Albertoni asserts that it only delays fermentation.

Physiological properties.—In doses of 16 grains it had no poisonous effect on rabbits (Burkart); one and a half to three grains administered to a healthy man (the dose being repeated several times daily) increased the appetite without producing any disorder or constipation. It is insoluble in the gastric juice, but is soluble in the intestinal fluids; dilates the abdominal vessels (Albertoni); modifies and restores the functional energy of the intestinal epithelium (Albertoni); lowers the temperature (Burkart); has

no effect on peristalsis, but is possessed of antisudorific (Fronmüller) and antisialagogue properties (Albertoni). Elimination is effected by the urine; there is diminution of indican (Burkart, Pribram).

Therapeutic uses.—Cotoine is chiefly useful in the treatment of diarrhœa, except in cases of ulceration of the intestines and in patients suffering from alcoholism and cirrhosis (Burkart, Albertoni,* Gielt, Pribram, Petrone).

It has also been recommended in cholera, the night sweats of phthisis (Fronmüller), salivation (Albertoni), etc. Some observers appear to have obtained no result from the exhibition of cotoine (Patella, Cattani, Bergesio, etc.).†

Cotoine	4 grains
Acetic Ether	up to 16 minims.

Inject a Pravaz syringe (16 minims) every 15 or 20 minutes, or every hour. The injection must be made deeply.

Messrs. Burkart and Jobst, who, subsequently to Baltz (1878), recommended this solution in cholera, advised that 8 to 16 grains of chloral should be added to diminish the pain. They also say that, according to the gravity of the case, the dose may be increased as the preparations of coto have no narcotic effect and do not give rise to any trouble.

* *Comunicazione interno all' uso della cotoina contro il cholera asiatico*, in the *Revista de clinica medica e farmaceutica, tossicologia e farmacologia*, vol. i, fasc. viii, August 1883. Messrs. Albertoni and Gasparini have used with success cotoine (6 grains) combined with bismuth (4 drachms), in mucilage (53 ounces). The latter has used it in persistent diarrhœa in phthisis.

See for further details, Bricon, *Du coto, de la cotoine et de la paracotoine*, (*Progrès médical*, Dec. 1883).

† *Cotorinde und Cotoin* (*Württembergischer med. Correspondenzbl.* no. 20, 1876).

CREASOTUM. CREASOTE.

Creasote was used in 1884 by Rynd as a vehicle for morphine.

Morphine	10 grains
Creasote	1 drachm.

Six drops for one dose in sciatica. He obtained good results from this prescription. Eulenburg in one case of facial neuralgia injected 3 drops of the solution. The injection was extremely painful and produced an elevation of the skin resulting in a yellow pustule which subsided on the second day and was succeeded by sloughing, redness, infiltration and thickening.

Creasote has recently been injected subcutaneously in the treatment of phthisis by Messrs. du Castel and Maigret (1882 and 1884).

Dried pepsine	10 grains
Creasote (beech)	3 minims
Neutral glycerine	77 minims
Alcohol	10 minims
Water	up to 112 minims.

The pain produced by this injection may be avoided by adding to the formula $\frac{1}{4}$ to $\frac{1}{2}$ grain of hydrochlorate of morphine. Sixteen minims of solution contain $\frac{3}{7}$ minim of creasote. Five to six injections daily may be made deeply and, if necessary, into the muscular substance.

CROTONIS OLEUM. CROTON OIL.

Béhier injected into the thigh one drop of croton oil to obtain its purgative action.* No purgative effect was induced, and there was local sloughing.

* We may observe that Langenbeck has inserted croton oil under the skin without producing diarrhoea, and that it has also been used hypodermically in the treatment of erectile tumours.

CUPRI SULPHAS. COPPER, SULPHATE OF.

Sulphate of copper has been used, without any effect, as an emetic by Lissauer. He found that the injection caused violent local inflammation and abscess. M. Luton used it to produce suppuration by derivation, but he found it inferior for this purpose to nitrate of silver.

CURARA, CURARINA. CURARE, CURARINE.

Curare is soluble in water, and in alcohol and water, but is insoluble in ether. Curarine is deliquescent and readily soluble in alcohol and in water.

Principal physiological effects.—From $\frac{1}{7}$ to $\frac{5}{7}$ grain; congestion of brain, violent, but transient, headache, feeling of fatigue, apathy, increase of salivary, lachrymal, sudoriparous and urinary secretions, glycosuria, pulse of greater force and frequency, more rapid respiration, and increase of temperature.

In doses of $1\frac{1}{2}$ grains; rigors, frequent and feeble heart beats, increase of temperature, increase of secretions, distress, and affections of sight, paralysis of lower limbs, intense headache, no loss of consciousness or sensation, diminution of organic changes.

The paralytic action of curare is at first confined to the extremities of the motor nerves; in very large doses this effect extends to the intra-vascular extremities of the vasomotor nerves. Death occurs from paralysis of respiration. Elimination is rapidly effected by the kidneys. The physiological effects of curare and curarine are identical, but the latter is the more powerful.

Antidotes.—Ligature above the wound by which the

poison has been introduced. Artificial respiration, kept up for 2 or 3 hours.

Doses.—According to Messrs. A. Voisin and H. Liouville the hypodermic dose should begin from $\frac{1}{2}$ to $\frac{3}{4}$ grain. Curarine might in man be injected in doses beginning at $\frac{1}{7}$ grain. Poisonous doses manifest their effects in 3 or 4 minutes, after a lapse of half an hour the curare injected produces no result.

The diaphragm being the last muscle the nerve endings of which are attacked by curare, it is easily understood how, when, by degrees, all the other muscles are in a state of relaxation, it may of itself keep up respiration, and consequently maintain life. The *extreme dose* is that which, though producing paralysis of the nerve endings of all the other muscles, still permits the diaphragm to act.

As the greatest uncertainty prevails as to the nature and source of the curare used, it is quite essential to test that which it is proposed to administer. We have therefore to ascertain (1) the genuineness of the curare (2) the degree of its activity.* The samples of curare are never alike, the most active only cause death in a rabbit of 4 to 5 pounds in a dose of $\frac{1}{16}$ of a grain; with some samples it would be necessary to give $\frac{2}{7}$, $\frac{1}{2}$, $\frac{3}{4}$ grain to produce the same result. One-fourteenth of a grain of curare being the extreme dose for a rabbit of 5 pounds 7 ounces, an animal of 50 pounds weight would require as the extreme dose about $\frac{3}{4}$ grain; one of over 108 pounds double that dose, and one of 164 pounds and over $2\frac{1}{4}$ grains.† The extreme dose is ascertained by injecting in a rabbit increasing doses until a lethal effect is produced, the dose

* See on this subject the admirable essay of M. Jousset, of Bellesme, *De la méthode hypodermique et de la pratique des injections sous-cutanées*, Paris, 1865.

† Jousset de Bellesme, *loc. cit.*, p. 72.

immediately preceding the fatal one being the extreme dose.

Local effects.—Swelling, pain, local and general rise of temperature, considerable redness, subcutaneous puffing, rosy-white elevation like urticaria* (Voisin and Liouville,† Du Cazal); painful swellings followed by abscess, which persisted several months, from the use of unfiltered solutions.

Point of injection.—It is always better to inject into a limb, so as not to lose the resource of ligaturing in case of serious accident.

Curare	1 grain
Distilled water	56 minims
Glycerine	up to 112 minims.

Eulenburg, Medic. Kalender, 1883.

Curare	1 grain
Distilled water	up to 112 or 56 minims.

Curare	1 grain
Glycerine	up to 64 minims.

Rosenthal.

Curare	1 grain
Hydrochloric acid	10 minims
Distilled water	up to 64 minims.

Formulary of Vienna Hospital.

Curare	5 grains
Distilled water	up to 30 minims.

Jousset.

Curare	5 grains
Hydrochloric acid	10 minims
Distilled water	up to 64 minims.

* It should be remembered that injections into the skin often produce this result.

† Recently filtered solutions.

Every fifth day one-third or two-fifths of a Pravaz syringe (Kunze, Edlefrei). Du Cazal used an aqueous solution, made by M. Hepp, with the addition of a few drops of alcohol; "it was more a suspension than a solution."

Preyer recommends the salts of curarine, especially the sulphate, in doses of from $\frac{1}{70}$ to $\frac{1}{14}$ grain.

Curarine 1 grain

Distilled water . . . up to 56 grains.

This was the solution which M. Beigel used, but according to M. Sachs (*Berlin. Klin. Woch.*, August, 1879), Preyer's curarine did not contain any active principle and was composed chiefly of phosphate of lime.

Quite recently Dr. G. Lehmann of Munich* made use of the following solution:—

Sulphate of curarine 1 grain

Cherry laurel water 12 minims

Distilled water up to 96 minims.

The effects observed in animals after a dose of $\frac{1}{22}$ grain are—paralysis, more or less pronounced, convulsions of the limbs, increased excitability of muscular and cutaneous reflexes, superficial respiration; *in poisonous doses*, forced expiration, progressive enfeeblement of heart's action, involuntary urination, salivation and lachrymation. In a healthy man after a dose of $\frac{1}{7}$ grain the pulse rose from 74 to 90 beats in the first minute and then sank to the normal rate. After 5 minutes there were occasional disturbances of vision, tendency to vertigo, feeling of oppressed breathing and general debility. The pupils were normal. The symptoms had vanished in two

* G. Lehmann, *Zur therapeutischen Wirkung des Curarinum sulfuricum* (*Allgemein Zeitschrift f. Psych.*, Bd. 41, 43, 1884). And in *Centralbl. f. Nervenheilkunde, Psychiatrie, etc.*, April, 1885.

hours. The reflexes were normal, but there was sense of weight and oppression of the head. The same symptoms were observed after doses of $\frac{1}{14}$ grain to $\frac{2}{7}$ grain.

Sulphate of curarine administered internally in doses of $\frac{2}{7}$ to $\frac{5}{7}$ grain produced similar results in from 20 to 30 minutes after its administration. M. Lehmann, who administered sulphate of curarine in cases of maniacal excitement, found no benefit result from its use.

Therapeutic uses.—Tetanus (Vulpian and Mance, Follin, Gintrac, Richard, Cornaz, Gherini, Lochner, Demme, Neudorfer); epilepsy (Mandl, Benedikt, Voisin and Liouville, Du Cazal, Kunze, Edlefrei, Bourneville and Bricon*); hydrophobia (Fauvel, 1864, Vulpian, Offenberg); chorea, strychnine poisoning (Richter, Burow, Corona); convulsive tic (Gualla); meningitis (Landerberger). Curarine has only exceptionally been employed, by Busch and Beigel among others. This last observer injected it in a case of epilepsy, without effect, up to a dose of over $\frac{1}{6}$ of a grain.

[According to Waring, *Manual of Practical Therapeutics*, 4th edit., 1886, the dose of curarine hypodermically is $\frac{1}{200}$ to $\frac{1}{100}$ of a grain. He says—"that curare controls the spasms of *Tetanus* and *Hydrophobia* is beyond question, but how far it is really effectual in promoting an actual cure has yet to be shewn. The best mode of administration is to inject hypodermically gr. $\frac{1}{10}$ in aqueous (filtered) solution of the strength of 1 in 100." *Trans.*]

* We have used at the Bicêtre, hypodermic injections of a 2 per cent. aqueous solution of curare in the treatment of epilepsy; we have practised more than 3000 injections, and we have only rarely observed slight local accidents (ecchymoses and indurations), and these of short duration. *De l'emploi du curare dans le traitement de l'épilepsie*, (*Arch. de neurologie*, t. ix., p. 43, 201 and 319, 1885).

CYANIDES OF MERCURY, AND POTASSIUM. (See
Hydrargyrum and *Acidum Hydrocyanicum*).

D.

DATURINA, EXTRACTUM STRAMONII. DATURINE,
EXTRACT OF STRAMONIUM.

An alkaloid extracted from the leaves and seeds of *Datura stramonium* (Solanaceæ), chemically identical with atropine (Planta);* sparingly soluble in water (1 in 288), freely soluble in alcohol, less so in ether.

Chief physiological actions.†—In small doses ($\frac{1}{70}$ to $\frac{3}{70}$ grain); dilatation of the pupils, dryness of the throat and mouth, dysphagia, intense thirst, slight increase of pulse and respirations, increased blood pressure, increased intestinal contractions, elevation (not constant) of temperature, heaviness of the head, slight excitement with tendency to movement (the legs are unsteady and give way), lassitude, occasional delirium, profound sleep. Variable phenomena, visual troubles (diplopia, etc.), erotic dreams, pollutions (Oulmont and Laurent). Pricking sensations and tremors (Schroff).

A larger dose produces a condition precisely analogous to drunkenness, the visual troubles are more decided, the iris completely invisible (never amblyopia).

* We have taken as our guide, for the physiological part, the excellent treatise of Messrs. Oulmont and Laurent, *De l'Hyoscyamine et de la daturine*, (*Archives de Physiologie*, t. iii., 1870-1871, p. 215).

† Poehl (1879) decided the non-identity of daturine and atropine.

In large doses.—Dysphagia, dryness and burning of the throat, hoarseness of the voice, sometimes absolute aphonia, rapid respiration which becomes jerky and sighing, rapid cardiac action, fall of temperature and of arterial tension, intestinal paralysis, pallor, chilliness with clammy sweats of the extremities. Sometimes, from the beginning, hallucinations, general convulsions, frequent desire to urinate, with or without priapism, coma, urgent thirst, and headache on awaking. Messrs. Oulmont and Laurent have never seen erythema.

In very large doses.—The phenomena resemble intermittents,* and there is arrest of the heart beats; peripheral sensibility is only blunted in poisonous doses. Daturine exerts its action especially on the great sympathetic; in small doses it diminishes the capillary circulation—in strong doses it determines vascular paralysis (Oulmont and Laurent).

After death in animals there are found intense injection of the meninges, and frequently hæmorrhagic extravasations at the base of the brain—there are no changes at the point of injection.

Elimination is rapid and is chiefly effected by the kidneys (Oulmont and Laurent). Daturine is *antagonised* by eserine (Amagat). *Local effects* are nil.

Extract of Stramonium	1 grain
Distilled water	up to 64 minims.

Dose.—4 to 12 minims.

Lorent.

Therapeutic uses.—Pulmonary emphysema (Lorent); neuralgia (Oulmont and Laurent); tetanus, various forms of tremor (shaking palsy, etc.).

* M. Laurent after an injection of $\frac{1}{2}$ grain has observed intermittent symptoms persisting for several days.

[According to Waring (*loc. cit.*) daturine may be given hypodermically in *Acute Mania*, in doses of $\frac{1}{120}$ to $\frac{1}{60}$ grain, but it is less useful than atropine or hyoscyamine. *Trans.*]

DIASTASE. (See also *Inject. Nutrit. Hypoderm.*).

Soluble in water, insoluble in alcohol. Diastase has been injected by Küssmaul in doses of $1\frac{1}{2}$ to 3 grains, in watery solution, in diabetes mellitus, without diminution of the sugar in the urine (diminution occurred after intravenous injection).

DIGITALINUM, TINCTURA DIGITALIS. DIGITALINE,* TINCTURE OF DIGITALIS.

Digitaline is a glucoside insoluble in water, fairly soluble in ether, freely soluble in alcohol and in chloroform. The degree of solubility varies with the sample of digitaline.

Principal physiological effects.†—Diminution of frequency of the pulse beats with increase of arterial tension, fall of temperature, increased diuresis, diminished perspiration (Gubler).

In poisonous doses.—The symptoms are reversed.

Elimination is slow and the effects are cumulative.

Local effects.—In a case of heart disease with general

* The composition of samples of commercial digitaline is very various, and it is, moreover, difficult to obtain it in a state of purity; we therefore, think, it preferable to recommend the use of preparations of the plant.

† Digitaline, digitaléine, and digitoxine produce effects similar to those produced by digitalis leaves. Digitoxine possesses the most intensely poisonous properties of the three. The products of decomposition, digitaliresin and toxiresin, are convulsants: they have been the subjects of investigation by Dr. Schmiedeberg and our friend Dr. H. Perrier; they are not used.

œdema, ten drops of an alcoholic solution of digitaline ($= \frac{1}{140}$ grain) produced, in addition to sharp pain at the time of injection, a comparatively large slough (Luton).^{*} The solution of Pletzer is also irritating, but that made use of by Prof. Eulenburg, prepared freshly, has according to him no local irritant action. The injections administered by Gubler do not occasion local accidents, except slight transient pain and burning. M. Guarda with a solution of $\frac{1}{7}$ grain in 16 minims of water, produced an erysipelatous swelling. Witkowski has observed grave local accidents (phlegmon, etc.). Digitoxine (not in use) causes phlegmons when administered hypodermically, even in extremely small doses.

Digitaline (Merck's) . . . 1 grain
 Glycerine 1 ounce 112 minims
 Distilled water . . up to 1 ounce 6 drachms 40 minims.
 16 minims $= \frac{1}{55}$ grain.

Witkowski.

Digitaline (Merck's) . . . 1 grain
 Glycerine 1 minim
 Distilled water . . . up to 12 or 24 minims.†

Otto.

Francque has used tincture of digitalis, Lorent uses digitaline dissolved in glycerine.

Digitaline 1 grain
 Glycerine 12 minims
 Distilled water up to 96 minims.

Four minims of this solution are equivalent to $\frac{1}{30}$ grain of digitaline.‡

Pletzer.

* Courvat, in 1871, had already observed the local irritant action of digitaline.

† [This solution is inconveniently strong; one minim $= \frac{1}{24} - \frac{1}{12}$ grain of digitaline. *Trans.*]

‡ [I have altered this formula, the quantities given in the French Edition being manifestly erroneous. *Trans.*]

Fronmüller* makes use of an aqueous solution, which must always be shaken before use, and Erlenmeyer of a perfectly clear aqueous solution of 1 in 20.

Digitaline 1 grain
 Alcohol 112 minims.
 Distilled water . . up to 224 minims
 4 minims = $\frac{1}{56}$ grain of digitaline.

Eulenburg.

Digitaline 1 grain
 Alcohol at 95° 1 ounce 80 minims
 Distilled water . . up to 2 ounces 160 minims.
 16 minims = $\frac{1}{70}$ of a grain.

Adrian.

Gubler has used a solution of one in five hundred of Homolle and Quévenne's amorphous digitaline in a mixture of alcohol and water in equal proportions; 16 minims of this solution are equivalent to $\frac{1}{35}$ grain of digitaline.

Homolle and Quévenne's Digitaline . . 1 grain
 Alcohol 280 minims
 Distilled water up to 560 minims.

Gubler.

Eight minims are equal to $\frac{1}{70}$ grain of digitaline.

Therapeutic uses.—Heart diseases, (Eulenburg, Fronmüller, Guala), mental diseases (Otto).

[The use of digitalis hypodermically is not as a rule desirable. According to Dr. Wood, of Philadelphia, tincture of digitalis causes less irritation when injected subcutaneously and is otherwise preferable. *Trans.*]

* Pletzer, Fronmüller, Erlenmeyer, Eulenburg, etc., used the digitaline of Walz which is soluble in 125 parts of cold water, whilst the digitaline of Nativelle is insoluble.

DUBOISINE.

An alkaloid, obtained from *Dubosia myoporoides*, a shrub half way between the Solanaceæ and Scrophulariaceæ (Lanessan); chemically and physiologically identical with hyoscyamine (Ladenburg, Berner) soluble in water, freely soluble in alcohol, ether, chloroform, benzol and sulphide of carbon (Gerrard).

Physiological actions.—Mydriasis, arrest of sweat secretion, dryness of the throat, hyperæsthesia, quickened pulse, cephalalgia, vertigo. Tetanus in frogs (Sidney Ringer), somnolence, general enfeeblement. According to Dr. Ringer its action is the opposite of that of jaborandi and pilocarpine, and also of muscarine (rapidity of heart beats is diminished by the latter).*

Sulphate of duboisine . . . 1 grain

Distilled water . . . up to 1 ounce 45 minims.

From one and a half to three minims of the solution contain $\frac{1}{350}$ to $\frac{1}{175}$ grain of salt.

M. Dujardin-Beaumetz has observed some poisonous symptoms with daily doses of $\frac{1}{280}$ to $\frac{1}{140}$ grain in a solution of 1 in 2000, in the treatment of exophthalmic goitre; he therefore recommends a lapse of some days between the injections. Three drops of a one per cent. solution inserted into the conjunctival cul-de-sac produced symptoms of poisoning.

Therapeutic uses.—Exophthalmic goitre (Dujardin-Beaumetz, Desnos, $\frac{1}{140}$ to $\frac{1}{70}$ grain), night sweats (Blake, $\frac{1}{70}$ grain), asthma (Bancroft).

[Gubler uses this remedy hypodermically in the sweating of phthisis, and also in cases of acute mania. *Trans.*]

* We see that these effects resemble those of atropine, and that it forms with the latter, daturine, hyoscyamine, and hyoscine a sort of ascending series (Binz). See also note on HYOSCYAMINE.

E.

EAU DE VIE. (See *Alcohol*).

EMETINA. EMETINE.

Pure emetine,* an alkaloid of ipecacuanha, is very sparingly soluble in cold water (1 in 1000) and in ether, is readily soluble in alcohol, chloroform, carbon sulphide and fixed and essential oils (Podwissotzky). The nitrate of emetine is soluble, 1 in 100 parts; the sulphate of emetine is the most soluble salt.

Principal physiological effects.—In doses of $\frac{1}{14}$ to $1\frac{1}{2}$ grains, burning taste, salivation, nausea, vomiting, diarrhœa, profuse sweats. During the period of nausea and vomiting,† quickening, then slowing, of the heart-beats and of respiratory movements (Ackermann), fall of temperature. In frogs there is loss of spinal reflex irritability and paralysis of the peripheral motor nerves and of the muscles (Weyland, Pécholier, Harnack).

In poisonous doses.—Extreme muscular debility, collapse and death ($\frac{2}{7}$ grain in a cat and $1\frac{1}{2}$ to $4\frac{1}{2}$ grains in a dog).

Emetic doses.—One-fourteenth to two-sevenths of a grain (Nothnagel and Rossbach). According to Gubler (*Leçons de thérapeutique*, 1880, pp. 425-428), it is necessary to give not less than 3 to $4\frac{1}{2}$ grains to produce the same effects as are obtained by 16 to 24 grains of powdered ipecacu-

* Messrs. Lefort and Würtz have lately obtained emetine crystallised.

† According to Messrs. d'Ornellas and Gubler, emetine injected hypodermically produces the emetic effect much more slowly (about 40 minutes) than by the stomach. Vomiting accompanies elimination from the stomach.

anha. The human subject can tolerate considerable quantities of it, especially if it is injected in the subcutaneous cellular tissue; even to $3\frac{1}{2}$ grains introduced several times. It is possible to obtain no poisonous effect from it—not even any inconvenience. The doses indicated as emetic by the hypodermic method by M. d'Ornellas are on the other hand very small, viz. from $\frac{1}{16}$ to $\frac{1}{14}$ grain. Fonssagrives (*Formulaire thérapeutique*, 1882) recommends a dose of $1\frac{1}{2}$ grains hypodermically—Dyce Duckworth, $\frac{3}{70}$ grain.

Local effects.—In the practice of Eulenburg, injection did not appear to induce pain; there remained only at the point of puncture a trifling redness which soon disappeared (the child was suffering from capillary bronchitis and died the following day). Sir Dyce Duckworth found on one occasion slight induration. Applied to the skin emetine produces inflammation and pustules.

Emetine (pure)	. . . . .	3 grains
Sulphuric acid	. . . . .	1 minim
Distilled water	. . . . .	up to 48 minims.

One minim = $\frac{1}{16}$ grain.

*Eulenburg.**

Pure emetine	. . . . .	1 grain
Distilled water	. . . . .	up to 140 minims.

One-tenth of a syringe or 2 minims ($\frac{1}{70}$ grain) to be injected every five minutes till the desired result is obtained. *Pharmacop. of Vienna clinics and Klin. Recept-tasch*). This solution is apt to produce suppuration; it is necessary to acidulate to effect solution of the emetine.

* This author injected this dose several times in a case of acute capillary bronchitis in a child without any effect. The action of emetine is very variable, inasmuch as it does not constitute a definite and constant principle. (V. Buignet. *Diction. de chirurg. et de médecine*, Jaccoud, art. *Éméline*).

EMETIC, TARTAR—ANTIMONIUM TARTARATUM.

TARTRATE OF ANTIMONY.

Soluble in water 1 in 15, in glycerine $5\frac{1}{2}$ per cent., insoluble in alcohol.

Principal physiological effects.—*In small doses.*—Administered every day for 14 days (experiments of Meierhofer and Nobiling on themselves), in doses progressively increased from $\frac{1}{70}$ to $\frac{1}{7}$ grain. Sense of weight in the head, debility, thirst with feeling of inward heat, drowsiness, frequent and irregular pulse, vertigo, pallor of face, ringed eyes, and dysphagia. Loss of appetite, sense of epigastric heat, frequent intestinal pains, nausea, anxiety, yawning, dyspnoea, painful abdominal sensations, diarrhoea or constipation, chilliness of the skin, feeble heart beats, general prostration and emaciation. In doses of $\frac{1}{7}$ grain continued for several days, eructations, efforts to vomit, frequent stools, increase of hepatic dulness with pain, colic and griping, itching of the skin, albuminuria, emaciation amounting to 124 ounces in $\frac{1}{2}$ to 14 days. The poisonous phenomena only disappear finally after two months.

In large doses.—(One-and-a-half grains and upwards), there are symptoms of gastro-enteritis, prostration, thread-like pulse, which is also frequent and irregular, superficial respiration, cold sweats, cyanosis and death* from paralysis of the heart. Pustular eruptions, ulcerations and scars supervene on application to the skin.

Local effects.—Very acute local inflammation with one-third of a grain, phlegmon and lymphangitis (Lehmann), with half a grain, syncope and phlegmon (Ellinger).

* Rare in this dose, especially if the heart is healthy.

Lissauer* has also observed phlegmons after hypodermic injection of tartar emetic, but this salt if combined with morphine only gives rise to trifling, and sometimes to no local ill effects.

Tartrate of antimony 1 grain
 Morphine (Tartrate?). $\frac{1}{6}$ grain
 Distilled water up to 64 minims.

16 minims = $\frac{1}{4}$ grain of antimony.

Lissauer.

Therapeutic uses.—It may really be said that tartar emetic is hardly ever indicated except as an emetic. It has been used by various authors, (Lehmann, Ellinger, etc.); it has been combined with morphine by Lissauer who recommends it in cases of poisoning where antimony cannot be administered by the stomach.

ERGOTÆ EXTRACTUM, ERGOTINUM, ERGOTININUM. EXTRACT OF ERGOT, ERGOTINE, ERGOTININE.

The extract, prepared *in vacuo*, of Grandral of Rheims, of Berjot of Caen, the ergotine of Bonjean of Chambéry (which is an aqueous extract of ergot of rye), the alcoholic extract of Wiggers, the ergotinine of Tanret, the hydro-

* This property of exciting phlegmonous inflammation has been used in the treatment of sebaceous cysts, but at the same time we must exclude this from the hypodermic method proper.

Tartrate of antimony 16 grains
 Distilled water up to 240 minims.

alcoholate of Yvon,* as well as the ecboline and ergotine of Wenzel and others are nothing more than mixtures of the soluble principles contained in ergot. (See the section on SCLEROTINIC ACID).

Wiggers' ergotine is soluble in alcohol, but insoluble in water and in ether; Bonjean's, on the other hand, is soluble in all three vehicles.

Dr. Kobert has obtained three new principles from ergot which he names ergotinic acid, sphacelinic acid and cornutin.† This author has only experimented on the lower animals. We certainly do not seem to have arrived as yet at a definite knowledge of the active principles of ergot. Uncertainty increases with fresh researches, and many of the variously named active principles are but imperfectly known, and confounded with one another.

Chief physiological actions.‡—In therapeutic doses, so far as we know, no abnormal phenomenon has ever been observed. In man, in large doses (3 ij), or in long-continued small doses, there are the following symptoms:—vertigo, weight of head, feeling of lassitude, tinglings, numbness of the ends of the fingers and toes, fugitive pains, convul-

* We think that preference should be given, for hypodermic purposes, to the ergotines of Bonjean and especially to that of Yvon (16 minims of the latter are equivalent to 16 grains of ergot, and even more if the fluid is concentrated) which is perfectly stable, salicylate of sodium and cherry laurel water being employed in its preparation. M. Schmitt says that the method by which Yvon's extract is prepared is tedious and awkward (*Répertoire de pharmacie*, 1880, p. 294).

† The results obtained by various observers are vague and contradictory. This discordance is probably due to differences in the preparations used, to uncertainty in composition, and to changes which have occurred in them by keeping.

‡ We give here the physiological action of the aqueous extract which contains a very large number of active principles. (See the essays of M. Haudelin, Dorpat, 1872; and of Messrs. Dragendorff and Podwissotzky in the *Archiv f. exp. Path. und Pharm.* bd. vi., p. 153).

sive paroxysms (clonic and tonic), sometimes epileptiform and accompanied by contractions, violent pains and cutaneous anæsthesia, erysipelatous swelling followed by gangrene. There is contraction of the involuntary muscular fibres of the uterus, blood-vessels, etc. The effects observed on the circulation are absolutely contradictory. According to Trousseau and Boissarie, ergot has the property of accumulating in the system and may then produce, after long-continued small doses, an onset of gangrene.

Local effects.—All the preparations of ergot when injected hypodermically cause intense persistent pain and inflammatory symptoms. Dr. Eulenburg states that he has not observed pain from the use of Bonjean's ergotine.

[This quotation appears to be inaccurate. In the *Handbook of Therapeutics*, *Loc. cit.*, p. 468, Prof. Eulenburg recommends Bonjean's ergotine 2·5, glycerine and distilled water, of each, 7·5, 1 to 2 syringefuls = $2\frac{1}{4}$ to $4\frac{1}{2}$ grains of the extract, and he adds "the injection of this solution is always somewhat painful, and is often accompanied by the formation of small obstinate lumps or indurations at the seat of puncture." I have repeatedly used the ergotinin tabloids of Messrs. Burroughs and Wellcome, and find that if injection is made deeply into the muscular substance there is no pain beyond that caused by the prick of the needle, and there are no unpleasant local after effects. *Trans.*]

M. Luton has seen inflammatory indurations and gangrenous abscess after the injection of 16 grains of ergotine (Grandval's extract) in solution in water. The same author states that he has never seen suppuration result from the injection of 16 minims of a 1 in 50 alcoholic tincture which he recommends. Drs. Dujardin-Beaumetz, Bourneville and Gœnner state that Yvon's ergotine never

entails local accident, and Messrs. Bénard and Herrgott likewise have not met with pain, induration, or other local trouble from its use.

Aqueous extract of ergot . . . 2 grains
Glycerine 12 minims
Distilled water . . . up to 24 minims.

Twelve minims = 1 grain of extract.

Albanèse.

Ergotine 4 grains
Cherry laurel water . . up to 24 minims.

Dose.—12 to 16 minims for one injection, to be given every 2 or 5 days.

*Vidal.**

Ergotine 3 grains
Glycerine 2 minims
Water up to 18 minims.

Hildebrandt.

Ergotine 2 grains
Glycerine 16 minims
Distilled water . . up to 32 minims.†

Moutard-Martin and others.

* Used in the treatment of prolapsus ani, the injections being made in the neighbourhood of the anus; cure in 20 days. We have used ergotine at the Bicêtre in the treatment of this affection. The injections, which were practised daily, produced at first no local accident, but after a time two abscesses formed which were followed by cure of the prolapsus. We used a solution of 4 grains of Bonjean's extract in equal parts of glycerine and water up to 32 minims. M. Jette asserts that either Bonjean's or Yvon's ergotine may be used, but that all others should be rejected.

The duration of treatment varies from a few days to several weeks.

† Terrier used this solution double strength in the treatment of metrorrhagia due to uterine fibroid. Sixteen minims were injected daily.

Yvon's ergotine 12 grains
 Water up to 96 minims.

Dujardin-Beaumetz.

Peton and other authors state that they have found this ergotine produce pain and indurations.

Ergotine 2 grains
 Distilled water up to 32 minims.

Bucquoy.

Dr. Eulenburg observed slight pain but no local inflammation from 16 minims of this solution.

Dr. Jaccoud administers 2, 3, and sometimes 4 daily injections of 16 minims of the following solution in the treatment of hæmoptysis, unaccompanied by pyrexia, in tubercular phthisis.

Ergotine 4 grains
 Glycerine 18 minims
 Cherry laurel water 9 minims
 Distilled water up to 48 minims.

Ergotine 1 grain
 Alcohol 42 minims
 Pure Glycerine up to 84 minims.

Dose.—6 to 12 minims = $\frac{1}{14}$ to $\frac{1}{7}$ of a grain of ergotine.

Eulenburg.

This solution was used unsuccessfully in a case of convulsive cough in a child of 4 years; 11 injections were made in 20 days.

Ergotine 6 grains
 Alcohol }
 Glycerine } of each 6 minims
 Water up to 24 minims.

Stephano Tolini.

Extract of Ergot	4 grains
Glycerine	20 minims
Water	up to 48 minims.

Dose.—16 to 32 minims.

Bonjean's ergotine	16 grains
Chloroform	4 minims
Water	up to 64 minims.

Each minim contains $\frac{1}{4}$ of a grain of ergotine. The chloroform is added to the solution to make it keep well for a considerable time and to lessen the pain of the injection; the proportion of chloroform, however, does not seem to be sufficient to effect this purpose.

Ergotinine	2 grains
Lactic acid	1 minim
Alcohol	22 minims
Cherry laurel water	220 minims
Water, a sufficiency to make 2 ounces,	160 minims.
Sixteen minims contain $\frac{1}{35}$ of a grain of ergotinine.	

Tanret and Dujardin-Beaumetz.

Colic and vomiting were produced when the dose exceeded $\frac{1}{14}$ of a grain. No effect followed until a lapse of from 2 to 24 hours.

Prof. Eulenburg (*Deutsche med. Wochenschrift*, 1883, No. 44) has used Gehe's ergotinine in the treatment of headache, neuralgia, Basedow's disease, and nocturnal incontinence of urine. There was hardly any pain, and no local troubles resulted. The dose ranges from $\frac{1}{700}$ to $\frac{1}{70}$ of a grain.

Therapeutic uses.—All forms of metrorrhagia (Reuben, Landmann), rectal prolapse (Vidal, Perrotin, Michel), retention of urine (Luton), uterine fibroids (Hildebrandt),*

* It has been asserted that injections of ergotine by Hildebrandt's method cause reduction of fibro-myomata, but we cannot find any recorded cases which indisputably bear out this statement.

hemicrania (Berger), cephalalgia (Lebert, Eulenburg), Basedow's disease (Eulenburg), poisoning by carbonic oxide (Remak), hæmoptysis (Drasche, Ritcliffe and others);* hæmatemesis, epistaxis, bleeding hæmorrhoids, varices (P. Vogt), aneurism (Langenbeck,† Rouge, Albanèse, Eulenburg and others), Werlhoff's disease or purpura hæmorrhagica, (Piazza of Palermo), hæmaturia (Luton), dangerous hæmorrhage resulting from rupture of the bulbous portion of the urethra (Albanèse, who used it successfully), splenic leucocythæmia (Da Costa found that it diminished the spleen), varicocele (Wycisk), neuralgia (Marino of Palermo), diabetes, various kinds of convulsion (Corrigan), phthisical cough (Allan).

The alcoholic tincture recommended by M. Luton in 16 minim doses, which according to this author never produced suppuration, does not appear to have been free from irritating properties in the hands of M. Stocquart. (*Note sur les injections hypodermiques de teinture de seigle ergoté, Annales de la Société médico-chirurgicale de Liège*, 1884).

Ergot of rye is often administered in an empirical haphazard fashion to promote uterine contractions. We may recall the fact that the best modern accoucheurs, among others, Nœgele, Schörder and Playfair, condemn this practice which is dangerous alike to mother and child on account of the persistent spasmodic contraction which it induces, moreover, the danger of premature closure of

* Cavaleri in a case of hæmoptysis used a 1 in 2 aqueous infusion of ergot of rye. Observe in passing that if it is desired to obtain a successful result from the use of ergot in these cases, it is absolutely essential that the middle tunic of the vessels should be healthy throughout.

† Injection between the skin and tumour. Schwalbe attributes the success of Langenbeck and P. Vogt to the irritant and inflammatory local effects of the alcohol used as a vehicle. We are inclined to share this opinion in regard also to other hypodermic solutions of ergotine, that, for instance, used by M. Vidal in the treatment of rectal prolapse.

the os before the third stage of labour is completed must not be forgotten. For these and other reasons, which it is unnecessary to enlarge on here, ergot and its compounds ought not, in our opinion, to be employed under any circumstances in the pathology of parturition. In short, we think that the indications for the use of ergot are comprised within a very narrow compass.

[I am indebted to my friend Dr. Halliday Croom of the Edinburgh Medical School for the following prescription, which, he assures me, causes neither inflammation nor abscess:—

R Ergotini	3 ij
Chloralis hydratis	℥ j
Aquam ad	℥ j.

Sig. Thirty minims for one injection.

The formula in the last edition of the *British Pharmacopœia* is as follows:—

Ergotin	100 grains or 1 part
Camphor water	200 fluid grains or 200 parts.

Dose.—3 to 10 minims. *Trans.*]

ESERINE. (See *Calabar Bean*).

ESSENCE OF TURPENTINE. (See *Turpentine*).

ETHER, SULPHURIC—ETHER, NITRIC—ETHER,
ACETIC—HOFFMANN'S FLUID.

Sulphuric ether is soluble in nine parts of water and in all proportions of alcohol.

Principal physiological effects.—In moderate doses.—Eleva-

tion of temperature (the rise being more marked the lower the temperature of the body before injection, Dupuy), increase of arterial tension, of pulmonary combustion, of all secretions except the urinary (Ocounkoff), excitement, exaltation of the senses and of cutaneous sensibility, dilatation of the pupils. Anæsthesia by hypodermic injection is only produced by a much larger dose than that required by inhalation, and then the opposite effects to those described above are observed.

In dogs the dose required to produce anæsthesia varies from $1\frac{1}{2}$ to 3 ounces, according to the animal's weight (Ocounkoff).*

Local effects.—Momentary but excessively acute pain, without, however, inflammation or subsequent suppuration (Luton);† sometimes the pain is absent (Dupuy). M. Luton and later M. Henrot (typhoid fever with hyperpyrexia) have observed at the point of puncture a circumscribed subcutaneous emphysematous swelling, due to the evaporation of the ether which has a boiling point of 36° (96.8° F.). According to M. Luton absorption is not too rapid, but all the facts reported by other authors are opposed to this opinion.

After injections of ether disturbances of motion and sensation have been observed (Arnozan and Salvat, Char-

* In the preparation of this article we have borrowed largely from the admirable work of Mlle. Ocounkoff, brought out under the direction of M. Verneuil (*Du rôle physiologique de l'éther sulfurique, de son emploi en injections sous-cutanées comme médicament excito-stimulant*, Paris, 1877), also from that of M. Dupuy (*Des injections sous-cutanées d'éther sulfurique, de leur application au traitement du choléra dans la période algide*, Paris, 1882). These are without exception the two best essays which have appeared down to the present time on this subject.

† M. Luton has met with abscess in a case of severe variola, but it is the only known case of the kind.

pentier, Remak). The etiology of these accidents is still obscure, nevertheless Messrs. Arnozan and Salvat believe, from their experiments, in the existence of a neuritis. It follows from the great diffusibility of ether that the injection should not be too large, should not be repeated a second time at the same point, and should not be pushed beyond the cellular tissue.

Doses.—Sixteen to thirty-two minims, or even less, often suffice to produce a stimulant action (Dupuy). The action of ether being eminently transient the injections should be repeated at short intervals (*e.g.* of an hour) to obtain the phenomena of excitement.

Alcoholic sulphuric ether (Hoffmann's fluid), has been used as an analeptic by Zuelzer, and *acetic ether* by Bumüller.*

Sulphuric ether in combination with camphor, has been injected subcutaneously by Messrs. Eulenburg (collapse due to facial erysipelas), Mader and Oser (cholera). M. Burdel has combined it with sulphate of quinine, 6 grains to 16 minims, in severe cases of pernicious intermittent affections. M. Zuelzer appears to have been the first to make use of subcutaneous injections of ether (1866) in choleraic patients and, in 1871, in patients suffering from adynamic typhoid. Since then it seems that numerous authors have used ether hypodermically.† Ether has thus been employed among others in the following diseases; typhoid fever, algide stage of cholera (Hans Büchner, 1873, Dupuy, Lindwurm, Reyher and Lermoyez), profound coma with coldness (33·5°C.) due to obstinate and excessive hæmorrhage after

* Quoted from Eulenburg, *Ziemssen*, B. i., 1880.

† M. E. Bœckel (1877) had used injections of nitric ether for some time without any marked results.

extraction of a naso-pharyngeal polypus (Verneuil),* in poisoning by morphia and chloral (Lewenstein), in sciatica and lumbago (Brindley James), in dropsies (fatty heart), in convulsions followed by coma in a child at the beginning of pneumonia (Gellé), cholera nostras (Cérenville, Dufour, Leube), traumatic shock (Bayr, 1874, Dupont), variola (Luton, Du Castel, Dreyfus-Brissac), lipothæmia as a result of repeated puerperal hæmorrhages (Bayr, Letulle, Peter and Verneuil), poisoning by aconite (Warrington, Howard), hæmorrhages (Weir Mitchell, Ortille, Hecker, etc.), pelvic peritonitis complicated with obstinate vomiting and alarming collapse (Schmeltz), *post partum* hæmorrhage (Macau, 1876), hæmorrhage due to mal-insertion of placenta (Lombe Atthill, Chantreuil who combined it with cognac), ovariectomy followed by depressed temperature (Olshausen), in impending death (Amalia Gimeno, 1880), as an adjuvant to chloroform narcosis (Fritsch).

In short, excellent results are obtained from the diffusible action of ether in patients in a condition of extreme adynamia (Dupuy), of complete collapse (Zuelzer, Winckel, Osterlah, etc.), coma (Verneuil), lipothæmia (Letulle), asystole (Huchard, Bellardinelli).†

[See a paper by Dr. T. More Madden on uterine hæmor-

* Messrs. Bayr, Verneuil and Mlle. Ocounkoff have proposed injections of ether as a substitute for transfusion of blood in hæmorrhages. M. Hayem on the other hand is in favour of transfusion with non-defibrinated blood. According to this author, injections of ether are only indicated in cases of syncope or prolonged lipothæmia (*Acad. de méd.*, Nov. 19, 1882).

† Ether is also frequently used with advantage as a vehicle and solvent, (*e.g.* for sulphate of quinine, etc.). We have had the opportunity of examining in the cadaver the results produced locally on the cellular tissue by injections of ether; we found a small ecchymosis of slight extent affecting nearly the entire thickness of the adipose tissue. Ether has been injected interstitially in the treatment of wens by M. Vidal (5 to 10 minims every 2 days), (Lermoyez, *Bulletin de thérapeutique*, 1884).

rhage and the hypodermic injection of ether in the *Brit. Med. Jour.*, 1880, vol. i., p. 592. Dr. Madden in the same volume, p. 997, draws attention to the fact that ether dissolves the cement by which the joints of the syringe are secured, and describes one devised by himself in which "the screw is cut on the cylinder, which is graduated, and the instrument is so arranged that it may either be used for throwing in a large dose of ether by a single movement of the piston, or for the gradual injection of the smallest quantity of any other fluid." *Trans.*]

EUCALYPTOL.

Eucalyptol is soluble in alcohol and sparingly soluble in water; it is an antifermentescient and antiputrescent. This agent produces, in doses of from 32 to 64 grains, cephalalgia, physical and mental prostration, loss of reflexes, failure of respiration, fall of blood pressure and temperature. *In poisonous doses*—death occurs from arrest of respiration. *Therapeutics*—Eucalyptus and its derivatives have been often used successfully both internally and externally in a great variety of diseases, but eucalyptol has only been administered subcutaneously by Dr. Sloan, who states that he has saved patients suffering from severe puerperal fever (Kobner, *Jahrbuch der pract. Medicin.*, 1884, p. 547).

[A paper by Dr. Sloan on the use of eucalyptus oil in midwifery will be found in Braithwaite's *Retrospect*, vol. 86, p. 278. *Trans.*]

EXTRACT OF ACONITE—(see *Aconitina*).

EXTRACT OF BELLADONNA—(see *Atropine*).

EXTRACT OF CALABAR BEAN—(see *Calabar Bean*).

EXTRACT OF GUACHAMACA—(see *Guachamaca*).

EXTRACT OF OPIUM—(see *Morphine and Opium*).

F.

FERRUM. DIALYSED IRON—PYROPHOSPHATE OF IRON—
CITRATE, TARTRATE AND LACTATE OF IRON—PEPTONATE
OF IRON.

Dialysed iron, diluted and undiluted, has been used by Da Costa in doses of 15 minims in cases of anæmia. M. Luton has injected it in doses of 3, 5 and 10 minims; “deprived of its styptic and astringent properties, it is nearly as well borne by the cellular tissue as perfectly neutral solutions of morphine, it is rapidly absorbed and locally gives rise to nothing more than a trifling nodosity, which, however, persists for a considerable time. The immediate effects are similar to those of an energetic diffusible stimulant,* a sense of warmth more agreeable than painful is diffused throughout the body, the arteries pulsate strongly, the countenance is flushed, there is increased mental activity, rapidity of thought and desire for exercise. In a word one might admit, as it were, a species of ferric intoxication, which borders afterwards upon a decidedly feverish condition. These effects last some time, proportionally to the dose injected, and are never followed by prostration,† but by a certain degree of anorexia. M. Luton has also observed a reawakening of the generative desire, and a love of dress (not of a sombre hue). Nasse after using a 5 per cent. solution abandoned it on account of the violent inflammation produced by the injections.

* Ammonia is an ingredient in the preparation of dialysed iron (35 parts to 100 of perchloride of iron).

† Luton, *Etude de thérapeutique générale et spéciale*, Paris, 1882, pp. 227-228.

The pyrophosphate of iron-ammonio-citrate* has been used hypodermically in cases of severe anæmia and chlorosis by Messrs. Huguenin of Zurich in 1876, Wychinski,† N. Neuss (1881) who in one-third of his cases observed signs of local irritation, Lippert, Nasse (for abscess) Messrs. Martensen (1876), Rosenthal (1878) and Neuss employed pyrophosphate of iron with citrate of soda.

Pyrophosphate of ammonio-

citrate of iron 3 grains

Distilled water up to 16 minims.

Huguenin.

[Sixteen minims of this solution are equivalent to about $\frac{1}{3}$ grain of iron. *Trans.*]

Pyrophosphate of iron with

citrate of soda‡ $2\frac{1}{2}$ grains

Distilled water up to 16 minims.

Eight to sixteen minims for a dose.

Martensen, Rosenthal, Eulenburg.

The solution should be prepared as required and kept in a cool place. Iron is detected in the urine thirty minutes after injection. Messrs. Nasse and Rosenthal have often met with local accidents after its administration.

The *ammonio-citrate of iron* has been administered subcutaneously by Messrs Quincke (1867), Ciamarelli (1879),

* [I am indebted to Mr. Martindale for the following note. "True pyrophosphate of iron is precipitated from a mixture of solutions of pyrophosphate of soda and perchloride of iron. After well washing, it is dissolved in a solution of citrate of ammonia, and evaporated to form a 'scale' preparation." *Trans.*]

† With the addition of a small quantity of albumen.

‡ This pyrophosphate contains 26.6 per cent. of iron.

Vincenzio Gauthier of Naples,* ($\frac{3}{4}$ grain to 16 grains), and that with success, in cases of anæmia which have resisted all other methods of treatment by iron. The presence of iron was detected in the urine; locally there was a sense of burning, but not to an insupportable degree.

The *citrate of iron* is recommended by M. Glœveke of Kiel (*Archiv f. exp. Path. u. Pharm.*, 1884), and by Martinetti, in doses of $1\frac{1}{2}$ grains, in a ten per cent. solution, for adults. Chiara (1885) has used it with benefit and without local mishaps.

Citrate of iron 2 grains

Cherry laurel water up to 24 minims.

The *tartrate of iron oxide*, used by Rosenthal in aqueous solution ($3\frac{1}{2}$ grains in 16 minims) produced local accidents, such as redness, swelling, and persistent hardness. He also used the *lactate of iron*,† after Eulenburg's researches.

M. Bouchut has made injections with perchloride of iron and, naturally, has caused very considerable sloughs.

Finzelberg's *peptonate of iron*‡ has been used hypodermically by M. Nasse§ since 1879 in cases of insanity, with benefit and without local troubles. Sixteen minims of a one in ten solution boiled and filtered represent $1\frac{1}{2}$ grains of peptonate of iron and nearly $\frac{1}{3}$ grain of oxide of iron. The solution should be kept in a cool place and prepared afresh whenever it becomes turbid.

* Gauthier, *Studio sperimentale e clinico sul ferro per iniezione ipodermiche* (*La medicina contemporanea*, Sept. 1884, p. 454). This author has also used injections of fer Bravais (6 minims to 16 of water).

† M. Luton has experimented on himself with a solution (1 in 10) of lactate of iron, he found it impossible to inject it so as to cause absorption.

‡ Known in commerce as the soluble oxide of iron for injection.

§ Nasse, *Ueber Substance Eisen Anwendung in Psychosen* (*Allgem. zeitshrift f. Psychiatrie*, Bd. xiv., 4, 4 and 5, 1885).

Dry pepsine	5 grains
Solution of iron perchloride . . .	6 minims
Neutral glycerine	55 minims
Solution of ammonia	10 minims
Cherry laurel water	up to 240 minims.

Jaillet and Quillet.

A Pravaz syringe, or 16 minims, is equivalent to $\frac{1}{3}$ of a grain of pepsine and $\frac{3}{7}$ of a grain of iron salt.

This solution causes neither pain nor local inflammation if it is injected at a temperature of 98.5° to 100° F.

More recently M. Jaillet has suggested the following formula for injection :—

Sublimated perchloride of iron . .	1 grain
Dry pepsine	2 grains
Pure glycerine	40 minims
Distilled water	60 minims or a sufficiency.

1. Dissolve the pepsine in a small quantity of water and add the glycerine. 2. Dissolve the perchloride of iron in the remainder of the water and mix the two solutions. 3. Add finely-powdered sodic carbonate to the point of saturation of the product. 4. Complete the solution by adding distilled water to make up the product to 112 minims, and finally filter. This solution keeps better than the preceding.

M. Rosenthal of Vienna recommends, when the stomach is intolerant of ferruginous preparations, hypodermic injections of a 1 in 20 solution of iron peptonate in olive oil. It never produces inflammatory troubles. The same author has used a 1 in 10 solution of iron peptonate (*Wien. med. Presse*, 1884, no. 3).

Albuminate of iron was first used by Dœnitz of Tokio (1879) as a solution of iron sesquichloride with albumen. Friedlander's 1 per cent. solution of iron albuminate

speedily became turbid and was very unstable (Neusse). In 1880 Goldmann used the following solution with success.

Pyrophosphate of iron.	3 grains
Albumen	4 grains
Distilled water	up to 16 minims.

According to Eulenburg (*Berlin klin. Woch.*, 1883, no. 2), Drees' solution of iron albuminate was found useful in hypodermic injections.

Albuminate of ammonio-citrate of iron has been suggested by M. Vachetta (*Lo Sperimentale*, June, 1884); he has, however, only tried it in animals.

We will not discuss here injections of iron in *nævi*, varices, aneurisms, etc.

IRON AND QUININE, CITRATE OF. (See *Quinina*).

G.

GELSEMII TINCTURA. GELSEMINA. TINCTURE OF GELSEMIUM. GELSEMINE.

Chief physiological effects.—Gelsemine paralyses the motor centres of the brain and the respiratory centres (Berger, Noritz, Ott); it first increases then diminishes reflex excitability of the spinal cord and the cardiac contractions. These symptoms are complicated with weight of head, vertigo, diplopia, impeded movements of the tongue, tremor of the hands, numbness of the fingers, nausea, vomiting, dyspnœa, feeling of general cold (Berger), mydriasis after instillation into the eye (Noritz). The lethal dose of Sonnenschein's gelsemine, according to M. Noritz, would be from about $\frac{1}{2}$ to 1 grain, and from $\frac{2}{7}$ to $\frac{1}{2}$ a grain of liquid extract.

The medicinal doses range from $\frac{1}{7}$ grain of gelsemine, and from 10 drops of tincture.*

Hydrochlorate of gelsemine 1 grain

Distilled water up to 210 minims.

From $1\frac{1}{2}$ to 3 minims, equivalent to $\frac{1}{140}$ to $\frac{1}{70}$ of a grain of salt. The hydrochlorate is ten times more active than gelsemine. It produces insensibility at the point of injection.

Therapeutic uses.—Tincture of gelsemium sempervirens has been successfully used in the treatment of neuralgia† by Drs. Jurasz, Wickham Legg, Thomson, Clarke and others, and without benefit by Messrs. Berger, Wolfe and others. Prof. Eulenburg has injected sometimes the tincture or aqueous extract of gelsemium, at others gelsemine (soluble in 116 parts of water), or again, an aqueous solution of the hydrochlorate—1 in 200 parts. This last which is ten times as active as gelsemine had already been recommended by Sonnenschein.

GLYCERINUM. GLYCERINE.

Glycerine is one of the most valuable solvents for hypodermic preparations; it is, however, of great importance to use it chemically pure so as to avoid its irritant action. Glycerine is frequently administered by the mouth in various affections; it is thus used frequently as a substitute for cod-liver oil, but in such cases the doses required are too large to permit of its being used hypodermically‡ (see *Nitro-glycerine*).

* Savory and Moore's gelatine discs contain ten drops of tincture.

† The rhizome and root have long been in use in America in the treatment of intermittent fevers, and of inflammatory diseases in children.

‡ See in the Introduction the table borrowed from the essay of M. Surun shewing the solvent power of glycerine.

GUACHAMACA, EXTRACT OF.

Guachamaca (Apocynaceæ) is a tree which grows in Venezuela. The active principle is chiefly contained in the bark and in the various layers of the liber. The extract, dark-brown and resinous, bearing an outward resemblance to the appearance of curare, is soluble in water, slightly so in absolute alcohol, and insoluble in ether and chloroform. The chief difference, according to M. Schiffer,* between the action of this substance and that of curare consists in the fact that guachamaca appears to act rapidly on the nerve-centres, whilst curare affects them slowly.

M. Schiffer has as yet used it but seldom in the human subject by the hypodermic method. In a case of spasmodic muscular contracture he injected a Pravaz syringe-ful containing $\frac{1}{7}$ of a grain of dried extract. He observed in three-quarters of an hour a light, and then profound, slumber which lasted about three hours, the circulation and respiration remained normal, reflex excitability being preserved during the period of somnolence.

The author thinks that in this case perhaps the dose was too small to obtain the full effect; he is of opinion that the remedy should be administered for some time to obtain a curative effect in convulsive diseases. He puts forward a hypothesis that guachamaca might be useful as a hypnotic.

[A paper on Guachamaca will be found in the *Lancet*, vol. i., 1884, p. 723. *Trans.*]

* *Deutsche med. Wochenschrift*, 1882, No. 28. Investigation undertaken at the instance of C. Sachs.

H.

HOMATROPINÆ HYDROBROMAS. HYDROBROMATE OF
HOMATROPINE.

Homatropine, according to Fronmüller (*Memorabilien*, 1880, p. 298, 1882, p. 6), does not include any of the poisonous elements of atropine; its local mydriatic action is quick and decided (2 per cent. solution), and the pupil rapidly returns to the normal condition. It diminishes tubercular sweats.

Hydrobromate of homatropine 1 grain

Distilled water up to 80 minims.

Sixteen minims = $\frac{1}{5}$ of a grain.*

Neither mydriasis nor narcotic phenomena are induced, cough, expectoration and insomnia are relieved.

Dr. William Murrell has found these injections less efficacious than those of atropine (*Practitioner*, November, 1880). Homatropine has been used, among other remedies, in cases of poisoning by pilocarpine (Fronmüller).

HYDRARGYRUM. PREPARATIONS OF MERCURY.

Bichloride of mercury is soluble in 6 parts of cold water, and freely soluble in alcohol, ether, and glycerine. Cyanide of mercury is soluble in water (5 per cent.), and dilute alcohol, slightly soluble in strong alcohol and in glycerine. Biniodide of mercury is insoluble in water and in glycerine, soluble in alcohol and in ether. In *small doses*,

* [Dose $\frac{1}{120}$ to $\frac{1}{20}$ grain *Martindale*.]

according to some authors, mercury is stimulating and restorative. It is antiseptic.

*Chief physiological properties.**—Stomatitis, more or less speedily produced according to idiosyncrasy or local predisposing causes, such as caries, the use of tobacco, etc., salivation, intestinal catarrh, diarrhœa. Mercurials often produce notable slowing of the circulation and fall of temperature. Mercurial fever is generally due to local irritations produced by these preparations (Barrallier).

Chronic mercurialism.—According to Küssmaul mercury is a brain poison, one of the most constant phenomena being the condition of timidity and embarrassment which characterises mercurialised persons, falling out of the teeth, shrinking of the gums, chronic inflammations of the mouth and pharynx, induration of the salivary glands and of the cervical ganglia, gastric catarrh, pains in the limbs,

* We omit the poisonous effects properly so-called. We will quote, however, some of the results recorded in the remarkable work of J. L. Prévost (Eternod and Frutiger) (*Etude expérimentale relative à l'intoxication par le mercure.—Son action sur l'intestin —Calcification des reins parallèle à la décalcification des os.—Rev. méd. de la Suisse Romande* (Nov. and Dec., 1882). M. Prévost used for his physiological experiments aqueous solutions of the acid nitrate of mercury, of corrosive sublimate, and of the peptonate. The results obtained by him tend to confirm those recently obtained by Messrs. Salkowski, Rosenbach, Heilbronn, Mering, and to elucidate some hitherto doubtful points. These experiments prove that mercury is capable, at least in large doses, of producing by the hypodermic method *intestinal lesions* quite as serious as those following ingestion by the stomach, though the latter method requires larger doses to produce the same amount of mischief. These lesions mostly consist in very pronounced hyperæmia of the cæcum and large intestine with ecchymotic patches, sometimes also with ecchymosis of the vesical mucous membrane; they have also been observed by authors who have experimented with hypodermic injections of corrosive sublimate.

Experimental mercurial poisoning, whether produced by large doses administered internally, or by smaller doses exhibited hypodermically,

nervous excitability, insomnia, vertigo, tremors, impairment of memory, frequently emaciation, dental neuralgia, headache, dyspnœa, tinglings, anæsthesia and analgesia.

Mercury in medicinal doses has no appreciable influence on the formation of urea; but it is generally admitted that its prolonged use is attended with diminution of globulin.

In 1880 M. Luton injected two or three globules of crude mercury into the cellular tissue of the dorsal aspect of the fore-arm; the operation was succeeded by a somewhat persistent induration and sometimes by slight suppuration, but absorption, nevertheless, took place. Later on he used mercury emulsified with glycerine (3 globules of fluid mercury shaken up vigorously and for some time with 16 minims of glycerine; the entire quantity was injected under the skin of the thigh behind the great trochanter). "Mercury thus treated

produces, when death supervenes only after a few days, an accumulation of calcareous matter in the renal tubules, more or less pronounced according to the species of animal. The process begins in the straight tubules of the cortex, and extends afterwards to the convoluted tubules as they traverse the medullary substance. This effect was first observed by Salkowski in his experiments with calomel, corrosive sublimate, and the iodides of mercury.

Several writers, among others Astley Cooper and Küssmaul, had long previously attributed to mercury and its preparations the power of exciting osseous changes. See among others the history of the painter's dog recorded by Hughes Bennett. [This case is recorded in the 5th edition of Bennett's *Clinical Medicine*, p. 978, and is of great interest and importance. *Trans.*] Some modern writers (Heilbronn, Mering, etc.), have also seen these alterations in the bones, but without associating them with the renal changes.

In one of Prévost's experiments (No. XII.), it was found that an injection of 40 grains of mercuric peptonate, which was an old and turbid preparation containing $\frac{1}{3}$ of a grain of corrosive sublimate, produced violent diarrhœa, lasting for two days, and death on the third day; at the autopsy, besides marked renal calcification, he found manifest signs of decalcification of the bones which rendered the heads of the long bones movable on their shafts.

assumes really the appearance of a greyish metallic powder, and requires a canula of large calibre to permit of its ready expulsion from the syringe." It is necessary to use a needle made of steel, and syringes, such as those made of vulcanite, the joints of which are not subject to the chemical action of the mercury. This form of injection only causes a very moderate amount of local irritation, but it is followed by persistent induration. M. Luton asserts that the advantage of this method consists in the fact that "the patient carries his remedy stored up (*emmagasiné*) in himself." If the dose has been sufficient there is no need to repeat the injection, but M. Luton admits that "the supply may require renewal if the trouble has not quite disappeared, and especially if, before the desired result has been attained, the local irritation has vanished." He always obtained excellent results from the use of this method in the treatment of secondary and tertiary syphilis.

Hunter and Hebra (1864) appear to have been the first to use corrosive sublimate hypodermically, one grain in one to four drachms of water; Berkeley Hill, in England,* also used hypodermic injections of mercury in the form of mercuric chloride; then come Drs. Walker and James (1869) and McCall Anderson (1870).

To Dr. Lewin of Berlin belongs the merit of popularising this mode of using mercury bichloride.

Corrosive sublimate	1 grain
Distilled water	up to 168 minims.

Dr. Lewin injected 12 minims of this solution, to which he sometimes added morphia and glycerine. He seldom

* Messrs. Scarenzio (1864), Ambrosoli, Riccordi, Monte-Forte, Casati (1867), Max van Mons Sigmund, Soresina (of Milan), Bertarelli (1879), etc., used injections of calomel (which see). These injections have latterly been used by preference and exclusively in the Grand Hospital at Milan.

observed local troubles as a result (abscess in 2 to 3 per cent.). Messrs. Richter, Böese, Klemm, Derblich, Wiederhoffer, Eulenburg (an aqueous solution of $3\frac{1}{2}$ grains in 4 drachms and 15 minims), and Rosenthal (solution made with water and glycerine) used Lewin's method successfully.*

In France, Liégeois in his turn recommended hypodermic injections of corrosive sublimate in the treatment of syphilis; he used the following solution:—

Corrosive Sublimate . . .	1 grain
Glycerine	160 minims
Distilled water† . . .	up to 1 ounce, 80 minims.

Two injections of 16 minims daily into the dorsal region. In 25,000 injections he only observed suppuration thrice. Sometimes Liégeois modified his formula thus:—

Corrosive Sublimate . . .	2 grains
Hydrochlorate of Morphine . . .	1 grain.
Distilled water	up to 2 ounces, 160 minims.

Messrs. Piquand (1868), Gubler, Léon Labbé, Marc Sée, Simonet, Müller et Pouillet, Spillmann, Hardy,

* This plan of treating syphilis has been also used since its introduction with varying success by Hardy, Diday (who noted pain, abscess and sloughing), Walker, Taylor, Hansen, H. Zeissl (who used Hydrarg. Perchlor., gr. xvi., Glycerine, ʒijss., Aq. Dest., ʒv. mxx. Messrs. Merscheim, Grünfeld (of Sigmund's clinic) and Stohr, but especially the last author, oppose the method recommended by Lewin. Stohr, besides the inconveniences encountered by other authors, has observed general enfeeblement, febrile attacks, and, occasionally, diarrhœa. In 1863 Stohr's observations were confirmed by Uhlmann, Rosenthal, Fournier and Kolner. Paikert did not meet with any accident in 5,000 injections made after Lewin's method; the syringe which he used had a capacity of 32 minims. Ædsmaason also has not seen a single case of abscess.

† Diday and Dron's solution differed slightly from the first solution used by Liégeois.

Galezowsky, Giraud-Teulon, Tillaux, Diday, Dron,* H. Bernard (1871), Le Moaligou (1873), following in the steps of Liégeois, used that author's solutions with more or less success.

M. Bergh, of Stockholm, never met with suppuration or other accidents after hypodermic injections of sublimate, and he attributed this immunity to methodical massage of the nodule resulting from injection immediately after its production. He advises that injections should be made into parts richly provided with cellular tissue, *e.g.*, the back and shoulders. Dr. Shoemaker uses a one per cent. solution of sublimate in distilled water; he uses gold canulæ.

M. Staub, of Strasbourg (1872), in Schützenberger's clinic,† administered corrosive sublimate hypodermically in a chloro-albuminate solution, which had previously been tried by M. Lewin.

- a. Bichloride of mercury 20 grains
 Chloride of ammonium 20 grains
 Chloride of sodium . 68 grains
 Distilled water . up to 4 ounces 320 minims.
- b. The white of one egg
 Distilled water q.s. up to 4 ounces 320 minims.

Mix the two fluids and filter. Sixteen minims of fluid are equivalent to $\frac{1}{14}$ of a grain of the salt. Le Moaligou, Sée and Grünfeld, who tried this solution found that it was

* *The treatment of syphilis by subcutaneous sublimate injections.* Philadelphia, 1882.

† The composition of this solution, which has been praised by M. Mialhe, is based on the theory that solution of mercury bichloride in contact with living tissues precipitates their albumen, and thus causes pain and other local accidents, whilst by combining it in the first place with albumen its absorption is effected without tissue changes.

unstable, painful to use, and capable of producing sloughing and abscess. The solution of sublimate in glycerine is preferred by some authors. D'Ancona in Italy (1876) used the chloro-albuminate solution.

Perchloride of mercury	1 grain
Pure chloride of sodium	6 grains
Distilled water	up to 112 minims.

Rub in a porcelain mortar, dissolve and filter.

Bamberger.

M. Van den Corput, of Brussels, has suggested another formula :—

Bichloride of mercury	1 grain
Chloride of sodium	10 grains
Distilled water	up to 1 ounce.

Three to five minims thrice daily, = $\frac{1}{160}$ to $\frac{1}{96}$ of a grain.

The formulæ of Dr. Stern, formulæ which recently had great publicity, differed but slightly from the preceding, the solutions being slightly more concentrated. Messrs. Rechtvall (who performed 2,937 injections, suppuration resulting in 8 to 17 per cent. of the cases), Jarmay, Reder and Gschirhagl recommended the combination of sodic chloride with the sublimate.

Auspitz used the following solution :—

Bichloride of mercury	1 grain
Chloride of sodium	2 grains
Distilled water	up to 112 minims.*

* This is the solution which Abadie and Leleu used in the treatment of interstitial keratitis (*Gazette médicale de Paris*, May 3, 1884. *De la kératite interstitielle et de son traitement par les injections de bichlorure de mercure*, Paris, 1884). The latter used it in 8 minim doses in children, and 16 minims in adults. Injections should be made deeply to avoid accidents.

M. Plevani adds hydrochlorate of cocaine to the solution to render the injection painless, and chloride of sodium to prevent the precipitation which would otherwise ensue from the formation of an insoluble double chloride of mercury and cocaine.

Bichloride of mercury	.	.	.	3 grains
Hydrochlorate of cocaine.	.	.	} of each 1 grain	
Chloride of sodium	.	.		
Distilled water	.	.	.	up to 336 minims.

Sixteen minims = $\frac{1}{7}$ of a grain of mercury salt, and $\frac{1}{21}$ of a grain of cocaine.

Martin has used biniodide of mercury subcutaneously.

Biniodide of mercury	.	.	.	4 grains
Distilled water	.	.	.	up to 112 minims.*

Sulphate of atropine	.	.	.	3 grains
Corrosive sublimate	.	.	.	20 grains
Distilled water	.	.	.	up to 4 ounces.

Dose.—Eight minims. This solution did not produce irritation.

Biniodide of mercury	.	.	.	2 grains
Iodide of potassium	.	.	.	4 grains
Hydrochlorate of morphine	.	.	.	$\frac{1}{2}$ grain
Distilled water	.	.	.	up to 112 minims.

Eight minims (= $\frac{1}{7}$ grain of mercury salt) every second day.

Biniodide of mercury	.	.	.	3 grains
Iodide of potassium q.s. to effect solution				
in distilled water	.	.	.	up to 210 minims.

Five minims = $\frac{1}{14}$ of a grain.

Ragazzoni.

* Some add 4 grains of potassium iodide to effect solution: in this way a double iodide of mercury and potassium is formed.

Double iodide of mercury and morphine . 5 grains
 Distilled water . . . up to 200 minims.
 Inject 4 to 8 minims = $\frac{1}{10}$ to $\frac{1}{5}$ of a grain daily.

Iodide of potassium 50 grains
 Biniodide of mercury 6 grains
 Distilled water . . . up to 2 ounces 192 minims.
 16 minims = $\frac{1}{12}$ of a grain of mercury salt.

Bricheteau has recommended the use of double iodide of mercury and sodium.

Double iodide of mercury and sodium . 3 grains
 Distilled water up to 240 minims.

A Pravaz syringe (or 16 minims) contains $\frac{1}{5}$ of a grain of salt. Eight, gradually increased to 16, minims every second day.

The following solution gave rise to no local reaction, was absorbed rapidly and did not coagulate albumen :—

Biniodide of mercury 1 grain
 Iodide of potassium 1 grain
 Tribasic phosphate of sodium . . 2 grains
 Distilled water up to 50 minims.
 Five minims = $\frac{1}{10}$ of a grain.

Yron.

Cullingworth in 1875 used bicyanide of mercury in solution in glycerine and distilled water.* Sigmund and Kroworzinski used it later (1876) in aqueous solution.

Bicyanide of mercury 3 grains
 Distilled water up to 6 drachms.

Twelve minims of the solution daily = $\frac{1}{10}$ of a grain. Cullingworth asserts that it does not cause pain; it should

* This author used Staub's solution at first, but, though it produced no suppuration, its administration was painful and it readily decomposed.

be remarked, however, that he observed infiltration of the cellular tissue persisting for a week. Mandelbaum used in 1878, a solution of 1 grain in 112 minims and only observed trifling pain lasting at most for an hour.

Galezowsky and Despagne injected 4 minims ($= \frac{1}{5}$ of a grain) of the following solution :—

Cyanide of mercury	.	.	.	1 grain
Distilled water	.	.	.	up to 224 minims.

According to Lagelouze, the above dose caused diarrhœa, vertigo, and giddiness.

Galezowsky has endeavoured to substitute for hypodermic injections of mercury cyanide, which in doses exceeding $\frac{1}{14}$ to $\frac{1}{7}$ of a grain produced intractable diarrhœa, those of *double cyanides of gold and potassium, of silver and potassium, and of platinum and potassium.*

Cyanide of gold and potassium	.	.	.	2 grains
Distilled water	.	.	.	up to 112 minims.

The dose used was from 16 to 24 minims ($= \frac{2}{7}$ to $\frac{3}{7}$ of a grain) and it was well borne.

The *cyanate of mercury* was particularly recommended for hypodermic use by Schütz* and Prochorow†. It is soluble in 13 parts of water, is neutral in reaction, has no chemical action on albumen nor on the metallic parts of the syringe, and is very stable if the solution is kept under cover from the light. It is injected in doses of $\frac{1}{14}$ to $\frac{1}{7}$ of a grain (2 per cent. solution), the maximum dose being less than $\frac{1}{2}$ a grain; the injections cause less pain than those of bichloride. (Discomfort lasts about two hours).

* *Die Med. Wochenschrift*, 1885, p. 215.

† Prochorow. Reference in *St. Petersburg Med. Wochenschrift*, 1885, p. 88, and *Centralblatt für Chirurgie*, 1885, p. 373.

“Two solutions have been recommended by Vienna physicians—the *albuminate* (bichloride of mercury $4\frac{1}{2}$ grains, solution of albumen ten drachms and 40 minims, Bamberger), and the *peptonate of mercury*.^{*} The albuminate is difficult of preparation, and will not keep long without becoming turbid; but it is essential to inject a perfectly clear solution. Bamberger has recently experimented with the peptones which are largely manufactured in England for the alimentation of convalescents, and he has obtained marked success. The two disadvantages which were encountered with albumen do not exist with regard to the peptonates; the latter are freely soluble in water, are easy of filtration, have no tendency to become turbid, and are not precipitated by heat, by acids, or by alkalies.”

“The meat-peptone which Bamberger used is prepared in London, by Stephen Darby of Leadenhall Street. The preparation of the peptonate is very simple;—dissolve 5 grains of sublimate in 110 minims of distilled water, and make another solution of 20 grains of sodium chloride in 110 minims of water. Dissolve 1 grain of meat peptone in 55 minims of distilled water and filter; add to this 22 minims of the sublimate solution and dissolve the resulting precipitate with a sufficiency (about 16 or 18 minims) of the solution of sodium chloride, and add distilled water up to 100 minims. Cover the liquid and let it rest several days, then filter and make up to 112 minims. Sixteen minims of this solution contain $\frac{1}{7}$ of a grain of mercury in combination with peptone. The vessel is kept closed and the

* According to Galezowsky, the double peptonate of mercury and ammonia which he has experimented with in conjunction with Fournier has not appeared to possess any greater value.

fluid is allowed to stand for a few days when a small quantity of white flocculent precipitate separates which, perhaps, is albumen which has been retained in the peptone. Finally, the fluid is filtered and is ready for use. This preparation, which we have seen used in the Vienna hospitals, will keep perfectly clear for at least three months. Undoubtedly, as in the case of morphine injections, we meet with instances where idiosyncrasy and susceptibility are so pronounced that we are obliged to lay aside this form of medication, but such cases are extremely rare, the great majority of patients tolerating it without any difficulty. The results of experiments made by Professors Bamberger, Zeissl, and Neumann are in complete accord: the peptonate of mercury causes less disturbance than any other preparation, the reaction consisting merely in a moderate degree of pain at the point of injection, and this would appear to be due to traumatism of the subcutaneous cellular tissue; Bamberger therefore recommends slow injection and the dispersion of the fluid by gentle pressure on the skin and by friction.”*

Solutions of peptonate of mercury have since been used by various authors; amongst others by Paulcke of Leipzig, Friedländer of Berlin, Neumann, Rotter, Petersen, and Oberländer.

Sublimate injected in minute doses in the form of albuminate or peptonate does not cause the slightest local irritation, provided the solution has been carefully filtered and is perfectly limpid (Nothnagel and Rossbach).

Dr. Terrillon† used at Lourcine, with benefit, Bam-

* Dupré. *La chirurgie et le pansement antiseptique en Allemagne et en Angleterre*. Paris, 1879, p. 135.

† *Bulletin de therap.* Aug. 15, Sept. 30, 1880.

berger's mercuric peptonate and Yvon's solution.* He insists on the use of instruments with vulcanite mountings. If the injection is made deeply and slowly (under the skin of the back, legs, and gluteal regions) it does not cause pain or give rise to inflammatory nodosities or abscess. Occasionally there are a few indolent indurations.

M. Delpach, chemist, prepared for M. Martineau a mercuric peptonate, 16 grains of which are equivalent to four grains of sublimate (bichloride of mercury 160 grains, Catillon's dried pepsine 240 grains, and 240 grains of ammonium chloride). The hypodermic solution is prepared thus—

Peptonate of mercury and ammonium	. 1 grain
Distilled water	. . . up to 80 minims.

Twenty minims represent $\frac{1}{16}$ grain of sublimate. This solution keeps good only a few days but the following is more stable—

Peptonate of mercury and ammonium	. 1 grain
Glycerine	. . . . . 16 minims
Distilled water	. . . . . up to 80 minims.

The next solution is perfectly stable.

Peptonate of mercury and ammonium	. 1 grain
Neutral glycerine	. . . . . up to 96 minims.

In conclusion, M. Martineau has administered more

* M. Yvon accepting this theory that the mercurial solution should not only not excite any local action, but, moreover, should not coagulate albumen in order that it may be absorbed as rapidly as possible, has, to attain these results, prepared the following formula:—

Biniiodide of mercury	. . . 2 grains
Iodide of potassium	. . . 2 grains
Tribasic phosphate of sodium	. . . 4 grains
Distilled water.	. . . up to 112 minims.

concentrated solutions hypodermically; they were prepared by M. Delpech and composed as follows—

Catillon's pepsine	.	.	.	9 grains
Ammonium Chloride	.	.	.	9 grains
Corrosive sublimate	.	.	.	6 grains.

This mercuric peptonate is dissolved in—

Pure glycerine	.	.	.	80 minims
Distilled water	.	.	.	up to 120 minims.

Five minims of this filtered solution added to 23 minims distilled water, yield a hypodermic solution, 16 minims of which are equivalent to $\frac{1}{7}$ grain of sublimate.*

M. Besnier has used in the St. Louis hospital, since 1881, the following formula:—

Catillon's dry pepsine	.	.	.	9 grains
Ammonium chloride	.	.	.	9 grains
Mercury protochloride	.	.	.	1—2 grains
Glycerine	.	.	.	85 minims
Distilled water	.	.	.	up to 112 minims.

Sixteen minims represent $\frac{1}{7}$ to $\frac{2}{7}$ of a grain of mercury salt. The injection should be made into the lumbo-sacral muscles and gluteals. Six injections weekly, beginning with half-a-syringeful.

The peptonate of mercury prepared by M. O. Kaspar should also be mentioned.†

M. Wolf, of Strasbourg, uses for hypodermic injections solutions which are freshly prepared as required. These solutions are in the first place made as follows:—
(1) $1\frac{1}{2}$ grains of dried carbonate of sodium in 112 minims of

* We have used this solution in children and have only observed transient indurations.

† *Revue médicale de la Suisse romande*, 1881, pp. 352 and 617.

water; (2) $3\frac{3}{4}$ grains of sublimate in 112 minims of water; (3) glycocole $2\frac{1}{2}$ grains in 112 minims. (The glycocole may be replaced by asparagine, alcanine, or sarcosine). The solutions may be kept an indefinite time; they are mixed in equal proportions when required and a syringe-ful is injected. (The inner surface of the canula should be platinised). A syringe-ful, or 16 minims, contains $\frac{1}{7}$ of a grain of mercuric oxide (International Medical Congress, Copenhagen).

Prof. Liebreich and afterwards M. Zeissl (*Wien. med. Presse*, Feb. 1883) administered soluble *formiamidate of mercury* subcutaneously. This new compound is very stable, does not coagulate albumen, and the mercury rapidly appears in the urine. Liebreich has obtained excellent results from its use in syphilis, injected in 8 to 16 minim doses of a one per cent. solution. (*Deutsche med. Zeitung*, No. 50, 1882, and *Viertel Jahresschrift für Dermatologie und Syphilis*, 1884, Heft 3 and 4). M. Carl Kopp* has also used it in 126 cases (3000 injections); he has abandoned its use in the severe forms of syphilis on account of its rapid elimination, but he believes that it can be advantageously used in the mild forms of syphilis; the relapses are frequent and it is better to administer mercurials internally, for example Lustgarten's oxytannate of mercury.

M. S. Rossa,† after having administered the formiamide of mercury to a considerable number of patients, concluded that this remedy produced no effect when administered internally, that given hypodermically it is extremely irri-

* Carl Kopp. *Ueber die Behandlung der Syphilis mit subcutanen Injectionen von Hydrargyrum formiamidatum* (Liebreich) at *Vierteljahresschrift f. Dermat. und syphilis*, 1885.

† *Syphilis-Behandlung mit einer Lösung von Formiamidum hydrargy-ratum* (*Allg. Wien. med. Zeitung*, April 10, 1883).

tating, and, moreover, that its effects are inferior to those of other mercurials.

M. Lavolotski, of Moscow, has used mercurial preparations in 25 cases of syphilis without encountering any local troubles beyond slight pain; according to this author the formiamidate is preferable to the sublimate, their effects are similar and the local irritation which results is less in the case of the former.

The *glycocolate of mercury* is also used subcutaneously (Streitz); it is made by dissolving $1\frac{1}{4}$ grains of glycolic acid in a few drops of distilled water, to which $\frac{1}{2}$ a grain of mercuric oxide is added. After filtration, distilled water is added to bring the solution up to 56 or 112 minims. Sixteen minims are equivalent to $\frac{1}{7}$ and $\frac{1}{14}$ grain of mercury respectively.

The formiamidate of mercury has been regularly used with benefit by the hypodermic method in the clinic of M. Neisser of Breslau in over 200 cases of syphilis. The injections, which are made into the gluteal muscles, are made slowly, and the portion injected is afterwards subjected to systematic massage.*

M. Bockhardt† has recently introduced a new preparation. Blood serum of the horse, sheep, or ox is sterilised by Koch's method and filtered. Take 40 minims of serum and precipitate the albumen by a hot solution of 3 grains of sublimate in 60 minims of water.‡ This precipitate of mercury albuminate is next dissolved by a solution of sodic chloride (1 to 3), and, finally, sufficient

* Kopp. *Loc. cit.*, 1885, Heft I.

† Bockhardt. *Blutserumquecksilber, ein neues präparat zur Injections-Behandlung der Syphilis* (Monatsheft f. prakt. Dermatologie).

‡ [Bourneville and Bricon here make a mistake which I have ventured to correct; they say 3 grains in 30 minims, but the sublimate will not dissolve in this proportion. *Trans.*].

water is added to bring the solution up to 210 minims. Ten minims of this solution contain $\frac{1}{7}$ grain of sublimate associated with albumen. It is neutral in reaction and keeps well if it is preserved in a dark vessel and in a cool place. The author has used it in 23 cases (505 injections); he makes one injection of 10 minims ($\frac{1}{7}$ grain of sublimate) every day or every second day. Three to five injections suffice to make exanthematous maculæ disappear; from 8 to 15 injections are necessary in the case of papular eruptions and of palmar psoriasis, from 8 to 12 for mucous gummata of the genital organs, anus, mouth, etc. The injections are not painful and should be made into the skin of the back, gluteals, and thigh; there never is any local reaction. Mercury can be detected in the urine 48 hours after treatment is inaugurated and for eleven weeks after the last injection.

The combination of *urea* with corrosive sublimate is, according to Schütz,* an excellent preparation for hypodermic use. This compound is readily soluble in water, does not precipitate albumen and causes no pain or local effects. It is prepared as follows:—dissolve 1 grain of sublimate in 100 minims of warm distilled water, add, when the solution is cool, $\frac{1}{2}$ a grain of chemicaly pure urea and make the solution up to 112 minims.

Savory and Moore's discs which contain $\frac{1}{16}$ grain of sublimate may also be used.

Mercury salts have been used hypodermically in the treatment of diphtheria (Hugo Schulz, 1883).

We purposely omit any reference to the parenchymatous hypodermic use of mercury in the treatment of carbuncle (Bienfait), elephantiasis Græcorum, etc. (Luton, Dominguez, Rigaud).

* Schütz. *D. med. Woch.*, 1883, p. 215.

[Martindale and Westcott give a formula :

Inject. Hydrarg. Iod. Rub., 1 in 64 } 2 to 6 m.
,, Sodii Iodid., q.s.

Messrs. Burroughs and Wellcome make hypodermic tabloids, which are very convenient, containing $\frac{1}{60}$ and $\frac{1}{30}$ grain of hydrarg. perchlor. respectively.

There are few subjects in regard to which there is greater contrariety of opinion than that of the utility of subcutaneous injections of mercury in syphilis. Although the subject is not a new one, so much has recently been published that it may be well to indicate generally the opinions which chiefly prevail among the leading English and Continental syphilographers. In 1878 (*Brit. Med. Jour.*, vol. ii., 1878, p. 475) Dr. Buzzard published his experience of the use of mercurial peptone by hypodermic injection in a series of over 200 cases. The preparation he used was made from the meat peptone prepared by Messrs. Darby and Godson, of Leadenhall Street. "The conclusion arrived at by Dr. Buzzard is that it is safe with ordinary care as regards the formation of abscesses, and that the mercury is absorbed into the system. He believes it, however, to be a painful mode of treatment, even when the injection is made in the back and the solution employed is quite clear. He is disposed to think that it possesses no advantages over mercurial inunctions in cases of gummatous syphilis, or when there is evidence of internal disease, except perhaps the very problematical one of substituting a clean but painful process for one which is as dirty as it is free from personal suffering."

The opinion of Messrs. Hill and Cooper is, like that of Dr. Buzzard, unfavourable to the use of subcutaneous mercurial injections, except in rare and exceptional cases, although they do not appear to question the safety of this

method. They recommend these injections only in cases where mercury fails to be absorbed after administration by ordinary methods, or in cases in which it is desirable to bring the patient rapidly under the influence of the drug, as, for instance, in severe affections of the eye, brain, and other internal organs. The perchloride, in minute doses administered twice in the twenty-four hours, is the salt to which these authorities give the preference; and they further recommend that the injections should be made into the flank, in preference to the arms and legs, pain being more likely to follow from injection into the latter regions. Bäumlér, while admitting that subcutaneous injections of mercury made with due precautions, beyond the pain which they occasion, need give rise to no local troubles, except in unhealthy persons, thinks that the method is not so rapid in its effects as appears at first sight, the rapid disappearance of the external symptoms of syphilis being by no means equivalent to a cure of the disease itself. He also quotes the observation of Zeissl to the effect that there is more apt to be recurrence of syphilitic manifestations after hypodermic than any other form of medication. He recommends the back and sides of the thorax as the most appropriate sites for injection.* Later observers, among others Villar, Florez, and Schultz, speak highly in praise of antisyphilitic hypodermic injections. The two former authorities recommend injections of mercuric peptone and of cyanide of mercury, and they state that the latter salt is specially useful in cases of ocular, cerebral, and medullary syphilis. They claim that hypodermic medication possesses the advantages over treatment by internal administration or by inunction, of being more exact in regard to dosage, in not giving rise to gastro-intestinal

* Ziemssen's *Cyclopædia of Practice of Medicine*, vol. iii., p. 291.

troubles, in shortening the duration of treatment, and in rarely causing ptyalism. Schultz uses a combination of mercuric chloride with urea.*

An important paper by Dr. Neisser on the value of calomel injections, published in the *Tageblatt der 58 Naturforscher-Versammlung* in Strasburg, is quoted in the *London Medical Record*, (Feb. 15, 1886). Dr. Neisser recommends 4 to 6 injections, each containing $1\frac{1}{2}$ grains of calomel prepared according to the subjoined formula.

Calomel	.	.	.	} of each 3 iv
Sodium chloride	.	.	.	
Mucilage of acacia†	.	.	.	3 ij
Distilled water	.	.	.	3 iss.

He concludes that injections of calomel, combined with mercurial inunction, constitute the most effective and energetic treatment of syphilis, and he is of opinion that this proceeding is the only one which ensures the success of mercurial inunction. He thinks, from clinical experience, that the calomel method is most appropriate, and has proved most efficacious—(1) in the first treatment of syphilis; (2) in the treatment of serious relapses, both in their first and subsequent stages (iritis, squamous eruptions, etc.); (3) in the energetic curative methods which are to be repeated annually for 3 or 4 years. It appears that out of a total of 717 injections, there were 31 cases of abscess in 25 patients. Pain was, however, a more frequent occurrence, as was also stomatitis. In short, Dr. Neisser thinks that the advantages of the calomel method preponderate over its disadvantages. *Trans.*]

* *London Medical Record*, vol. xiv., pp. 37, 38.

† [It would be advisable to substitute mucilage of tragacanth for mucilage of acacia, as calomel is apt to cake with the latter and would thus be likely to choke the needle. *Trans.*]

HYDRARGYRI SUBCHLORIDUM. CALOMEL, MERCURY PROTOCHLORIDE.

Scarenzio, of Pavia, in 1864, then Ambrosoli, of Milan, and Sigmund, of Vienna,* used hypodermic injections of calomel, by means of a finely levigated powder held in suspension in water or in glycerine, in various syphilitic affections. Maximum dose $\frac{3}{4}$ grain.

Calomel	.	.	.	.	2 grains
Glycerine	.	.	.	up to 16 minims.	

(Scarenzio).

M. G. Smirnoff treated syphilis successfully by hypodermic injections of calomel. This author employed solutions of one-half the strength of those employed by Scarenzio and others with the object of avoiding abscess.

Calomel	.	.	.	.	3 grains
Distilled water	}	of each	.		56 minims.
Glycerine					

Calomel	.	.	.	1½ to 2 grains
Powdered gum arabic	.	.	.	½ grain
Distilled water	.	.	.	up to 16 minims.

Eight to sixteen minims contain $\frac{3}{4}$ to 1½ grains of the weaker preparation, and 1 to 2 grains of the stronger.

The results obtained in the treatment of syphilis were satisfactory, but a small abscess frequently resulted at the point of puncture. A certain number of Italian physicians (Quaglino, Flarer, Magri, Gotti and Santini),

* Messrs. Riccordi, Monte Forte, Casati (1867), Max van Mons, Soresina of Milan, Bertarelli (1879), Padova, Magri, Appiani, Ragazzoni, Fiorari, Profetà, Watraszewski (1884), have used calomel by injections in syphilis.

used hypodermic injections of calomel in various ophthalmic affections of syphilitic origin. Messrs. Arigo, Formenti, Rossetti, Malvisi, subsequently used injections of calomel in pneumonia. According to Rossetti they should be made from the seventh to the tenth day in doses of $\frac{3}{4}$ grain to $1\frac{1}{2}$ grains in mucilage. (See MERCURY).

M. Boni was much pleased with the results obtained by injections of calomel in croup; $\frac{3}{4}$ grain in the left arm of a child. (*Gazzetta med. Ital., provincie Venete*, December 15th, 1883, p. 408).

HYOSCINA. HYOSCINE AND ITS SALTS.*

[There has been considerable divergence of opinion as to the influence and mode of action of hyoscyamine, and it appears to be probable that many samples of so-called hyoscyamine have really owed their properties to the presence of unrecognized hyoscine. To Ladenburg the merit is due of having been the first to isolate hyoscine and to describe its chemical and physical properties and its physiological action. As this drug is likely to take a foremost place among well-established hypnotics, and as only a passing notice has been taken of it as an anhydrotic by Drs. Bourneville and Bricon (which action by the way is questioned by Dr. Mitchell Bruce and other writers), it has been thought well to insert a notice of its properties and uses.

* This section is based on the experimental researches of Prof. H. C. Wood, M.D., of Philadelphia, published in the *Therapeutic Gazette*, 1885, and on recent papers by Dr. Mitchell Bruce and others.

Hyoscine is a somewhat glutinous material and yields crystalline salts, the principal of these being the hydriodate, the hydrobromate, and the hydrochlorate. The experiments of Prof. Wood have been made with the two former, the hydrobromate being mostly used.

In frogs the symptoms produced were these:—"An increasing sluggishness with a progressive loss of muscular movement, and a corresponding depression of the reflex activity; but without marked loss of sensibility. The respiration seemed to suffer *pari passu* with the general muscular power." When the dose administered did not produce lethal effects, there were no convulsive phenomena accompanying the restoration of muscular power, as is the case in frogs poisoned with atropine. Respiration failed before circulation, and even a strong solution of the alkaloid applied directly to the exposed heart exerted a slow and feeble depressing influence.

In the case of *mammals* hyoscine acts as a spinal depressant, a centric respiratory depressant, but it affects the circulation slightly, and does not paralyse the pneumogastri-
cs. In poisonous doses, although it paralyses the vasomotor system, it has very slight depressant influence on the heart. In the healthy human being the effects of a medicinal dose were as follows:—In ten minutes after subcutaneous injection the symptoms resembled those of slight alcoholic intoxication, *viz.*, sense of lightness and giddiness. These symptoms were succeeded by dryness of the mouth and throat, and restlessness in spite of the giddy sensations. Then followed drowsiness and profound sleep, on awakening from which there was no recollection. In one gentleman who accidentally took a small dose of a strong solution there were symptoms of weight of the eyelids, constrictive headache, chiefly frontal, sense of suffocation without dyspnœa, great uneasiness and unrest with

intervals of unconscious sleep. On recovery the after-effects were limited to slight headache and feeling of lassitude.

The dose ranges from $\frac{1}{200}$ to $\frac{1}{100}$ of a grain, and in some cases to as much as $\frac{1}{75}$ or $\frac{1}{50}$ of a grain. Dr. Mitchell Bruce has given as much as $\frac{1}{25}$ of a grain of the hydriodate without injurious effects, but as a general rule this dose is unsafe, and even with $\frac{1}{100}$ of a grain Dr. Nestor Tirard has observed, in a case of chronic Bright's disease, angry and combative delirium.*

The drug is best administered hypodermically.

Hydriodate of hyoscine 1 grain

Distilled water 200 minims.

One minim = $\frac{1}{200}$ grain.

Therapeutics.—Dr. Wood regards hyoscine as being of little use for the relief of pain, but of great value in the treatment of spasm. It is contra-indicated in patients with a tendency to pulmonary œdema.

Hyoscine is of great service in the treatment of delirium, excitement, and insomnia, alike in insanity and other diseases. It has been found useful in controlling the spasms of *hydrophobia*, although it failed to cure the disease, in the delirium of *pneumonia*, *cardiac and renal disease*, *epileptiform convulsions and chorea*. Prof. Edlessen† administered it in six cases of *whooping cough*, with advantage in three cases; in six cases of *asthma*, always with advantage, and in two cases of severe *enteralgia* with relief of pain. It has been extensively used by alienists with unmistakeable benefit in

* *Practitioner*, vol. xxxviii., p. 84.

† *Centralb. für Med. Wissensch.*, 1881, 416. Quoted by Prof. Wood in the *Therap. Gazette*, January, 1885.

cases of *acute dementia, mania, melancholia, hystero-epilepsy*, and other mental diseases.

As Dr. Mitchell Bruce points out, hyoscine is only a temporary remedy to quiet delirium and control excitement, and it does not cure the various diseases in the course of which delirium arises.* *Trans.*]

HYOSCYAMINA. TINCTURA HYOSCYAMI. Hyos-
CYAMINE. TINCTURE OF HYOSCYAMUS.

Hyoscyamine is an alkaloid obtained from *Hyoscyamus niger*† (Solanaceæ), identical with duboisine and daturine (Ladenburg and Meyer). Hyoscyamine occurs in crystals (Geiger and Hesse, Thibaut, Schuchardt, Duquesnel, 1881). The physiological phenomena produced by it are identical with those of daturine (see DATURINE),‡ nevertheless there is this difference between the two alkaloids, that

* *Practitioner*, November, 1886.

† Belladonna contains, besides atropine, hyoscyamine in small quantities; this hyoscyamine constitutes the commercial light atropine (Ladenburg). It occurs in commerce in the impure atropine obtained from the datura, under the name of heavy daturine. It may also be obtained from M. Tromsdorff, of Erfurt, under the name of daturine, an alkaloid which is identical with pure atropine. The observations of Schmidt tell also in favour of the presence of atropine in datura stramonium (Ladenburg). The reactions of hyoscyamine closely resemble those of atropine, with which it is isomeric (Ladenburg). After this it is not a matter of wonder that the alkaloids of belladonna, hyoscyamus, and datura stramonium, are intimately allied, both in chemical constitution and physiological properties, so much so that for a long time they were regarded as absolutely identical.

‡ Oulmont and Laurent, *loc. cit.* These authors used Merck's brown liquid hyoscyamine, of a syrupy consistence.

the former causes no intermittence or arrest of the heart, nor convulsions. It induces carbuncles and emaciation. Elimination is rapid and chiefly by the kidneys. It is partially *antagonised* by eserine (Amagat).

Local effects.—Nil.

Dose, $\frac{1}{10}$ to $\frac{1}{7}$ grain (!) daily. M. Pitha reports that after a dose of $\frac{1}{12}$ grain, he observed almost at once extreme bodily enfeeblement.

Hyoscyamine . . . 1 grain

Distilled water to } 1 ounce 80 minims, or 2
 } ounces 160 minims.

(Eulenburg).

In the treatment of night-sweats of phthisis, and in one case of profuse perspiration after a paroxysm of intermittent fever. M. Fräntzel has given the hydriodate of hyoscine in doses of from $\frac{1}{140}$ to $\frac{1}{48}$ grain and upwards according to the following formula:—

Hydriodate of hyoscine 1 grain

Distilled water . . . up to 2 ounces, 160 minims.

Eight minims = $\frac{1}{140}$ grain.

This author recommends hyoscine in cases where atropine has failed.*

Therapeutic uses.—Mercurial, saturnine, alcoholic and senile tremors (Oulmont, Eulenburg); obstinate chorea (Richter); mania (Mendel, Reinhard, Gray, Sepilli, Riva and Richter); epilepsy (Reinhard, Laurent, Sepilli and Riva); neuralgiæ, sciatica, Eulenburg (solution 1 in 500—from $\frac{1}{70}$ to $\frac{1}{6}$ grain), and Simonowitzch, both without success; Verneuil used it with success after resection of the nerve had failed to afford relief. Laurent has used it in hydrophobia (Milan Commission, 1864); it has been

* According to Ladenburg (*Deutsche chem. Gesell.*, 1880 and 1881), hyoscine is merely the amorphous hyoscyamine of commerce, and has the same composition as atropine. [See HYOSCINE].

used in the period of excitement in general paralysis, in locomotor ataxy and sclerosis (Lawson); lumbago (Laurent); paralysis agitans (one per cent. solution, Bourneville).

[For further details of the therapeutics of hyoscyamine, see a paper by Mr. Engledue Prideaux, L.R.C.P. (published in the *Lancet*, 1884), who has used the drug extensively. He has administered it, both by mouth and subcutaneously, in cases of mania with changeable delusions, with marked benefit, in monomania and pure melancholia, without much benefit, and with good results in mania of suspicion, even if accompanied by depression, and in ordinary epilepsy. Mr. Prideaux finds that in delirium tremens it lessens the delusions and cuts short the attacks. He adds "that in all cases of mental excitement, including acute mania, hysterical mania, and puerperal mania, it is the only reliable hypnotic that we have got." He uses Merck's amorphous extractive in doses of from $\frac{1}{16}$ to $\frac{1}{8}$ of a grain according to circumstances. *Trans.*]

HYPNONE.

[This new hypnotic, which was first observed and reported upon by Dr. Dujardin-Beaumetz, is also known under the name of aceto-phenone, and is prepared either by the action of benzol chloride on zinc-methyl, or by distilling together benzoate and acetate of calcium.

Some experimenters state that in the system this acetone undergoes a chemical transformation into benzoic and carbonic acids and is eliminated by the urine in the form of hippurates. Dr. Dujardin-Beaumetz says of it,* "administered to adults in doses of 2 to 4 drops, which correspond to 5 to 15 centigrammes, hypnone induces

* *Les nouvelles medications*, Paris, 1886.

sleep, and in cases of alcoholism it has appeared to yield better results than either chloral or paraldehyde."

"When injected subcutaneously in guinea pigs, in doses of 8 to 16 grains of the crude drug, hypnone induces a condition of torpor deepening into coma and the animal succumbs after 5 or 6 hours. Hypnone is a fluid at the ordinary temperature and possesses a powerful odour resembling at the same time that of cherry-laurel and of fresh hay." It is insoluble in water, but is miscible with alcohol, ether, and glycerine.

Dr. Savage, who has used hypnone in several cases, has not found any ill effects follow from its administration; it appeared to be useful in cases of active melancholy, "and in one case at least it appeared to check an attack of recurrent mania." He does not consider that it is adapted for hypodermic purposes. It appears to resemble urethane in being a pure hypnotic, and consequently is not calculated to be of much service as a sedative where there is pain.* *Trans.*]

I.

ICHTHYOL OR SULPHO-ICHTHYOLIC ACID.

Ichthyol or sulpho-ichthyolic acid† is an oil of a brownish-yellow colour, soluble in water. Introduced by Unna

* *Practitioner*, vol. xxxviii., p. 35.

† Consult Baumann and Schotten, *Monatsh. f. prakt. Dermatologie*, Bd. ii, No. 9; Unna, *D. Med. Zeitung*, 1883, p. 237; Thimann, *Zur Anwendung des Natrium Ichthyosulfuricum*, June 28, 1884.

in the treatment of skin diseases, the same author has recommended it for some internal ailments, amongst others for acute and chronic rheumatism. Although it is chiefly used as an external application, it has been also used hypodermically in 16 minim doses of a 5 to 10 per cent. aqueous solution.

Dr. Unna has also recommended hypodermic injections of sulpho-ichthyolate of sodium (2 per cent. aqueous solution) in the treatment of lupus.

[Ichthyol is a very soluble preparation of sulphur, and is a powerful antiphlogistic, rapidly producing anæmia of all the tissues to which it is applied. It must not be applied to abraded surfaces. Internally it is best administered by the mouth in doses of 3 ss to 3 j for adults, and 3 to 6 grains for children.*

Dr. Unna† says that ichthyol is indicated internally :—
“(1) In skin diseases, acne rosacea, nervous forms of eczema in persons of nervous constitutions; eczema from teething; lichen urticatus; erythema multiforme; dermatitis herpetiformis; furnuculosis—but it is *not* indicated in psoriasis. (2) In the following other diseases (I speak after five years' experience) in acute and chronic rheumatism; bronchial asthma; chronic catarrh of the stomach and intestines, together with catarrh of the bile duct (icterus); chlorosis, tuberculosis (especially in children), and scrofula; vascular engorgements of all kinds.” It is a paratriptic, the body weight increasing under its use.‡
Trans.]

* *British Medical Journal*, 1887, vol. i., p. 636.

† *Loc. cit.*, p. 800.

‡ *London Medical Record*, vol. xv., p. 152.

INJECTIONES HYPODERMICÆ NUTRIENTES.

NUTRITIVE HYPODERMIC INJECTIONS.*

Since the physiological researches of Messrs. Menzel and Perco (1869) on the absorption of alimentary substances by the subcutaneous tissue, several attempts have been made in this direction. *Cod-liver oil*, which was experimented with by Messrs. Mosler and Pick, produced symptoms of local irritation.†

Sweet almond and olive oil have also been administered as nutritive agents (see OILS).

* See in connection with the subject of intravenous injections of milk, gelatine, serum, and egg albumen, the treatise of M. Calmettes, *Recherches expérimentales sur l'albuminurie produite par l'injection de substances organiques azotées dans le sang*. (*Archives de physiologie*, Tome iii., 1870-71, p. 26).

† Injections of fluid fat, of various oils, milk, etc., are incapable of causing fat embolism. The experiments of M. Flournoy (*Contribution à l'étude de l'embolie graisseuse*, Paris-Strasbourg, 1878) have proved that they are innocuous in this respect. It is true that M. Riedel has discovered fat emboli in the lungs, consequent on injections into the abdominal cavity. Oil which has been injected, except when the injection is made into the peritoneal cavity, is only absorbed after the lapse of a very long time, at least in the case of rabbits. See also the physiological experiments of M. Eichhorn (*Wien. Med. Woch.*). M. Albertoni (1873) injected milk serum into the veins of dogs. About the same time Hodder in Canada practised transfusion of milk in four cases of cholera, with three recoveries. M. Miglioranza (*Gazz. Med. It. Lomb.*, May 6, 1883) found as a result of experimental researches that it was a mistake to propose transfusion of milk for that of blood; that in the treatment of cholera transfusion of serum by Albertoni's plan might be adopted, but not that of pure milk; that in anæmia lacteal transfusion could never replace blood transfusion; and, moreover, that these injections produced serious and even fatal results.

Solution of *sugar* has been used by Krueg in a case of insanity where nourishment was refused. An entire *egg*, the white and yolk being mixed, has been injected by Krueg, with subsequent abscess. Pick injected the *yolk*. Whittaker has injected with success in a case of gastric ulcer, milk and beef juice alternately (one fluid drachm every two hours). M. Luton made injections of milk (one-and-a-half drachms each) and in four instances phlegmonous abscess resulted. We may add that Pick also practised injections of milk.*

Dr. Edward Warren (*The Treatment of Typhoid Fever*, 1876) recommends hypodermic injections of diluted milk, both as an aliment and as an antipyretic.

Milk has besides been injected into the veins; this method, which appears to have been used chiefly in America, has been recommended as a substitute for transfusion of blood, but this question does not fall within the scope of our enquiry. (See the cases of Mr. Thomas, of New York, who used from ten drachms up to eight ounces with success, and others). M. A. Voisin in melancholia, and M. Bernutz, in two cases of gastric ulcer, injected—the former, sheep's blood, and the latter, dog's and chicken's blood. Subcutaneous injections of defibrinated blood have been administered, both in cases of defective nutrition and as a substitute for transfusion by various authors; among others by Messrs. Karst, Landerberger, Bumüller, Camerer, Schmeltz, Nicaise, Fless, Barreggi,† Casse, and Langlet.

* Intravenous injections of milk have been made by Hodder, of Toronto (1850), and later by Gaillard Thomas, etc.; but they are apt to be productive of various accidents, amongst others fatty emboli (Culurq, 1879).

† This author uses for this purpose a Pravaz syringe with a capacity of one fluid drachm, or an apparatus for continuous pressure. The in-

Prof. Ziemssen* has recently recommended a somewhat similar method. He injects into each thigh six drachms and twenty minims of defibrinated human blood, by means of a special syringe of the same capacity. Systematic massage of the blood tumour is then made. The injections caused only a trivial amount of pain and no local reaction. Ponfick in 1879 recommended peritoneal injections of blood; since that time they have been practised by several other authors (Golgi and Raggi used them in anæmia with profound syncopal attacks). The attempt to utilise hæmoglobin solution at a temperature of 94° proved a failure in the hands of M. Bernezür, in consequence of the severe local troubles which resulted. We may mention, in conclusion, injections of blood serum (Hüter), and of sodic chloride† (Lubanski, see SODIUM); and lastly, of the peptones (see FERRUM).

jections should be repeated every five or ten days, and should be of considerable amount, from 3 to 9 fluid ounces. The defibrinated blood is prepared from blood taken from the jugular vein in the horse, dog, or man. The globules were absorbed without alteration (?), and the results were superior to those obtained from peritoneal transfusion. The blood was enriched both in globules and in hæmoglobin (*Arch. It. Med.*, quotation from the *Imparziale*, 20th August, 1883). Paladini on two occasions injected 4 fluid ounces, in two doses, of human blood (case of acute anæmia) into the subcutaneous tissue by means of an ordinary syringe, fitted with an elastic tube uniting it to a fine trocar, which he moved about laterally to separate the meshes of the connective tissue. With the exception of some ecchymosis there was no local trouble. Cure followed. (*Gazette Med. Ital. Lombardia*, No. 34, p. 342, 25th August, 1883).

* Ziemssen, *Deutsch. Archiv. f. Klinische Med.*, Band xxxvi., Heft 3 and 4, 1885.

† Saline transfusions have been successfully practised by Messrs. Bischoff, of Bâle, and others.

IODI TINCTURA. TINCTURE OF IODINE.

Hypodermic injections of iodised water (S. Cézard, Jaillot, Collot, Chipault, Verneuil, Davaine, Raimbert, Rémy, Labbé, and A. Richet), or of pure tincture of iodine (Boinet, Th. Anger, and Coulom),* have been used in the treatment of malignant pustule, but the mode of action and the operative procedure class these injections among those with a localised effect.

IODOFORM.

Insoluble in water, soluble in alcohol (1 in 50), in ether (1 in 6), in fats, volatile and fixed oils, vaseline, chloroform, and carbon sulphide.

Chief physiological effects.—Local and general anæsthesia, antiseptis, vomiting, nausea, epigastric pains, diarrhœa (Maillard, dose 7 grains). According to some authors iodoform acts like iodine. In dogs, doses of 77 grains produced convulsions and death; fatty degeneration of liver, kidneys, and pancreas. Elimination is effected by the kidneys.

Local effects.—Slight pain, redness and induration. Solutions in oil give rise to a more decided local action.

Dr. Bozzi, of Milan, was the first (in 1870) to make use of hypodermic injections of iodoform.

Iodoform	.	.	.	.	3 grains
Ether	.	.	.	.	up to 20 or 32 minims.

One to two syringefuls.

Neumann, Jouon of Nantes.

* These authors have not observed either abscess or phlegmon as a result of injection.

The ethereal solution of iodoform has been used with success in severe cases of arthritis by Messrs. Miculicz, Neumann, Müller, etc.

Iodoform 6 grains
Glycerine* up to 24 minims.

From 4 to 10 minims of the solution.

Thomann.

Iodoform 1 grain
Almond or castor oil . . . up to 16 minims.

M. Neumann rejecting Thomann's diluted solution (5 per cent.) made use of saturated solutions.

Iodoform 1 grain
Castor oil up to 16 minims.

Iodoform 5 grains
Sulphuric ether up to 32 minims.

Iodoform 3 grains
Sulphuric ether 15 minims
Olive oil up to 32 minims.

Sixteen minims = $1\frac{1}{2}$ grains.

Iodoform 2 grains
Castor oil up to 16 minims.

Iodoform 6 grains
Glycerine up to 24 minims.

From his researches Prof. Neumann believes not only in the absorption of iodoform in solution in ether, etc., but also in its absorption when held in suspension in glycerine. Dr. Mracek (*Anzeiger d. Ges. d. Æ.*, no. 27,

* We have found iodoform insoluble in the above proportions.

1882), has also used iodoform suspended in glycerine ; its presence was detected in the urine, but the process of elimination was slow, at the rate of $1\frac{1}{2}$ grains per diem, $1\frac{1}{2}$ drachms of iodoform having been injected in thirteen days. Microscopical observations made by the author (post-mortem) showed that the glycerine injection was not innocuous, but gave rise to a local inflammatory process.*

The solutions should be freshly prepared and kept in dark bottles. Emulsions of iodoform with distilled water and glycerine (equal parts) and mucilage have been employed in parenchymatous injections by Messrs. Delbastaille and Troisfontaines in the clinic of M. Van Winiwarter, and did not cause irritation ; but such injections do not come within the scope of our subject. Iodoform has been injected hypodermically in syphilis by Messrs. Bozzi, Thomann and Lopp, and Neumann. Iodoform, which was introduced in 1836, has been chiefly used internally and externally in goître, scrofula, rickets, syphilis, phthisis, anal fissure, prostatic enlargements, neuralgia (Dr. Moretin, 1853), uterine and mammary carcinoma (Demarquay), serous collections, chronic arthritis, glandular enlargements (Gubler), cancerous and venereal ulcers, to stimulate sluggish wounds, in varicose and phagedænic ulcers, rupia and ecthyma, inter-digital mucous gummata, suppurating buboes, moist gangrene, gunshot wounds (Féréol), chronic venereal ulcer (D'Amico), intermittent fevers (Knotts, Keundi), toothache due to caries (Lailier, Marrotte, etc.). The use of iodoform has been revived at various times, among others in Paris in 1873, finally, it has been brought into use anew in the treatment of wounds and various surgical affections.*

* See also a recent communication by Thomann on this subject, in the *Centralblatt f. d. Med. Wissensch.*, No. 35, 1882.

iodo-TANNATES, SOLUTIONS OF. (See *Tannin*).

IODIDES OF POTASSIUM, ETC. (See *Potassium and Sodium*).

JABORANDI. (See *Pilocarpina*).

K.

KAIRIN.

A derivative of quinoline, was discovered in 1882 by Fischer. We understand by this name the hydrochlorate of oxyethyl-quinoline. [Kairin is an alkaloid which has been prepared synthetically by Prof. Fischer, of Munich. Its formula is $C_{10}H_{13}NO_{11}$. (*London Medical Record*, xii., 20). *Trans.*] Kairin hydrochlorate exists in the form of a yellowish-white crystalline powder. It is very soluble in water and alcohol, slightly soluble in glycerine, and insoluble in ether. It has a saline bitter taste.

Principal physiological effects.—Is an antiputrescent, slows the pulse and respirations, lowers arterial tension,* and diminishes temperature by vaso-motor dilatation. There is diminution of general sensibility and motility in proportion to the amount of the dose; convulsions, contractures, pupillary contraction and paresis occur only after large doses. Profuse sweats coincide with fall of temperature and rigors with its rise; there may be cyanosis, hæmaturia, and diminished excretion of urea. The respiratory capacity of the blood is diminished (Picot, Brouardel,

* See especially the works of Bouchardat, Deschamps (1853), Moretin and Humbert (1856), Righini, of Novare (1860), Demarquay, Maillard, Féréol (1868), and "*iodoform dressings*" Nieszkowski (1871), Petiteau, etc.

P. Loye, Conscience), reduction of hæmoglobin to methæmoglobin (Moroghowetz, of Moscow, and Galoubof). *Elimination* is effected by the kidneys with dark-green discolouration of the urine.

Therapeutic uses.—Kairin although used in a great variety of affections by various authors (Filehne, Guttman, etc.) has been almost exclusively used internally. M. Queirolo (*Italia Medica*, 1884) has, however, used kairin hypodermically in doses of $1\frac{1}{2}$ to 8 grains in 16 minims of water. These injections did not give rise either to local or general ill-effects. The same author states that at the ordinary temperature kairin will only dissolve to the extent of $1\frac{1}{2}$ grains in 16 minims of water. Stronger solutions can be prepared by gradually raising the temperature of the water, which will remain clear at a temperature of 95° F. Deep injection is necessary. Kairin has been mostly used as an antipyretic, but the unpleasant effects, such as profuse perspiration and rigors to which it gives rise, and the very temporary influence it exerts on the temperature render it less useful as an antipyretic than anti-pyrin. In conclusion, it is contra-indicated in cardiac and pulmonary diseases, anæmia, and those ailments which are characterized by diminished hæmatosis and impoverishment, of the blood. (Picot and Conscience).

* Many of its physiological properties are still *sub-judice*, and the statements of writers are very contradictory. We quote from the most recent published researches.

LAC. MILK. (See *Nutrient injections*).

LACTAS FERRI. (See *Ferrum*).

LACTAS SODII. (See *Sodium*).

LAUROCERASI AQUA. (See *Acidum Hydrocyanicum*).

LIQUOR POTASSII ARSENIATIS. (See *Arsenium*)

LIQUOR SODII ARSENIATIS. (See *Arsenium*).

LITHII BROMIDUM. LITHIUM, BROMIDE OF.

M. Lévy has experimented on himself with lithium bromide, in doses of $\frac{2}{7}$ of a grain, but "although no local inconvenience was occasioned, this mode of administration appeared to him to be useless and dangerous."* Dr. Weir Mitchell has seen slight suppuration after injection of this salt.

M.

MAGNESII CHLORIDUM. CHLORIDE OF MAGNESIUM.

M. Luton says he has accidentally used chloride of magnesium,† produced by double decomposition by the action of morphine hydrochlorate dissolved in cherry-laurel water, the excess of acid being neutralised by the magnesia. "The contact of such a fluid with the tissues is scarcely

* Lévy, *Du bromure de lithium*, Paris, 1874.

† Was it true chloride of magnesium which M. Luton injected in this instance? In any case this preparation should never be used.

perceived, it excites no irritation, and, what is more, it plays the part of a laxative. This effect very soon passes off, but it is incontestably manifested in some individuals. [Dr. Hay remarks on this subject—"saline purgatives do not act when injected subcutaneously; or, if they do, it is only when they are injected over the abdomen, and in virtue of a reflex effect." Von Ziemssen's *Handbook of General Therapeutics*, vol. ii., 481. *Trans.*]

MAGNESII SULPHAS. MAGNESIUM, SULPHATE OF.

M. Luton has used sulphate of magnesia ($1\frac{1}{2}$ grain in 16 minims of distilled water) by the hypodermic method, and the purgative effect was produced. "This solution, he remarks, is not irritating as has been asserted, or, at least, it does not cause more pain than pure water does."

M. Betz has used it and found it irritating. Gubler has used subcutaneous injection of sulphate of magnesia unsuccessfully (3 grains in 16 minims).* Armaingaud (1877) injected it successfully (*Bordeaux Médical*).

MORPHINA. MORPHINE AND ITS SALTS.

Morphine is almost entirely insoluble in water, sparingly soluble in alcohol, ether, chloroform, and glycerine, and insoluble in essential oils.

The *hydrochlorate* is soluble in 16 to 25 parts of water, 50 parts of alcohol, and to the extent of 20 per cent. in glycerine.

* See also Vulpian and Carville's experiments on animals (*Bulletin de la Société de biologie*, 1874).

The *sulphate of morphine* is soluble in water, but less so than the hydrochlorate,* and in glycerine. It contains 76 per cent. of the alkaloid. The *nitrate* is freely soluble in water (in $1\frac{1}{2}$ of its weight). The *acetate* is soluble in water (in 24 parts of acidulated water), and in alcohol, but it is somewhat unstable; it contains 86 per cent. of alkaloid. The *tartrate* is very soluble in water and alcohol; according to Stuart, who has recommended it for hypodermic use, it does not irritate the cellular tissue and is stable in aqueous solution. The *meconate* is almost gone out of use.

[The following table of the solubility of the morphine salts is from the *Pharmaceutical Journal*, November, 1882, p. 404 :—

Acetate	1 in	$2\frac{1}{2}$	parts of water at 60° F.		
Tartrate	1 „	$9\frac{3}{4}$	„	„	„
Sulphate	1 „	23	„	„	„
Hydrochlorate	1 „	24	„	„	„
Meconate	1 „	34	„	„	„

Trans.]

Principal physiological effects. In medicinal doses—somnolence,† muscular enfeeblement, sensorial troubles, contraction of the pupils, mental torpor, diminution of sensibility, and of muscular contractility, co-existing with increase of reflex excitability,‡ dryness of the mouth

* According to Eulenburg and Schivardi it is on the contrary more soluble (1 in 10).

† In small doses, and even when the dose is considerable, the period of prostration is preceded by a stage of excitement, which, however, is very short in the latter case. Insomnia, excitement, and hallucinations; increase of blood pressure and temperature, and increased rate of cardiac pulsations also result from these doses.

‡ The spinal cord is influenced by the morphine after the brain.

and throat with thirst, impairment of appetite and of gastric digestion, constipation, nausea, and vomiting, more or less profuse perspiration, itchings, excitement and alarm on awaking.

*In larger doses** there are sluggishness of thought and of movement, succeeded by comatose sleep; the pulse is either slow or of unwonted frequency, respiration becomes irregular and sometimes falls in number to eight or ten per minute; the mucous membranes become cyanosed, the countenance is pallid and covered with violet coloured patches. The temperature falls and death finally supervenes, frequently amidst clonic and tonic spasms.†

Opium has a much more decidedly stimulating effect than morphine on the cardio-vascular apparatus;‡ it raises the pulse, at the same time increasing the amplitude of the pulse wave, and it stimulates also in the most marked way the calorific function.

Morphinism.§—Dryness of the mouth, thirst, nausea, vomiting, generally constipation, occasionally dyspnœa and palpitation (a combination rare and unusual), albuminuria, loss of power, amenorrhœa, insomnia, with hallucinations, varying disposition, hyperæsthesia, neural-

* We have borrowed largely in this account of the physiological actions of morphine from the essay by M. Fonssagrives in the *Dictionnaire Encyclopédique*, to which we refer our readers for further details, as well as to Messrs. Nothnagel and Rossbach's *Traité de Thérapeutique*, French translation by Alquier, 1880.

† The local action of morphine hypodermically injected, although it appears to be tolerably certain, is still a matter of controversy.

‡ The hypnotic phenomena produced by opium may be explained, according to many authorities, by a condition of static congestion of the cerebral substance and the meninges; hence it has been proposed to utilise it and its derivatives to counteract the cerebral anæmia resulting from aortic insufficiency and other affections.

§ Lewinstein, *Die Morphiumsucht, eine Monographie nach eignen Beobachtungen*, Berlin, 1877. Dalbaune, thèse de Paris, 1877.

gia, tremor of hands, bewildered and stupid expression; various forms of eruptions, loss of appetite, tendency to suppurations, emaciation. These phenomena are more pronounced after the sudden abandonment of the morphine habit.*

The combined action of *morphine* and *chloroform* was observed almost simultaneously by Neumann, and H. Bernard. Morphine administered before chloroform induces profound muscular relaxation; given afterwards, it prolongs the chloroform anæsthesia. Numerous surgeons have used it with benefit in combination with atropine before anæsthetising. (See ATROPINA).

The subjoined table shews readily the relative position as hypnotics, convulsants, and toxic agents of the various alkaloids of opium.

Hypnotic action.—(1) Narceine,† (2) Morphine, (3) Codeine.‡

Tetanic action.—(1) Thebaine; (2) Papaverine; (3) Narcotine; (4) Codeine; (5) Morphine; (6) Narceine.

Poisonous action.—(1) Thebaine; (2) Codeine; (3) Papaverine; (4) Narceine; (5) Morphine; (6) Narcotine.

Man is of all animals most sensitive to the action of morphine and hence it is necessary to be on one's guard,

* M. Luton, following the practice adopted by certain physicians and hospitals in New York, is in favour of the sudden cessation of morphine injections; in addition to an appropriate hygiene, he recommends nuxvomica, preparations and derivatives, as a remedy for morphinism as well as of alcoholism. (See also Bourneville and Regnard, *Icon. phot. de la Salpêtrière*, tome iii., p. 93).

† M. Frommüller and some authors attribute only the slightest hypnotic effects to it. In man according to Rabuteau, it is less of a soporific than morphine.

‡ M. Rabuteau, in opposition to the opinion expressed by M. Bouchut, regards it as soporific and analgesic to a very trifling extent; in man it does not appear to be poisonous except in doses above $2\frac{1}{4}$ grains.

more perhaps than in the case of any other drug, against the error of judging the effects likely to arise in him from those which are manifested in the lower animals. Besides, in men and the lower animals alike, the effects vary with age, constitution, etc. Children, for instance, are extremely susceptible to the influence of morphine. The lethal dose in individuals who are not habituated to its use varies within very wide limits; hence it is wise to begin with very minute doses ($\frac{1}{70}$ grain for example), and to increase them cautiously. Morphine is *eliminated* with considerable rapidity by the kidneys. As regards the question of *antagonism* between opium and its salts on the one hand and atropine and daturine on the other, it is very open to question. The *local effects* are *nil* when the injection is skilfully effected.

Rynd was the first who administered morphine subcutaneously (with creosote as a vehicle), and he was followed by Wood, Béhier, etc. Solutions of morphine hydrochlorate become turbid very quickly, they form apomorphine and become possessed of irritant properties. To obviate this difficulty cherry-laurel water has been proposed as a vehicle,* as have also water distilled from eucalyptus globulus (Gubler), peppermint and cinnamon water (Delieux and Savignac), glycerine, alcohol, alcohol and water (Adrian and C. Paul), distilled elm water (Patrouillard), chloral (Vidal), a solution of salicylic acid, 1 in 2000 (Limousin, Keyes, etc.), carbolic acid, etc.

We always think it desirable, whatever vehicle may be selected, to use a one or even a half per cent. solution.†

* This fluid readily oxidises by exposure to the air, and the solution causes pain. Messrs. Lailier and Dujardin-Beaumetz have, however, never seen any disadvantage from the use of cherry-laurel water.

† The solution may besides be prepared as required, with advantage.

Hydrochlorate of morphine . . . $\frac{1}{2}$ to 1 grain
 Distilled water up to 112 or 224 minims.
 Sixteen minims represent $\frac{1}{14}$ to $\frac{1}{7}$ grain.

Morphine hydrochlorate. 2 grains
 Chloral 4 grains
 Distilled water up to 112 minims.

M. Vidal finding that this solution caused pain reduced the proportion of chloral to $\frac{1}{2}$ grain.

Morphine hydrochlorate 1 grain
 Cherry laurel-water up to 56 minims.
 Eight minims contain $\frac{1}{7}$ grain.

Messrs. Savory and Moore's discs contain $\frac{1}{7}$ grain of morphine; they are perfectly soluble in a few drops of warm water. Numerous authors have pointed out the happy effects of combining morphine with atropine. (See ATROPINE).

Morphine hydrochlorate 1 grain
 Neutral sulphate of atropine . . . $\frac{1}{10}$ grain
 Cherry-laurel water up to 224 minims.

Sixteen minims of this solution contain $\frac{1}{14}$ of a grain of morphine, and $\frac{1}{140}$ of a grain of atropine.

Acetate of morphine. 12 grains
 Acetic acid 1 minim
 Glycerine 5 minims
 Distilled water up to 36 minims.*

Nider.

* [This formula appears to be erroneous, as Messrs. Bourneville and Bricon observe, and should be stated as follows:—

Acetate of morphine 12 grains
 Acetic acid 1 minim
 Glycerine 5 minims
 Water. up to 240 minims.

This solution contains 1 grain, instead of 6·9 grains, in 20 minims.
Trans.]

Hydrochlorate of morphine . . .	1 grain
Spirit of peppermint	10 minims
Peppermint water	up to 112 minims.

Delieux and Savignac.

Sulphate of morphine	256 grains
Salicylic acid	8 grains
Distilled water	16 fl. ounces.

Heat the water to boiling point, dissolve the morphine and salicylic acid in it and filter.

Keyes (1879).

Sulphate of morphine	16 grains
Distilled water	up to 1 ounce

Dissolve and filter.

Bartholow.

Sulphate of morphine	16 grains
Sulphate of atropine	$\frac{1}{3}$ grain
Glycerine	1 drachm
Carbolic acid	6 grains
Distilled water	7 drachms.

Dissolve and filter. 1 grain of morphine and $\frac{1}{48}$ grain of atropine in 30 minims.

Sledge.

White oxide of antimony	10 grains
Morphine hydrochlorate	2 grains
Cherry-laurel water	up to 112 minims.

Eight minims contain $\frac{1}{7}$ of a grain of morphine. To allay cough.

Navarret.

Sulphate of morphine	10 grains
Distilled water	q. s.
Dilute sulphuric acid	1 minim
Carbolic acid	2 grains
Pure glycerine	60 minims.

Filter.

Ainsworth.

Dissolve the morphine in 180 minims of water with the dilute sulphuric acid by the aid of a gentle heat; then add the carbolic acid dissolved in the glycerine. Filter and add water up to 300 minims. Five minims contain $\frac{1}{6}$ of a grain of morphine. The injection should be made intramuscularly. This solution frequently causes suppuration.

M. Rusconi has combined cocaine and morphine:—

Cocaine hydrochlorate . . . $1\frac{1}{2}$ to 3 grains

Hydrochlorate of morphine . . 1 grain

Distilled water . . . up to 224 minims.

Sixteen minims contain $\frac{1}{14}$ of a grain of morphine and $\frac{1}{10}$ to $\frac{1}{5}$ of a grain of cocaine.

The use of morphine has become so extensive and universal that it is administered now-a-days in all sorts of ailments* rightly and wrongly. It is impossible to protest too strongly against this abuse, as morphine and its salts should never be prescribed except in well-defined cases. Morphine† injections have frequently been used in the treatment of cholera. Dr. Walter Coles, of St. Louis, recommended them in 1883; morphine before the period of collapse, combined with atropine in the intermediate stage, and atropine alone in the stage of collapse. Morphine and

* We do not deem it necessary to dwell at greater length on the physiology and therapeutics of morphine and its salts, as they are so well known to, and in such general use by all practitioners. We may refer for further details of the hypodermic uses of this alkaloid to the monograph by Dr. Kane of New York, *The hypodermic injection of morphia, its history, advantages, and dangers*, New York, 1880. We may further refer to the essay by M. A. Dennis of Strasbourg (1868), which contains a well constructed table of the diseases treated by morphine injections, with the names of the authors who have used them. This table, which is now out of date, consists of no fewer than six quarto pages.

† M. A. Renault, and more especially M. Huchard, have recommended the use of morphine in all forms of dyspnœa without any reference to their cause.

narceine alone of all the alkaloids of opium are ane-smotic; the former is specially serviceable in hypodermic injections (Béhier, C. Codrescu (1866), Vulpian, Legagneur (1876), etc.)

[The B.P. (1885) *Injectio Morphinæ Hypodermica* is a solution of the acetate; ten minims=1 grain of the acetate, and the dose is 1 to 6 minims.

Martindale and Westcott give a formula for a solution of the acetate having a strength of 1 in 6. They also give a formula for a solution of the acetate in combination with sulphate of atropine, 3 minims of which contain $\frac{1}{2}$ a grain of acetate of morphine and $\frac{1}{60}$ of a grain of sulphate of atropine. I have now for some time used the tabloids of Messrs. Burroughs and Wellcome, which yield excellent results and are convenient in many ways.

The bimeconate of morphine was recommended by the late Mr. Squire (*Companion to the Pharmacopœia*, 13th edit., p. 228). It is one of the least irritating solutions for hypodermic purposes, but has the disadvantage of readily becoming turbid. The tartrate of morphine is excellently adapted for hypodermic use and is not so apt to corrode the needle as some other preparations. Like the bimeconate, it has the further advantage of not being apt to produce headache, nausea, or constipation.

Messrs. Ferris and Co., of Bristol, make an excellent preparation for hypodermic use, "Glycerole of Nepenthe." It keeps good for an indefinite time, produces no local irritation, and is not apt to cause any unpleasant after-effects. Among many other cases, I have used it frequently of late in a patient suffering from cancer of the cervix uteri. The pain in this case came on at uncertain intervals and was so intense that the poor woman rolled on the floor in agony. An injection of eight minims into the arm gave speedy relief, and an interval of ten to fourteen

days frequently elapsed before the injection required to be repeated. I have also used it with the best results in intestinal colic.

Among the many diseases in which morphine has been used subcutaneously *diabetes* should be mentioned. The value of opium in the treatment of this disease has been known for a long time, and its employment hypodermically has been advocated for many years (see Neale's *Medical Digest and Appendix*); but Dr. Mitchell Bruce has recently conducted some important clinical investigations which seem to prove that morphine may be used hypodermically in diabetes for diagnostic purposes—*i.e.* to ascertain the particular form of the disease and the source from which the sugar is derived.

Dr. Bruce treated a case of glycosuria (1) on ordinary diet, (2) on strict Pavy diet, (3) on Pavy diet with the administration of morphine by the mouth, and (4) on Pavy diet combined with the subcutaneous administration of morphine. During the continuance of these experiments daily observations were made as to the amount of sugar excreted, and Dr. Bruce arrived at the following conclusions:—

I. *Therapeutical.* That morphine was of signal value in the treatment of diabetes.

II. *Physiological and Pathological.* 1. That in the particular case reported on, the glycosuria was proved to be due to an increased income of sugar into the blood, not to diminished destruction of sugar in the system.

2. That in the same case the increased income of sugar was proved not to originate in simple transportation of sugar from the intestine or portal vein to the general circulation.

3. The excessive glycogenesis in this case was proved to

be effected mainly or entirely in the liver, not in the muscles or any of the other viscera.

4. The seat of the disordered process, whatever may have originated it, was shewn to be in the liver, and not in the central nervous system or nerve-trunks.*

The importance of these observations and their direct bearing upon the subject of hypodermic medication are so obvious that no apology is, perhaps, required for quoting them at such length. *Trans.*].

MOSCHUS—TINCTURA MOSCHI. MUSK, TINCTURE OF MUSK.

M. Rosenthal praises musk highly as a diffusible stimulant in the algid stage of cholera and in adynamic forms of typhoid fever. M. Rohde used an aqueous solution (1 in 40), of which he injected from 16 to 48 minims *per diem*, according to the gravity of the case. In most of the cases a rise of pulse-rate and of temperature resulted.

Locally he observed on one occasion a slight slough of the skin in a case of cholera, and in another instance there was induration without abscess. M. Drasche obtained only negative results in the treatment of cholera. Musk and its tincture have lately been used by various writers, among others by Vogelsang, in the treatment of infantile convulsions. Tincture of musk* is injected in doses of 8 to 32 minims.

* *Practitioner*, vol. 38, p. 20

† We refer to the tincture of the German Pharmacopœia which is made with one part of musk and twenty-five parts each of water and alcohol. The French tinctures are much stronger (the tincture of the *Codex* is composed of ten parts of musk to one hundred parts, by weight, of alcohol). The practical value of musk is open to question, inasmuch as it is very costly, and its place is easily supplied by other stimulants.

MUSCARINA. MUSCARINE.

Muscarine has been used hypodermically only by Ringer and Morshead, who gave it in doses of $\frac{1}{8}$ to $\frac{3}{4}$ of a grain.* M. Prévost† has suggested that it might be possible to antagonise the poisonous symptoms due to atropine by hypodermic injection of muscarine, of physostigmine, or of pilocarpine in moderate doses. We may add that M. Prévost's experiments prove a mutual antagonism between muscarine and atropine.

N.

NAPELLINA. NAPELLINE.

Napelline which has been now investigated by Messrs. Habschmann and Groves, who gave it its name, is contained in the mother-liquors of crystallised aconitine. It has been extracted by Duquesnel, is an amorphous alkaloid of aconite, is soluble in water, ether, alcohol, and to a slighter degree in chloroform.

* [For full details of Dr. Ringer's investigations see his *Handbook of Therapeutics*, 11th edit., p. 489. He states that the action of muscarin is identical in men and in animals, that it contracts the pupil, excites profuse perspiration, free salivation, and running at the nose and eyes; it purges, occasionally causes nausea and vomiting, and excites a strong desire to urinate. Its properties are closely analogous to those of pilocarpine. It has been used with success in the night sweats of phthisis, and it has also been administered to arrest the secretion of milk. See also the *Transactions of the Medical Congress*, 1881, vol. i., p. 508. *Trans.*]

† J. L. Prévost, *Antagonisme physiologique* (Congr. Internat. des sciences méd., Geneva, 1877, and *Arch. de Physiol.*, 1877, p. 837).

“The great solubility of our napelline, observe Messrs. Duquesnel and Laborde,* has permitted our preparing a very clear solution, eminently suitable for subcutaneous injections.” From their experiments they conclude that the effects of their napelline demonstrate: (1) that the phenomena by which it manifests its action are, in reality, fundamentally identical with those which are characteristic of the physiological action of crystallised aconitine. (In addition to a calmative and analgesic action, however, it is also soporific); (2) that the intensity of this effect is incomparably less than that of crystallised aconitine. From a dose of 16 grains, administered to a dog, Messrs. Duquesnel and Laborde obtained lethal toxic effects without emesis.

Napelline	:	.	.	.	.	.	.	.	.	1 grain
Distilled water	.	.	.	.	.	.	.	.	.	up to 112 minims.

Sixteen to sixty-four minims = $\frac{1}{7}$ to $\frac{4}{7}$ of a grain of the active substance.

Calmative and soporific effects were produced by doses of $\frac{1}{7}$ to $\frac{4}{7}$ grain, which were not succeeded on awaking by any sensation of illness (malaise).

M. J. Voisin has injected it hypodermically in several cases of epilepsy. His formula is:—

Napelline	.	.	.	.	1 grain
Alcohol at 90°	.	.	.	.	48 minims
Distilled water	.	.	.	.	up to 112 minims.

Napelline has been used in the clinic of M. Dumontpallier in facial neuralgia, in a hysterical patient, in neuralgic lumbago, and sciatica, in rheumatoid pains, and fugitive neuralgiæ, in doses of $\frac{1}{7}$ to $\frac{3}{7}$ of a grain in a 1 in 20 solution. We are of opinion that further experiments must be made

* *Tribune médicale*, 1881, pp. 472, 499, 520.

before admitting this so-called alkaloid into our list of therapeutic agents. It is with this substance as with many others, we have not deemed it right to pass it over in silence; but such agents can only be accepted after extended investigation.

NARCEINÆ HYDROCHLORAS. NARCEINE HYDRO-
CHLORATE.

Narceine is almost insoluble in water, is insoluble in ether, but readily soluble in alcohol.

The *hydrochlorate* dissolves readily in water, but the sulphate is insoluble in this vehicle.

Dose. One and a half to three or even to six grains.

Narceine hydrochlorate . . . 2 grains

Distilled water up to 224 minims.

Dose. Six, eight, twelve, or even as much as sixteen minims = $\frac{1}{18}$, $\frac{1}{14}$, $\frac{1}{9}$, and $\frac{1}{7}$ of a grain respectively. (*Pharmacopœia of Vienna Hospitals*).

M. Rabuteau (1883) recommends injections of narceine hydrochlorate to obtain complete narcosis from small doses of chloroform. According to this writer, thebaine, and papaverine also, to a certain extent, promote chloroform narcosis.

Messrs. Béhier, Linné (1865), Erlenmeyer, May Figueira, Reissner, Piedvache, Ettinger, Petrini, Eulenburg, Frommüller, Harpprecht, Lubanski and others have administered hypodermically both narceine ($\frac{2}{3}$ of a grain in 16 minims) and its hydrochlorate. Narceine cannot be used cold and its injection is sometimes attended with pain, as it is necessary to acidulate the solution.

M. Lubanski has suggested a combination of morphine and narceine injections in the subjoined formula.

Morphine Hydrochlorate . 1 grain
Distilled water . . . up to 24 minims.

To this may be added $1\frac{1}{2}$ to 3 minims of a ten per cent. solution of narceine.* Such a solution is as questionable in regard to composition as it is in regard to utility. If it is made use of at all, the solution should be made with hydrochlorate of narceine on account of its solubility.

NARCOTINA. NARCOTINE.

Narcotine is insoluble in water and alkaline solutions, but dissolves in alcohol, ether, and essential oils. *In small doses* it produces narcotic and soporific effects, and *in large doses* twitchings, convulsions, and, at last, general paralysis and death. It takes a larger dose of narcotine than of morphine to produce soporific effects. Writers are not agreed as to the dose which may be given, and there is a similar disagreement in regard to its physiological action;—thus M. Rabuteau denies that it has any analgesic or soporific action. This alkaloid has been administered hypodermically by Prof. Eulenburg.† Injections occasion severe smarting, which, however, rapidly disappears.

* [“The advantage of this is very doubtful.” Eulenburg in Ziemssen’s *Handbook of General Therapeutics*, Dr. Hay’s translation. *Trans.*]

† [Who says that both thebaine and narcotine are quite worthless for hypodermic as they are for any therapeutic use. *Loc. cit.* p. 457. *Trans.*]

NICOTINA. NICOTINE.

Nicotine, never previously used therapeutically, was employed hypodermically by Erlenmeyer in a case of tetanus, without local trouble and with good results, in doses of $\frac{1}{70}$ of a grain.

Nicotine 1 grain
 Distilled water . . . up to 280 minims.
 Four minims = $\frac{1}{70}$ of a grain.

NITRAS ARGENTI. (See *Argentum*).

NITRAS VERATRINÆ. (See *Veratrina*).

NITRIS AMYL. NITRITE OF AMYL.*

Nitrite of amyl has generally been used in the form of inhalations.

The results obtained from its use by subcutaneous injections are uncertain (Amez-Droz). From 16 to 80 minims have been injected in the dog, and 90 minims in man in one and a half hours.

On post-mortem examination of animals which have been subjected to injections, nothing abnormal could be found, with the exception of a greyish discolouration (Guttman); there is no suppuration. Dr. David B. Smith was the first, so far as we know, who administered amyl nitrite hypodermically in man. The case was one of cholera, a disease in which Hayden and Cruise had

* [It has been thought better to retain here the arrangement adopted by Drs. Bourneville and Bricon, rather than to class Amyl under its initial letter. *Trans.*]

previously given inhalations of amyl without apparent benefit. Dr. Smith's patient died.

Nitrite of amyl	.	.	.	10 parts
Alcohol	.	.	.	90 parts.

(Barnes).

Eight to twelve minims in lumbago. Dr. Barnes asserts that he has obtained the same physiological effects by hypodermic injection as by inhalations.*

Dr. Sydney Ringer mentions the case of a woman affected with chronic mania in whom Dr. Strahan injected 8 minims of a 10 per cent. solution of amyl for the relief of lumbago; this was followed by two epileptiform attacks in close succession.†

NITRO-GLYCERINUM. NITRO-GLYCERINE OR GLONOINE.

Nitro-glycerine or glonoine, which was discovered by Sobrero in 1847, is a nitric ether of glycerine; it exists in the form of an inodorous yellowish oil and has a mawkish

* Braithwaite's *Retrospect*, vol. lxxxvi., p. 27.

† *Journal of American Medical Association*, 1885, vol. iv., p. 149. [Full details of this case will be found in the *London Medical Record*, vol. xii., p. 356.

Dr. Barnes (*British Medical Journal*, 1882, vol. i., p. 457) advocates the use of amyl nitrite by inhalation (not by mouth) in cases of strychnine poisoning, and he attaches great value to its power of arresting, or at least controlling, diastalsis. He also recommends the use of this remedy to subdue irregular and excessive action of the uterus, to overcome hour-glass contraction of the uterus, and to control puerperal convulsions.

Should unpleasant symptoms follow the subcutaneous administration of amyl nitrite, the antidote (used successfully in Dr. Strahan's case) is chloroform by inhalation. *Trans.*]

taste; it is slightly soluble in water, but dissolves readily in alcohol and ether.

Principal physiological effects in man. Nitro-glycerine is a powerful poison.

In moderate doses, 1 to 10 drops of a 1 per cent. solution, it produces a feeling of intracranial fulness, more or less severe headache, confusion or sluggishness of thought, tinnitus aurium, vertigo, amblyopia, quickening of pulse-rate with occasional dirotism, diminution of arterial pressure, redness and flushing of the face, sweats, nausea, vomiting, and occasionally exaggeration of the respiratory movements.

In poisonous doses (exceeding ten drops) clonic and tonic convulsions and death from asphyxia. The effects of glonoine closely resemble those of amyl nitrite, but are more persistent. Most investigations have obtained merely negative results in animals. Indeed the effects of glonoine vary widely with the species of animal, its age, etc.; moreover, the physiological properties have long been a matter of uncertainty and dispute.

Messrs. Dujardin-Beaumetz and Marieux have injected $1\frac{1}{2}$ to 3 minims of a 1 per cent. solution of nitro-glycerine mixed with water up to 16 minims.

Alcoholic solution of nitro-glycerine

(1 per cent.) . . . 25 minims

Cherry laurel water . . . up to 160 minims.

Marieux and Dujardin-Beaumetz.

Sixteen minims = $2\frac{1}{2}$ minims of solution of nitro-glycerine.

The effects are produced in from 5 to 10 minutes after injection. The dose should commence with two minims and never should exceed six minims in the twenty-four hours. By taking the precaution to make the injections into the

muscles of the back or of the gluteal regions, these authors have never observed local accidents—such as pain or abscess.

Therapeutic uses. Nitro-glycerine has been administered internally by Field (*Medical Times and Gazette*, 1858) for neuralgia, epilepsy, and hysteria. Thorowgood and James, Laurence of Brighton, Baker Edwards, S. Brady (1859) and others have administered and recommended it. In consequence of the experiments of Fuller, Harley, and Vulpian (1859), who disputed the results obtained by the above mentioned authors, glonoine fell into disrepute for several years, but after the publication of M. Bruel's essay* glonoine was again used by Murrell (1879), Mayo-Robson, Craig, Farquhar, Stitls, McCall Anderson, Green, Hammond, Steward, Korcinski, Huchard, Trusevich, and Bramwell, in angina pectoris, acute and chronic nephritis, epilepsy, eclampsia, asthma, palpitation, affections of the heart and aorta, syncope, migraine, neuralgia, vertigo, Menière's disease, and epileptiform tic.

In regard to some of these ailments, the results obtained are contradictory. Glonoine appears to be mostly of use in angina pectoris and in all diseases in which cerebral anæmia is a leading symptom. Quite recently M. Rossbach has recommended its use in the treatment of interstitial nephritis (*Berlin Klin. Woch.*, no. 3, 1885).

[The following formula is borrowed from the *Extra Pharmacopœia* of Messrs. Martindale and Westcott.

Nitro-glycerine solution, 1 per cent.	.	5 drachms
Rectified spirit	.	2 drachms
Distilled water	.	up to 1½ ounces.

Dose 1 to 4 minims. One minim contains $\frac{1}{240}$ of a grain.

* Bruel. *Recherches expérimentales sur les effets toxiques de la nitro-glycerine et de la dynamite.* Thèse de Paris, 1876.

By far the most convenient mode of administration is by means of the Trochisci or Tabellæ Nitro-glycerini, which were introduced by Mr. Martindale. In addition to the diseases mentioned by the authors, nitro-glycerine has been used with marked benefit in the treatment of seasickness, the vascular tension which occurs in the aged, myxœdema and puerperal convulsions. *Trans.*]

O.

OLEANDRINE.

This alkaloid, extracted from rose laurel* (*Nerium Oleander*) has been administered subcutaneously only by Erlenmeyer, but without success, in epilepsy.

Oleandrine	.	.	.	10 grains
Alcohol	.	.	.	q.s.
Distilled water	.			up to 120 minims.
12 minims = 1 grain.				

OLEUM AMYGDALÆ. ALMOND OIL.

According to M. Binz (*Grundzüge der Arzneimittellehre*, Berlin, 1882, p. 100), this oil has been used subcutaneously as a nutrient injection, but without success on account of the difficult absorption of oils by the cellular tissue (see *Inject. Nutrient.*).

[Dr. Shoemaker, of Philadelphia, has used oil subcutaneously in numerous cases with most encouraging

* Rose laurel is included in the group of cardiac poisons.

results. He has obtained the purgative effects of castor oil after hypodermic administration, and he has injected one to four drachms of cod liver or olive oil in cases of debility, dyspepsia, scrofula, and in cutaneous and nervous diseases. In diseases of the alimentary canal and in all forms of defective nutrition this method of treatment has been eminently successful. As in most other cases of hypodermic medication, no evil results ensue from the practice, and beyond trifling and transient pain, and perhaps a little local redness and swelling, no inconvenience is experienced by the patient. See *British Medical Journal*, vol. i., 1885, p. 1257. *Trans.*]

OLEUM CROTONIS. (See *Croton*).

OLEUM OLIVÆ. OLIVE OIL.

(See also the section on *Nutritive Injections*).

Krueg* has injected four to eight drachms of olive oil per diem in the case of a lunatic who refused food. The injection fluid being expelled slowly caused no pain and left only a trifling redness.

OLEUM TEREBINTHINÆ. (See *Terebinthina*).

OPIUM.

Opium in aqueous solution (Lobl), the extract (Lebert), and the tincture of opium (Wood, Hunter, V. Franque,

* *Weiner Med. Wochenschrift*, 1875, 34.

etc.), have been exhibited hypodermically (Eulenberg), but they are now quite abandoned. Opium is chiefly indicated in the treatment of diarrhœa, in which disease it appears to be a more efficient remedy than morphine.

P.

PAPAVERINA. PAPAVERINE.

Papaverine has been used hypodermically by Messrs. Leidesdorf and Schüle in cases of insanity, in the form of hydrochlorate or phosphate (six to twelve minims of a 1 in 12 solution of the salt).

The phosphate of this alkaloid produced abscess and sloughing.

PARACOTOINA. PARACOTOINE.

Paracotoine, which was isolated from the Paracoto in 1876 by Messrs. Jobst and Hesse, exists in the form of a yellowish white crystalline powder, with an insipid taste and a peculiar, slightly balsamic odour. Slightly soluble in water, it dissolves in boiling alcohol, is sparingly soluble in cold alcohol and in boiling water, and is insoluble in ammonia (Wurtz). The physiological effects of paracotoine are identical with, but less pronounced than, those of cotoine (see this word).

The method of using it is the same as in the case of cotoine; it has been used subcutaneously by M. Bälz in the treatment of cholera.

The only drawback to the use of paracotoine is its sparing solubility in water. The best solution is one made with equal parts of glycerine and water.

PARALDEHYDUM. PARALDEHYDE.*

Isomeric with aldehyde, paraldehyde, which is soluble in water (1 in 10), less soluble in hot water than in cold, is used in the same way as syrup of chloral. Introduced into therapeutics by Messrs. O. Berger, Morselli, and Bergesio, it is a hypnotic in doses three times as large as that of chloral. According to M. Peretti it exercises no injurious action on the heart even in large doses; the hypnotic effect is produced rapidly, without a stage of excitement or of congestion. The number of pulse beats is generally diminished. The respiratory movements are slowed down, the temperature falls, and the secretion of urine is diminished (?). Nausea, vomiting, and vertigo have sometimes been observed after its administration. In large doses, sensibility and reflex movements are abolished, and death takes place from arrest of respiration. It exerts its action on the cerebral hemispheres, the medulla, and the spinal cord. There is an *antagonism* between strychnine and paraldehyde. (Dujardin-Beaumetz).

At first used as a hypnotic, it has been lately used

* The physiological action of paraldehyde has been fully investigated by M. Cervello (1883) in the laboratory of M. Schmiedeberg, and since then by various authors, viz., Messrs. Albertoni, Frederici, Quinquaud, Hénocque, Bochefontaine, Prévost, and Coudray, who mostly confirm the results obtained by Cervello. Nevertheless, some of the results are matters of controversy, especially as regards the action of paraldehyde on the blood.

as a sedative in mania, melancholia, etc., by numerous authors (Morselli, Peretti, Berger, Langreuter, Masius, Nercam). M. Kéraval was the first to use it hypodermically.

Paraldehyde . . .	}	of each 10 minims
Cherry Laurel Water . . .		
Distilled water . . .		up to 40 minims.

Kéraval.

It is necessary before using this solution to take the precaution of plunging it into hot water, not that heat increases the degree of solubility, far from it, but because by preventing crystallisation of the paraldehyde, it ensures its being kept in a fluid condition and, consequently, its thorough admixture with the vehicle. By this expedient it is possible to administer 16 minims (= 4 minims of paraldehyde). P. Kéraval.

Paraldehyde . . .	56 minims
Spirit of peppermint . . .	1 minim
Olive oil to make . . .	112 minims.

Langreuter and Strubisch.

PEREIRINA. PEREIRINE.

Pereirine is extracted from the *Pao-pereira*, the bark of which has been used for a very long time (it was used in 1838 by M. Correia, of los Santos, Brazil, who gave it its name) on account of its tonic, febrifuge, and antiscro-

fulous properties, in a great variety of diseases. M. Freire, of Rio-de-Janeiro, investigated it with great care in 1879. It exists in the form of a yellowish, non-crystalline, inodorous powder, has a bitter taste, is sparingly soluble in water, but dissolves in ether, alcohol, and chloroform. It undergoes changes at very high temperatures—100° C. and upwards. The pereirine of commerce is an impure product. Of its salts, the hydrochlorate, sulphate, and valerianate are the only ones which have, as yet, been used therapeutically.

For hypodermic purposes the neutral hydrochlorate alone is capable of being used with advantage; it crystallises in quadrangular prisms of a vermillion tint. It does not dissolve in ether, but is soluble in all proportions in water. Pereirine and its salts have an intensely disagreeable bitter taste.

According to Messrs. Cypriano Freitas and Bochefontaine,* pereirine has no local irritant action and abolishes the functional activity of the central grey nervous substance, and more especially of the grey matter of the medulla and spinal cord (abolition of voluntary movements, afterwards of the reflexes, and finally of the excitability of the motor and sensory nerves).

M. Lacerda† drew the following conclusions from his physiological experiments:—(1) That the hydrochlorate of pereirine in poisonous doses paralyses the vaso-motor centres in the bulb, as well as the cardiac fibres of the vagus; (2) that it does not possess any antithermic action, but that, on the contrary, it increases the temperature by several tenths of a degree; (3) that this salt

* Cypriano de Freitas et Bochefontaine, *Recherches sur l'action physiologique du Pao-pereira*. (Société de Biologie, 1877).

† Lacerda, *Investigações experimentaes sobre a accção physiologica do chlorhydrato de pereirina*, Rio-de-Janeiro, 1881.

does not appear to exert any action on the secretions, and that it does not directly modify the properties of muscular fibre or the excitability of the motor nerves ; (4) that its action on the heart is antagonistic to that of digitalis.

Hydrochlorate of pereirine . . . 1—2 grains

Distilled water . . . up to 24 minims.

Sixteen minims = $\frac{2}{3}$ — $1\frac{1}{3}$ grains.

*Almir-Nina.**

Hydrochlorate of pereirine delays fermentation (Almir-Nina). According to the same author the action of pereirine on the temperature is still an open question.

In *medicinal doses* pereirine gives rise neither to intellectual nor to sensorial troubles ; its influence on the circulation is trifling and irregular.

The dose is 16 minims of the solution in each arm. This solution produces only slight inflammatory phenomena (redness, pain either spontaneous or excited) which disappear quickly. In no case have scars been produced.

Therapeutic uses.—Pereirine and its salts, which have been mostly used in intermittent fevers (15 grains per diem, $1\frac{1}{2}$ to 6 grains subcutaneously), have also been tried, but so far without any decided results, in the treatment of pernicious fevers and other diseases.

[Pereirine is one of the numerous substitutes for quinine, and is almost unknown in this country. It is used largely in the West Indies, hypodermically and otherwise, as a febrifuge and antiperiodic. A short notice of its virtues may be found in a letter from Dr. Daunt, published in the *Medical Times and Gazette*, vol. i., 1884, p. 443. *Trans.*]

Almir Nina, *Da Pao Pereira, da Pereirina e seus saes, suas indicações e contra-indicações nas manifestações agudas da malária*. Thèse de Rio-de-Janeiro, 1883.

PHYSOSTIGMINA. (See *Calabarina*).

PICROTOXINUM. PICROTOXINE.

Picrotoxine, obtained from the seeds of *Menispermum Cocculus*, is not an alkaloid; it forms, however, with bases and alkaloids chemically distinct salts. It is sparingly soluble (1 in 150) in water, and is freely soluble in boiling alcohol and in ether.

Picrotoxine in poisonous doses causes convulsions; it acts specially on the bulb, and, probably, on the whole extent of the spinal cord (Glover, Planat); its action on the cerebellum and corpora quadrigemina (Glover) is far from being proved.

Gubler has used picrotoxine hypodermically in labio-glosso-laryngeal paralysis; he obtained, after the lapse of some days, marked improvement. The dose was $\frac{1}{70}$ of a grain. Locally it produced persistent induration. Westbrook used it subcutaneously, with benefit, for the night sweats of phthisis in doses of $\frac{1}{140}$ to $\frac{1}{48}$ of a grain.*

* Westbrook. *Archiv de Pharmacie*, p. 867, 1884. [See a *resumé* of this paper in the *Bristol Medico-Chirurgical Journal*, vol. ii., p. 211. Drs. Westbrook and Platt used the drug in nine cases. It entirely checked the night sweats in six cases and afforded great relief in two. The drug was administered subcutaneously or by the mouth, at intervals of two to ten days, and in doses of from $\frac{1}{60}$ to $\frac{1}{20}$ of a grain. "It was found in some cases that $\frac{1}{20}$ of a grain hypodermically, at night, would control the sweats for ten nights following." Dr. Murrell also obtained good results but with much smaller doses,—he administered from the $\frac{1}{180}$ to $\frac{1}{60}$ of a grain, and had only one failure in twenty cases. *Trans.*]

PILOCARPINÆ HYDROCHLORAS ET NITRAS.
HYDROCHLORATE AND NITRATE OF PILOCARPINE.

*Chief physiological effects.** Congestion of the skin, principally of the face; increase of the secretions, especially of saliva and sweat; acceleration of cardiac pulsations; initial increase of temperature (sometimes persistent, if diaphoresis fails) with consecutive fall in accordance with the greater or less abundance of perspiration.

In medicinal doses, the salts of pilocarpine never produce vomiting, diarrhœa, and that sense of extreme lassitude which frequently result from the administration of jaborandi infusion. We may observe that in doses of less than $\frac{2}{7}$ of a grain the unpleasant effects resulting from administration of the salts of pilocarpine have been for the most part observed in patients suffering from cardiac affections.

Local effects. Hypodermic injections of pilocarpine salts have never in our experience given rise to any accident whatever.

Nitrate or hydrochlorate of

pilocarpine 2 grains

Distilled water . . . up to 140 minims.

Dose—5 to 10 minims ($= \frac{1}{14}$ to $\frac{1}{7}$ of a grain) and upwards.

It is well to begin with small doses, say $\frac{1}{14}$ of a grain,

* See for further details, and for its use in the treatment of epilepsy, an essay by one of the authors: *Du traitement de l'épilepsie. Hydrothérapie. — Arsenicaux. — Magnétisme minéral. — Sels de pilocarpine*; Paris, 1882.

and to increase the dose cautiously to $\frac{1}{7}$, $\frac{2}{7}$, or $\frac{1}{2}$ of a grain. When the dose exceeds $\frac{2}{7}$ of a grain, it is advisable to give it in divided doses, one half in the morning and the rest in the evening. We have never given a larger dose than $\frac{3}{4}$ of a grain, though some authors have administered as much as $1\frac{1}{2}$ grains, but this has been given by mouth.

Therapeutics.—Pilocarpine is chiefly indicated in those cases where it is desirable to check or diminish excessive salivary or sweat secretion. Injections of pilocarpine salts have been specially used in the treatment of various forms of dropsy, in pleurisy, bronchitis, pneumonia, acute articular rheumatism, epilepsy, eclampsia, mercurial poisoning, intermittent fever (Prokop Rokitanski), unilateral sweats (André), foetid perspiration of the feet (Armaingaud), rapidly progressive posterior sclerotico-choroiditis with *muscæ volitantes* and threatened detachment of the retina (Dehenne, Deniau), detachment of the retina (Dianoux and others), some forms of polyuria (Roques, Huchard and Ducroux), syphilis (Lewin), diphtheria (Lehwess and Guttman), anasarca in the horse (Signol). It has been given internally in combination with pepsine (Lereboullet, Lepidi-Chioti), in cholera (Maestre Perez). It seems difficult as yet to pronounce definitely as to the value of this therapeutic agent. There is an undoubted *antagonism* between the salts of pilocarpine and belladonna or atropine.

[Messrs. Martindale and Westcott give the following formula:

Nitrate of Pilocarpine	.	.	1 grain
Distilled water	.	.	20 minims.
Dose—2 to 6 minims.			

Besides the diseases mentioned by the authors, pilocar-

pine has been used to assist uterine contractions, in uræmic coma, asthma, hydrophobia (mostly unsuccessfully), puerperal convulsions, and to relieve the pains of tabes dorsalis. An interesting case of cure of alopecia from pilocarpine injections is recorded in the *Lancet*, vol. i., 1882. Brünauer has used it with success in a case of tetanus of rheumatic origin. M. Chéron has injected $\frac{3}{4}$ of a grain daily as a galactagogue, with complete success in eight out of nine cases. Dr. Purjeck has cured a case of atropine poisoning, and Dr. Roth a case of datura stramonium poisoning by hypodermic injections of pilocarpine. *Trans.*]

POTASSII BROMIDUM. BROMIDE OF POTASSIUM.

M. Bergeron has used it hypodermically in a case of mania; its use was followed by sloughs. M. Alling in a case of puerperal eclampsia met with suppuration after each injection ($7\frac{3}{4}$ grains in 40 minims of water). M. Asshurot has met with ulceration after the hypodermic injection of bromide of potassium. Dr. Weir Mitchell, on the other hand, has never observed local ill-effects after these injections, which only occur, according to Pepper, in cases of idiosyncrasy.

Messrs. Martin-Damourette and Pelvet, who have also administered potassic bromide hypodermically, assert that in *small doses* it produces marked hypnotic effects. They have also stated that injection caused (1) pain; (2) muscular tremor, affecting in the first instance the muscles adjoining the injected point, and gradually extending, after two or three minutes, to the most distant muscles; (3) enfeeblement, first of movement and afterwards of sen-

sibility. This condition is manifest after 5 or 10 minutes in the limb in which the injection has been made and becomes general after 20 to 40 minutes. Sensibility disappears in the following order:—skin, motor nerves, spinal cord, muscles (those which have been affected by absorption), for the muscles of the injected region lose their sensibility in a few minutes, by imbibition, before they are affected by encephalic poisoning. Respiratory movements cease soon after voluntary movement. (4) Diminution of capillary circulation, and, finally, arrest of the heart. Martin-Damourette and Pelvet say that death is at the last due to paralysis of the respiratory muscles, contrary to the opinion of Eulenburg and Guttmann who attribute death to cardiac palsy. (5) Lowering of the temperature and increase of the secretions; (6) in man, enfeeblement of the generative functions.

Messrs. Martin-Damourette and Pelvet think it safer not to exceed at one dose 32 grains in one injection, lest local disturbances might ensue. They are further of opinion that even when several punctures are made, the dose should not exceed one drachm.

M. Luigi Frigerio, and afterwards M. Carmelo Andromico (*Archivio Italiano per le Malattie Nervose*, May, 1876) have used hypodermically a solution with the following composition:—

Bromide of potassium	.	.	$\frac{1}{3}$ grain
Distilled water	.	.	up to 16 minims.

The former has given as much as 8 grains in each injection, but this dose has caused ill effects locally; he has seen abscess and sloughing even from a dose of $3\frac{1}{2}$ to 4 grains. He selects the skin of the forearm for injection, and observes that by gently manipulating the part injected

it is possible to avoid the risk of suppuration. It is well also to enjoin rest of the limb, and M. Frigerio often sends his patients to bed. By this treatment the frequency of epileptic convulsions is diminished. Local accidents, though frequent, are inconsiderable.

POTASSII CYANIDUM. (See *Acidum Hydrocyanicum*).

POTASSII IODIDUM. IODIDE OF POTASSIUM.

M. Eulenburg has used an aqueous solution (1 in 3) of potassium iodide, of which he injected 16 minims at one time. In many cases of scrofulous glandular enlargements, and more frequently in glandular affections due to syphilis, which were treated by this method, he failed to obtain any good result. In syphilitic periostitis the treatment was not much, if any, more efficacious, and syphilitic cutaneous ulcers did not appear to heal more rapidly than when treated in the ordinary way by internal administration. He did not meet with more success in several experiments which he made in patients affected with rheumatic or scrofulous affections of the joints, even when the disease was treated from the beginning.

The therapeutic results reported by Dr. Thierfelder differ from those of Prof. Eulenburg. This author obtained certain and definite results from this use of the drug, which were rapid and decided in cases of osteoid pains. The same authority has, besides, made use of iodide of potassium in various other diseases; thus, in a case of chronic rheumatism of the cervical vertebræ, after two injections (1 grain in each), he obtained free move-

ment of the head; in a case of hysteria and in a case of gastric ulcer with gastralgia, injections of potassium iodide produced effects analogous to those resulting from morphine injections. In short, Dr. Thierfelder believes that these injections are specially indicated in cases where the digestive functions require to be treated.

Locally, the same author observed, after hypodermic administration of iodide of potassium, burning pain of varying intensity and duration; in some cases he noticed tearing pain radiating into the surrounding parts, and in two cases he met with circumscribed phlegmons.

Messrs. Fronmüller, Jakubowitz, and Mader, also used hypodermic injections of iodide of potassium. Goldbaum injected iodides of potassium and sodium in the asphyxial stage of cholera, with the object of studying the absorption of medicines.

The rapid absorption of iodide of potassium, according to Eulenburg, does not encourage us to expect local effects of any importance from its use. Concentrated solutions frequently produce local irritation and even suppuration.* Quite recently (*Progrès Médical*, 6 January, 1883) M. Gilles, of la Tourette, has used hypodermic injections of potassium iodide.

Iodide of potassium	.	.	8 grains
Distilled water	.	.	16 minims.

This solution produces no local accidents "provided that the solution is neutral, that the injection is made as deeply as possible in some part where there is abundance of cellular tissue, and that the punctures are at a

* These observations are, for the most part, borrowed from Eulenburg.

sufficient distance from one another." They produce an unpleasant sense of smarting which speedily abates.*

Iodide of potassium . . .	24 grains
Distilled water . . .	up to 112 minims.†

M. Cantarano (*Il Movimento*, January, 1883) has used iodide of potassium hypodermically, in the latter stages of syphilis, where, from any cause, the internal administration of the salt was contra-indicated. He did not meet with any local troubles, as he took the precaution to select for injection parts which were richly supplied with connective tissue and by adding to the solution a small proportion of morphine; the fluid should be neutralised by the addition of a few drops of acetic acid and eight minims only should be injected at one time.

M. Parona (*Gazetta degli ospitali*, 1884, Nos. 52, 53, 54, 55) condemns solutions of 8 grains in 16 minims for hypodermic use. The solution of this strength is almost saturated and local accidents from its use are frequent. He has generally used solutions of $1\frac{1}{2}$ to 3 grains in 16 minims of distilled water, gently warmed in a sand

* M. Besnier has also used iodide of potassium hypodermically, but he has not published his observations. M. A. Denis states in his essay that he has injected 8 grains of iodide of potassium without any ill effect beyond sharp pain at the moment of injection. M. L. Julien in his *Traité des maladies vénériennes* (1879, p. 1060) says, "In conclusion, the hypodermic injection of iodide of potassium has been highly recommended (A. Martin)." Unfortunately, M. Julien does not give any of the bibliography on this subject, and our own researches are, so far, without result. There is no reference to hypodermic injections of iodide of potassium in Messrs. Belhomme and Martin's *Traité de la syphilis*, edition of 1876.

† Although this solution is inconvenient on account of the pain which it sometimes causes, Prof. Carbo has obtained good results from its use.

bath. According to this author cold injections are always productive of pain, more or less severe according to the strength of the solution, circumscribed phlegmous resulting from doses of 6 to 9 grains; tepid injections produce a less pronounced local reaction, especially after the application, for one or two hours, of an ice bladder. The combination of morphine with the iodide he deemed immaterial, the pain being only momentary. He frequently observed local disturbance from the injections recommended by Cantarano (8 grains in 16 minims).

In conclusion, the author thinks unfavourably of hypodermic injections of iodide of potassium; he points out the small quantity of salt which is introduced at a time into the system, the inconvenient results to which these injections may give rise, and, finally, he accords the preference to rectal injections.*

[Dr. Carl Schadeck has recently instituted a series of clinical experiments with the iodides of sodium and potassium in the treatment of syphilis, by the hypodermic method. The patients were soldiers in the Kiew military hospital. Eight cases were treated, ninety injections in all being made, and the largest number of injections made in one case was sixteen; in the others the number of injections was twelve, ten, nine, eight, and seven. The iodide of potassium was the salt mostly used, only eleven injections in all having been made with the iodide of sodium.

R Potassii (Sodii) Iod. . . gr. xlv.
 Aquæ destil. 3 ijss.

* These contradictory statements tend to shew that the iodides of potassium used have not been identical. Iodides vary greatly, the iodide of commerce being very impure. In a note published in the 68th number of the *Gazetta degli ospitali*, M. Parona says that he had actually used the commercial iodide, but that the French iodide of potassium in a solution of 8 grains in 16 minims was neither very painful nor irritating.

The solution was prepared fresh day by day, and was carefully neutralised and filtered. A Pravaz syringe was used to make the injections and the needle was in twenty-six instances inserted perpendicularly, so as to carry the solution directly into the parenchyma of the gluteal muscles.

Dr. Schadeck's experience is summarised as follows:—

1. Pain was either trifling or absent at the time of injection.
2. There was invariably secondary painful irritation, which varied in intensity and duration in different instances.
3. No abscess or inflammatory induration resulted at the point of injection.
4. In two cases, after nine or ten injections, an iodine exanthem in the form of acne pustules appeared on the face, trunk, and extremities. The eruption vanished when the injections were discontinued.
5. In two instances all syphilitic lesions were eliminated by the exclusive use of the salts of iodine hypodermically.
6. The results, so far obtained, tend to shew that mercury is not an essential in the treatment of syphilis.* *Trans.*]

POTASSII PERMANGANAS. PERMANGANATE OF
POTASSIUM.

Hypodermic injections of potassium permanganate have been recommended by M. Lacerda in the treatment of the bites of venomous serpents. Dr. Brown also recommends

* Dr. Schadeck's paper is published in the *St. Petersburger Medicin. Wochenschrift*, No. 29, 1886, and a resumé of it (from which the above notes are taken) will be found in the *Therapeutic Gazette*, vol. xi., p. 121.

these injections in diphtheria, in which disease he believes that the remedy acts as a specific.

Permanganate of potassium . . . 1 grain

Distilled water . . . up to 112 minims.

Dose—32 to 48 minims after ligature of the limb above the wound.

QUINIDINA ET CINCHONIDINA. QUINIDINE AND CINCHONIDINE.

Quinidine, which is isomeric with quinine, possesses very nearly the same physiological properties. It was used first by Wunderlich in 1860. The *sulphate of quinidine*, sparingly soluble in water, was administered in typhoid fever by Strümpel, who regards it as superior to sulphate of quinine. Quinidine and its salts are not in use for hypodermic purposes.

Cinchonidine, isomeric with cinchonine, is insoluble in water. According to Bouchardat, it might be used as a substitute for quinine; Coronado and Gubler regard it as equal to quinine in therapeutic value. The *hydrobromate*, used hypodermically by the last named authors, was found to be perfectly innocuous; it produced no signs of cinchonism or any local disturbance in doses of 6 to 8 grains. M. Chiron asserts that it is capable of producing epileptiform convulsions by irritation of the cortical motor centres, which, beginning in the muscles of the face, spread thence to those of the neck, arm, etc.

Bouchardat and Wedel say that sulphate of cinchonidine

is as efficacious as sulphate of quinine. It has recently been prescribed with success in several cases of intermittent fever, by Bourru, in doses of from 12 to 16 grains without producing vertigo, tinnitus, visual troubles, weight of head, or obfuscation of the ideas. Its action is less toxic than that of quinine, but its effects are less marked and of shorter duration.

Sulphate of cinchonidine . . .	40 grains
Acetate of morphine . . .	$\frac{1}{2}$ grain
Distilled water . . .	up to 1 ounce.

12 minims = 1 grain of cinchonidine and $\frac{1}{80}$ of a grain of morphine. M. Machiavelli injected about 16 minims of this solution, and he has substituted in this formula the hydrochlorate for the sulphate of cinchonidine.

The *neutral tartrate of cinchonidine* is so sparingly soluble in water that it is inadmissible for hypodermic use.

Cinchonine, cinchonidine, and their salts are moderate in price. Possibly some of the cinchonidine salts, especially the hydrobromate, might with advantage be substituted for quinine salts in hypodermic medication.

QUININA. QUININE AND ITS SALTS.

Quinine is very sparingly soluble in water (1 in 576—Squire); it dissolves in ether, [and in alcohol, chloroform, and dilute acids. *Trans.*]

Principal physiological effects. Antiputrescent and anti-

fermentative (Binz); sialagogue, by reflex stimulation, in virtue of its bitterness; diminishes tactile sensibility, and dulls the sense of hearing, causes tinnitus aurium, and hallucinations of hearing; vertigo, sense of weight of head, confusion of ideas, carotid pulsations, cephalalgia, quinine intoxication, ataxic gait, apathy, drowsiness, general prostration; dilatation of the pupils, and nausea.

In larger doses—Vomiting, delirium, deafness, occasionally blindness, and aphasia.

In poisonous doses—Collapse, convulsions, and death.

There are increased volume of the red corpuscles, due to increased supply of oxygen, disappearance of amœboid movements of the white corpuscles, the number of which is diminished; the area of splenic dulness is diminished.

In moderate doses (up to 15 grains)* there are first increase and then slowing of the cardiac pulsations, and lowered blood pressure; finally, there is arrest of respiration, followed by paralysis of the heart.

In healthy men and animals the effect on the temperature is either nil or trifling. With the exception of the various fevers dependent on malarial poison, in which quinine acts as a powerful antipyretic, its action on the temperature is still *sub judice*.

Elimination is effected rapidly and chiefly by the kidneys, the secretion of urine becoming very abundant, while the secretion of sweat is arrested. In some rare instances various eruptions (eczematous and scarlatiniform) and hæmaturia have been observed after the administration of quinine. Some cases of tetanus have been ascribed to injections of quinine (?).

Local effects. As a general rule, great circumspection is

* [This is a decidedly large dose; and the symptoms which are described do not follow from moderate doses. *Trans.*]

necessary in using hypodermic injections of quinine and its salts; for, in many instances, it produces, besides pain, persistent indurations, followed by suppuration and even by gangrenous sloughs and tetanic symptoms, especially with the sulphate. It is advisable to inject no more than 16 minims at one point and to expel the fluid very gently. The hydrochlorate appears to be the most suitable of all the salts of quinine for hypodermic injection. In cases of urgency, such as pernicious fevers, we ought not to be deterred from using hypodermic injections by the risk of local accidents.*

M. Galvani recommends that 8 to 12 grains of bisulphate or hydrochlorate of quinine should be dissolved in 32 minims of distilled water in a capsule or glass tube, by the aid of a sand-bath. The salts of quinine should be dissolved by heat alone without the aid of acids, and thus prepared they are not apt to produce local troubles. This author's practice is, however, open to question, when we find that he recommends the use, for three days, of cold water compresses at the point of puncture, which are to be renewed every ten minutes. Besides, the acid hydrochlorate is soluble in all proportions in cold water. (*Gazetta med. di Roma*, p. 198, 15th August, 1883).

Pure quinine is not suitable for hypodermic use on account of its sparing solubility. Otto used a solution of it in ether, and in this way he was able to administer it in a concentrated form without local ill effects.

Quinine	.	.	.	.	8 grains
Ether	.	.	.	.	20 minims.

For this reason we deem it right to mention some solutions, although they are often faulty, which have been proposed by various writers, for they possess at least an historic interest.

Prof. Eulenburg found that this solution produced considerable local irritation, and he recommends its abandonment. M. Kuhn, of Strasbourg, had previously recommended ethereal solution, and Dr. Bartholow also employed it, but on the other hand, M. Ventzel Bernatzik always found its use followed by local accidents. M. Burdel used the following solution with benefit in several severe cases of pernicious fever.

Sulphate of quinine	.	.	16 grains
Ether	.	.	up to 64 minims.

Dose—16 minims = 4 grains.

The injection was repeated daily and no ill results followed.

The basic, or so-called neutral, sulphate, on account of its sparing solubility in water and alcohol, can only be used with great difficulty in a sufficient degree of concentration; it is moreover necessary, in order to increase the degree of solubility, to acidify the solutions with sulphuric, hydrochloric (Bernatzik), nitric (Desvignes), citric (Hunter), tartaric (Bourdon), or acetic acid. These concentrated solutions produce, in consequence of their acidity, local irritations which may result in ulceration or suppuration. These accidents may be avoided by the use of very dilute solutions, but they, in their turn, possess the inconvenience of necessitating numerous injections; moreover such solutions do not keep well. Glycerine is the best vehicle; it dissolves one part in six, by weight, by means of heat, but in the cold it dissolves only 3 per cent. M. Denis, who has employed solution of the sulphate in glycerine, has discontinued this form of solution, as he could only obtain weak solutions ($\frac{1}{7}$ grain to 8 minims) even with the aid of heat.

Moore used the following solution :—

Sulphate of quinine	.	.	24 grains
Sulphuric acid (dilute ?)	.	.	10 minims
Distilled water	.	.	up to 240 minims.
10 minims = 1 grain.*			

This solution being difficult to use, it was soon set aside for the acidulated preparation of M. Craith.

Sulphate of quinine	.	.	2 grains
Sulphuric acid (dilute)	.	.	q.s.
Distilled water	.	.	up to 16 minims.

Later on, Prof. Eulenburg suggested the following formula :—

Sulphate of quinine	.	.	2 grains
Dilute sulphuric acid	.	.	q.s.
Distilled water	.	.	up to 20 minims.

These latter formulæ were of uncertain composition owing to the varying proportions of acid necessary to effect solution. Therefore, Claude Bernard, seeing the numerous accidents which ensued from their use, attributed these ill effects to the sulphuric acid for which he proposed to substitute tartaric acid.

Bourdon, Gualla, and Vinson adopted the following formula :—

Sulphate of quinine	.	.	3 grains
Tartaric acid	.	.	1½ grains
Distilled water	.	.	up to 32 minims.
16 minims = 1½ grains.			

* In order to avoid too great acidity of the solution, an error which may readily occur by measurement with drops, it is preferable to weigh an excess of the salt and to add a sufficiency of acid to dissolve and, lastly, to filter the solution.

Pilhan-Dufeillay and Decaisne* prepared an extemporaneous solution by dissolving the quantity of salt required for injection in a sufficiency of Eau de Rabel, a proceeding not only inexact, but as often as not impracticable, and by which they introduced another irritant, viz. alcohol, into the formula.

M. A. Denis, from whom we borrow these remarks, after considering all the methods which had been tried to attain the desired end, says that after using tartaric acid in the first place, he set it aside for sulphuric acid, as he found that the latter caused much less pain. The solution which was used in the first instance was prepared in the following manner by Mr. Hepp. The quinine sulphate was first bruised with the tartaric acid in a mortar, a little water was then added, and the whole heated in a sand-bath; the remainder of the water was then added, allowance being made for evaporation, and after filtration a limpid fluid was obtained, containing—

Sulphate of quinine	.	.	.	.	3 grains
Tartaric acid	.	.	.	.	1 grain.

In distilled water 20 minims.

This solution, although it was superior to all the pre-

* The formula of Pilhan-Dufeillay is—

Sulphate of quinine	.	.	.	3 grains
Eau de Rabel	.	.	.	7 minims
Distilled water	.	.	.	up to 16 minims.

We have used it at the Bicêtre without any more serious trouble than pain and induration, but we only used 3 minims of Eau de Rabel, which we found sufficient to effect solution of the quinine salt. We may here remark that if the greater number of quinine solutions proposed by various authors are to be rejected on account of the accidents to which they may give rise, it is not less true that, in cases where they must be used, it is possible to avoid, to a great extent, the inconveniences which might otherwise result by care in the operative procedure; this explains why, in the hands of some physicians, even very irritating solutions do not give rise to local troubles.

ceding, nevertheless threw down a deposit after some time; he therefore tried the following prescription:—

Sulphate of quinine	.	.	.	24 grains
Dilute sulphuric acid	.	.	.	15 minims
Distilled water	.	.	.	up to 168 minims.
7 minims = 1 grain.				

M. Hepp tried to reduce the acidity of this preparation, which made it too irritating, and prepared a fresh solution in such a way that the sum of the sulphuric acid corresponded in equivalents to the sulphate of quinine.

Sulphate of quinine	.	.	.	24 grains
Dilute sulphuric acid	.	.	.	12 minims
Distilled water	.	.	.	up to 168 minims.
1 grain in 7 minims.				

This solution reddened litmus paper, and preserved its limpidity without any precipitate for several months. He injected $\frac{1}{2}$ of a grain of the sulphate, and he believed that it would have been easy to obtain a greater degree of concentration by warming the solution before injection. This plan, which Mr. Denis thought it desirable to avoid, was successfully carried out by Dr. Goldschmidt, of Graffenstaden, for whom M. Hepp prepared the following solution:—

Sulphate of quinine	.	.	.	12 grains
Tartaric acid	.	.	.	4 grains
Distilled water	.	.	.	up to 24 minims.

This solution threw down a large deposit in the cold, but soon became clear again after immersion for a short

time in boiling water. Dr. Lente, of New York, used the subjoined formula :—

Sulphate of quinine	.	.	.	10½ grains
Dilute sulphuric acid	.	.	.	18 minims
Carbolic acid	.	.	.	1 grain
Water	.	.	.	up to 112 minims.
16 minims = 1½ grains.				

Out of 300 injections there were only two instances of abscess and one of slough. One is naturally astonished at these results with a fluid containing such a large proportion of acid, and in an amount which is much more than enough.*

Desvigne's formula is :—

Sulphate of quinine	.	.	.	4 grains
Nitric acid (dilute ?)	.	.	.	2 minims
Distilled water	.	.	.	up to 48 minims.
1 grain in 12 minims.				

One of the authors has injected the following solution, which has also been used by other authors, in a severe case of typhoid fever :—

Quinine sulphate	.	.	.	1½ grains
Acetic acid	.	.	.	q. s.
Distilled water	.	.	.	up to 16 minims.

* Many of these preparations are open to criticism. Many authors employ the term *sulphate of quinine* without specifying to which of the two sulphates they refer, and hence arises a most regrettable confusion. This uncertainty characterises the solution of M. Ravicini (of which he administers six syringefuls per diem in typhoid fever) the sulphate of quinine (basic or neutral) being insoluble:

Sulphate of quinine	.	.	.	.	25 grains
Morphine hydrochlorate	.	.	.	.	½ grain
Distilled water	.	.	.	.	up to 250 minims.

This solution gave rise to considerable local irritation and abscess, probably due to the adynamic condition of the patient.

The next two formulæ are taken from Bernatzik:—

Sulphate of quinine	.	.	.	12 grains
Dilute hydrochloric acid	.	.	.	8 minims
Distilled water	.	.	.	up to 24 minims.
2 minims = 1 grain.				

Sulphate of quinine	.	.	.	10 grains
Morphine hydrochlorate	.	.	.	1 grain
Dilute hydrochloric acid	.	.	.	6 minims
Distilled water	.	.	.	up to 50 minims.

5 minims contain 1 grain of quinine and $\frac{1}{10}$ of a grain of morphine. [This formula and that of Ravicini would be much improved by the substitution of hydrochlorate for sulphate of quinine. *Trans.*]

Sulphate of quinine	.	.	.	8 grains
Dilute sulphuric acid	.	.	.	$1\frac{1}{2}$ minims
Distilled water	.	.	.	up to 64 minims.

12 to 24 minims = $1\frac{1}{2}$ to 3 grains.

This preparation, which is recommended by Dr. Bartholow, should be carefully filtered to remove undissolved particles of the salt and foreign bodies. [In the last edition of his work, Dr. Bartholow gives, as the best sulphate preparation, the following formula:—

R Quinin. disulph., gr. 50
 Acid. sulph. dil., \mathfrak{m} 100
 Aquæ fontan., \mathfrak{z} 1
 Acid. carbolic. liq., \mathfrak{m} 5.

Solve.

Trans.]

The *bisulphate of quinine* (a neutral sulphate, though commonly styled the acid sulphate), is much more soluble than the sulphate, and is consequently more suitable for hypodermic purposes.* It is freely soluble in alcohol, and it dissolves in three parts of warm glycerine, forming a solution which will keep good an indefinite time.

Eulenberg makes use of the following solution :—

Bisulphate of quinine	6 grains
Glycerine	up to 64 minims.
Sixteen minims = $1\frac{1}{2}$ grains.	

One or two syringefuls are generally sufficient. This prescription may be modified by mixing equal parts of water and glycerine.

Vée, and afterwards Gubler (*Commentaires du Codex*), suggested the following solution :—

Acid sulphate of quinine	1 grain
Distilled water	up to 12 minims.

Rosenthal's solution :—

Acid sulphate of quinine	2 grains
Distilled water	up to 12 minims,

is apt to deposit crystals of quinine sulphate in the cold.

The *basic hydrobromate* (neutral) and the acid hydrobromate of quinine have been used hypodermically by Gubler, Soulez, and by Raymond. The former salt which is richer than the sulphate in alkaloid, is soluble, according

* ["It dissolves with vivid blue fluorescence in 10 parts, while the sulphate requires 740 parts, of water at 59° F." Brunton, *loc. cit.*, p. 858. *Trans.*]

to Eulenburg, in four parts, and according to Boille, in ten parts of glycerine. It dissolves in 60 parts of cold water, in 5 parts of alcohol at 60.8° F., and in all proportions in absolute alcohol.

The *acid hydrobromate* is very soluble; according to Gubler its action appears to differ from that of quinine sulphate by its being less apt to produce symptoms of cinchonism, and by its marked sedative and hypnotic influence on the nervous system. Injections of quinine hydrobromate cause considerable pain.

Gubler's solution (1 part in 10).

Neutral quinine hydrobromate	1½ grains
Alcohol	4 minims
Distilled water	up to 16 minims.

Dardenne's solution for use in intermittent fevers :—

Acid quinine hydrobromate	3 grains
Dilute sulphuric acid	1 minim
Or, tartaric acid	1½ grains
Distilled water	up to 32 minims.

Auliffe, of St. Denis, Réunion, recommends the following prescription :—

Quinine hydrobromate	8 grains
Sulphuric ether	80 minims
Rectified spirits	20 minims.

Rosenthal gives the preference to a solution in glycerine, as being of a non-irritating character. M. Chéron recommends injections of quinine hypobromate (1 in 20 to 1 in 10) in the treatment of the morphine habit. M. Maximowitsch, of St. Petersburg, has given the *bibrom-*

hydrate in doses of from $2\frac{1}{4}$ to $3\frac{1}{2}$ grains in several acute diseases.

Bibromhydrate of quinine .	. 18 to 30 grains
Distilled water . . . . .	. up to 112 minims.

Warm and filter. The solution should be freshly prepared. With the rare exception of induration, this injection did not cause any local irritation.

The *basic sulpho-vinate of quinine** is insoluble in ether, but dissolves readily in alcohol; it dissolves in 2 parts of water, forming, according to Dziewonski and Jailard, a clear solution which keeps well.

Sulpho-vinate of quinine . . . . .	. $2\frac{1}{2}$ grains
Distilled water . . . . .	. up to 16 minims.

Of 45 observations which he has collected,† M. Dziewonski reports 4 cases of abscess, 2 in which sloughs formed, and a few in which injection was followed by induration. The *basic sulpho-vinate of quinine* has been used in intermittent fever by Messrs. Bourgeois, Pugens, Moret, Merz and Dardenne.

The *carbolate of quinine* has been used lately by M. Maestre Perez in the treatment of cholera:—

Carbolate of quinine . . . . .	. 5 grains
Alcohol . . . . .	. up to 16 minims.

Three injections are given one after the other, in the first stage of cholera.

* M. C. Paul administered acid sulpho-vinate of quinine in one case of intermittent fever.

† Six observations from M. Pugens (4 to 8 grains in 20 minims of water), 15 from M. Moret, 18 from M. Merz, and 6 cases of his own.

The *formiate of quinine* is fairly soluble; it has been used by Messrs. Namias, Lévi and Calza. The quinate, tannate, valerianate, and lactate of quinine have been tried, but we do not think them of sufficient importance to do more than mention them here. The *citrate of iron and quinine* has been used hypodermically by M. Rosenthal; it dissolves with the aid of heat in 10 parts of glycerine forming with it a greenish-brown oily fluid, which requires dilution with distilled water for hypodermic use. According to Prof. Eulenburg, Berg, of Dresden, recommends a green citrate of iron and quinine.*

The *carbamide hydrochlorate of quinine* (a combination of hydrochlorate of quinine with urea), which is soluble in its own weight of water, has been injected in a 50 per cent. solution by M. Jaffé,† 16 minims being equivalent to $5\frac{1}{2}$ grains of the quinine salt. The local reaction is as a general rule trifling, neither redness nor puffiness being observable. In doses of 16 grains, hummings of the ears are frequently observed, but only in women.

In intermittent fevers its action has always been uniform, and the paroxysms have been arrested after 3 or 4 injections. In typhus the temperature falls considerably after the injection of two or three syringefuls.

The *hydrochlorate of quinine*, suggested by M. Binz, is richer in quinine than the sulphate, besides being more soluble, easier of absorption, less liable to decomposition, and only half the price. It has been used hypodermically by Messrs. Bernatzik, Steinhaus, Galignani, and others,

* [“As prepared according to Von Walter’s prescription; it is said to be much more soluble and stable than the preparation of the German Pharmacopœia.” Von Ziemssen’s *Handbook of Therapeutics*, vol. ii. Hay’s Translation, p. 466. Trans.]

† Jaffé. *Centralblatt. f. d. méd. Wissensch.*, and *Journal des Connaissances médicales*.

sometimes in watery solution, at others dissolved in glycerine or in ether (Winckel).

Hydrochlorate of quinine	.	.	.	3 grains
Glycerine	.	.	.	8 minims
Water	.	.	.	up to 16 minims.

Kohn.

Four syringefuls, or 12 grains at the commencement of a maniacal paroxysm, were administered without either local or general accidents, by taking the precaution to warm the solution and to give it in divided doses.

Hydrochlorate of quinine	.	.	.	10 grains
Dilute hydrochloric acid	.	.	.	8 minims
Distilled water	.	.	.	up to 20 minims.

*Bernatzik.**

Steinhaus' formula :—

Quinine hydrochlorate	.	.	.	4 grains
Dilute hydrochloric acid	.	.	.	q. s.
Distilled water	.	.	.	up to 24 minims.

This solution produced ulceration and sloughing of the cellular tissue. Prof. Ziemssen gives the following prescription :—

Quinine hydrochlorate	.	.	.	8 grains
Dilute hydrochloric acid	.	.	.	2 minims
Distilled water	.	.	.	up to 20 minims.

M. Otto Soltzmann, of Breslau, used the *hydrochlorate carbamide of quinine*—one syringeful of a ten per cent. solution. Its use was never followed by suppuration, and

* In the *Real-Encyclopædie*, Bernatzik gives the formula thus :—

Quinine hydrochlorate	.	.	.	.	10 grains
Dilute hydrochloric acid	.	.	.	.	4 minims
Distilled water	.	.	.	.	up to 20 minims.

better results were obtained than by the internal administration of quinine.

Therapeutic uses.—Quinine has been used subcutaneously extensively and by many physicians in the treatment of intermittent fevers, in tubercular, intermittent, and in remittent fever. In septicæmia, mania, neuralgia, cholera, and infantile cholera, typhoid fever, acute and chronic articular rheumatism, sunstroke, convulsions, hydrophobia, and pyæmia.

In conclusion, injections of quinine salts should only be practised in cases of urgency, or when there is difficulty in administering it per os or per rectum.

[Dr. Smirnoff (quoted in the *London Medical Record*, vol. xiii., p. 228) reports the results obtained by the hypodermic use of quinine in the treatment of 470 malarial soldiers. The average number of injections required in each case was 2·5, the greatest number in an individual case being nine. Relapse was rarer after treatment by subcutaneous injection than after the internal administration of quinine. The hydrochlorate was the salt used, and it never gave rise to serious local troubles, such as abscess or sloughing, while the pain caused by injection was trifling. Dr. Aitken, of Rome,* recommends a solution of the bisulphate, one grain of which dissolves readily in six minims of equal parts of pure glycerine and distilled water. To this solution, two per cent. of pure carbolic acid must be added. Thirty minims of this solution (= 5 grains of bisulphate of quinine) may be injected at one time in severe malarial affections, and also in the treatment of hyperpyrexia. (See, for further remarks on the use of quinine hypodermically, the article on SALICYLATE OF SODIUM). *Trans.*]

* *British Medical Journal*, vol. ii., 1885, p. 695.

QUINOIDINA. QUINOIDINE, AMORPHOUS QUININE.

This is a solid mixture of quinine, cinchonine, quinidine, etc., easily soluble in acidulated water (dilute acetic acid 1 in 10 of water. Binz). M. Bernatzik has used pure amorphous quinine (quinoidine) in ethereal solution.

Prof. Eulenburg thinks, after investigations which he has made, that both the ethereal solution and the tincture of quinoidine should be set aside.

Quinoidine	.	.	.	.	.	10 grains
Ether	.	.	.	.	.	up to 32 or 44 minims.

Reduce by evaporation to 20 minims. This solution frequently produces abscess.

The *hydrochlorate of quinoidine* is soluble in equal parts of water and is readily absorbed. Mosler used it in hypertrophy of the spleen.

QUINOLEINA. QUINOLINE, TARTRATE AND HYDROCHLORATE OF QUINOLINE.

Quinoline is insoluble in water, soluble in alcohol, ether, chloroform, and benzol. The *tartrate* and *salicylate* are stable salts; the former is readily soluble in water, the latter dissolves in 80 parts of water, and in alcohol, ether, benzol, vaseline, glycerine, and fixed oils.

Chief physiological effects.—Marked fall of temperature (Donath, von Jaksch, Biach, and Loimann), diminution and irregularity of respiratory movements, gastric disorder (nausea and vomiting), noises in the ears, sensation of pressure on the nucha.

In poisonous doses; frequent respirations, diminution

and finally loss of reflex excitability, total paralysis, and death (frequently with hyperæmia and œdema of the lungs). Quinoline and its salts possess antiseptic properties; it is one of the substitutes for quinine and has the advantage of being moderate in price. ["The tartrate of quinoline is soluble in water and has the taste of peppermint. It lowers the temperature, prevents coagulation of the blood, and possesses remarkable antiseptic properties. Given by the mouth it acts like quinine, but without causing noises in the ears or giddiness." Dr. Donath; quoted in *London Medical Record*, vol. xii., p. 161. *Trans.*]

M. Hagens* used hypodermic injections of citrate of quinoline, without serious local disturbance, in 34 cases of intermittent fever.

Citrate of quinoline	30 grains
Citric acid	6 grains
Distilled water	up to 45 or 60 minims.

In 25 per cent. of the cases the paroxysms ceased; of the others, there was one return in 55 per cent. The results from internal administration were, immediate cure in 71 per cent., and one relapse in 28 per cent. of the cases.

Local effects.—The tartrate, hydrochlorate, and citrate of quinoline are the only salts used for hypodermic injections. Injections of the hydrochlorate, according to Von Jaksch who has used it in doses of 3 grains, are painful and often followed by extensive infiltration of the cellular tissue. The tartrate is preferable for this purpose; it is of a dull white colour, has a distinctive odour, is soluble in alcohol, and insoluble in ether. The medium dose hypodermically for an adult is from 3 to 16 grains.

* Hagens. *Zeitsch. f. Klin. Med.*, v., p. 242.

Therapeutic uses.—The salts of quinoline have hitherto been used with varying and uncertain results in intermittent fever, neuralgia, typhoid fever, whooping cough, tuberculosis, pneumonia, erysipelas, and septicæmia.

Further researches into the action of these salts are required before pronouncing on their therapeutic value.

[Further information on quinoline, or chinoline salts, may be found in the *Lancet*, vol. i., 1882, p. 324, and an excellent *resumé* of their nature and properties will be found in an article entitled "Recent studies in therapeutics. XII. Resorcine and its allies," in the *British Medical Journal*, vol. ii., 1881, p. 945. I have frequently used tartrate of chinoline, by internal administration, as an antipyretic in pneumonia and erysipelas. Its effects on the pulse, as tested by sphygmographic tracings, and on the temperature closely resemble those which follow on the administration of kairin. *Trans.*]

QUINONE, HYDROQUINONE. SYN., CHINONE, HYDRO-CHINONE.

Quinone is very sparingly soluble in cold water, but is more soluble in alcohol and ether. Hydrochinone is a benzol derivative, isomeric with pyrocatechine and resorcine, and is freely soluble in water, alcohol, and ether; it is inodorous and has a sweetish taste.

Chief physiological effects.—Rapid fall of temperature, a dose of 3 grains producing an immediate fall of five-tenths. Doses of 6 to 9 grains produced this result with greater certainty and at the same time effected a diminution of the pulse. In doses of from 12 to 16 grains symptoms of excitement, resembling those produced by full doses of resorcine, were observed. These symptoms are transitory.

Its ready solubility and non-irritating character make hydroquinone suitable for hypodermic use, its injection never causing more pain than an injection of pure water.

Hydroquinone	.	.	.	.	10½ grains
Distilled water	.	.	.	.	up to 112 minims.

32 minims = 3 grains of the salt.

After this injection a fall of 2° C. in the temperature, and of the pulse-rate by one third, were observed, but these effects were very transient.

[In the article already quoted from the *British Medical Journal*, it is stated that 3 grains of hydroquinone reduce the temperature very quickly without any unpleasant effects. The writer recommends that 5 to 10 minims of a 10 per cent. solution should be injected into each arm. An interesting paper by Dr. Seifert, of Dresden, in the *Berliner Klin. Wochensch.*, 1884, no. 29, is quoted in the *London Medical Record*, xii., 468. Dr. Seifert praises hydroquinone highly as an antipyretic, and says that no ill effects follow from repeated doses, so that fever may be kept down by it continuously and methodically. It has no disagreeable taste and is taken readily by children. *Trans.*]

RESORCINE.

Resorcine is a derivative of benzol, is isomeric with hydroquinone and pyrocatechine, dissolves to almost any extent in water, and is also soluble in ether, alcohol, glycerine, and vaseline. It is insoluble in chloroform and carbon sulphide. Aqueous solutions when exposed to air and light soon acquire a brownish colour, without appreci-

able alteration, according to the degree of concentration; their reaction is neutral.

*Principal physiological effects.**—Resorcine possesses the same properties as carbolic and salicylic acids; a one per cent. solution prevents fermentation, and a one and a half per cent. solution prevents putrescence. Its poisonous properties are less than those of carbolic acid.

“In doses of from 4 to 8 grains to every kilogramme (= 35 ounces and 120 grains) of the animal's body weight, it produced tremor, clonic convulsions, and acceleration of pulse and respiration, all these symptoms disappearing in the course of an hour. Sensibility and consciousness were unaffected. Beginning with 8 grains for every kilogramme, severe vertigo and loss of consciousness supervened, sensibility was dulled, the convulsions became violent and frequent and were mostly localised to the anterior portion of the animal's body. The pupils were dilated, respiration and circulation were very much accelerated, but the temperature was not much affected. There was a return to the normal condition at the end of two hours.

In doses of from 14 to 16 grains per kilogramme, death supervened in half an hour, preceded by the same symptoms, the limbs, however, being less affected, and there were tetanic spasms of the nuchal muscles. The temperature invariably rises gradually till, at the moment of death, it reaches 106° F.”†

* Resorcine has been frequently used of late in those numerous affections for which carbolic acid is prescribed. The dose for adults has generally been from 40 grains to ʒij. It is always desirable to commence with small doses.

† Hippocrate Callias. *De la résorcine et de son emploi en thérapeutique; recherches expérimentales et cliniques*, Paris, 1881. We have borrowed from this author most of the preceding and succeeding details.

According to M. Russo Giliberti,* resorcine in medium doses of one grain per kilogramme produced in three quarters of an hour lowering of the temperature to the extent of nine-tenths of a degree C., a return to the original temperature taking place in two hours. In a dose of $2\frac{3}{4}$ grains there is a fall of 1.6° C., but this is a poisonous dose. Elimination of carbonic acid is only slightly influenced by this drug.

Resorcine brought into contact with albuminous substances or with egg albumen, causes immediate coagulation, forming an albuminate of resorcine. Slightly concentrated solutions are possessed of caustic properties, causing opacity, with white discoloration of the cellular and muscular tissues. In man, resorcine often produces noises in the ears and vertigo. Elimination is rapidly effected by the kidneys. For use either by deep or subcutaneous injections, the following formula may be used:—

Resorcine	5 to 20 grains
Distilled water	up to 112 minims.
16 minims = $\frac{2}{3}$ to 3 grains.	

These injections give rise to no local troubles.

In inveterate sciatica, intramuscular injections of resorcine, in a ten to twenty per cent. solution, often produce a healthy local derivation. A five per cent. solution has been used hypodermically, with success, by Messrs. Bogusch, Stibnewski, and Ugo Bassi. This strength of solution has also been used by Cattani without local or general ill results. He asserts that he has obtained by this method definite and rapid effects.

* Giliberti. *Contributo allo studio fisiologico della Resorcina* (Archiv. per le scienze med., vol. iii., no. 11).

[Dr. Murrell found that a dose of 3 ij of resorcine administered in one dose to a young woman, who was suffering from asthma, produced alarmingly toxic phenomena. "She was, in a few minutes, in a profuse perspiration from head to foot; there was complete loss of voluntary power and reflex action, the pulse at the radials was weak and thready, and the temperature in the axilla was only 94° F. Restoratives were applied, consciousness was soon restored, and the temperature gradually returned to the normal" (*Medical Times and Gazette*, 1881, vol. ii., p. 486). Dr. Andrew first used hot baths as restoratives, but latterly he has had recourse to red wines, especially the good vintages of Bordeaux and Burgundy, and he has found that under the influence of these stimulants the toxic symptoms speedily vanish (*Medical Times and Gazette*, vol. ii., 1885, p. 411). Dr. Dujardin-Beaumetz, who was the first in France to use resorcine, has entirely discontinued its internal administration. In his work, *Les nouvelles médications*, Paris, 1886, he says that he was led to abandon the use of resorcine in rheumatism and typhoid, not only on account of its powerlessness, but also on account of the toxic phenomena to which it gave rise. After quoting the experiments which he made in conjunction with Hippocrate Callias, referred to above, he says:—"While recognising the fact that resorcine is not so poisonous as carbolic acid, I came to the conclusion that it was a dangerous remedy as an antipyretic, for I observed in patients suffering from typhoid fever who were treated by resorcine, the same depression of the vital powers, the same adynamia, and the same pulmonary congestion which I had previously seen in patients who had been treated by carbolic acid. I have therefore discontinued the use of this drug, and I believe that in Germany also, resorcine is seldom administered internally; nevertheless, for external application, in

the treatment of unhealthy wounds, it is an invaluable remedy." In addition to the diseases mentioned by the authors for which resorcine has been administered, it has been used in whooping cough by Dr. Moncorvo (*De la coqueluche et de son traitement par la résorcine*, Paris, 1885), in the treatment of diarrhœa, by internal administration in combination with castor oil (*London Medical Record*, vol. xii., p. 500), and "in paroxysmal colic accompanying cancerous, dysenteric, tuberculous, and other diseases of the intestinal tract, and insomnia. In every instance where resorcine is administered as a hypnotic it must be given in toxic doses." (Andeer, *Therap. Gazette*, quoted in *Braithwaite's Retrospect*, vol. xci., p. 24).

See also for further information as to its therapeutic uses, *Neale's Digest*, 1882, and Appendix, 1886. *Trans.*]

SALICYLAS SODII. (See *Sodium*).

SANGUIS. BLOOD. (See *Injectiones Nutrientes Hypodermicæ*).

SAPONINE.

Saponine, which is a glucoside, is the active principle obtained from the root of *Polygala senega*, and is soluble in water. Prof. Eulenburg was induced by the researches of Messrs. Pelikan and Kohler to use it hypodermically, but without success. It was employed in two and five per

cent. solutions in sciatica, neuralgia, and in several cases of epilepsy with aura.

Saponine	.	.	.	.	.	1 grain
Distilled water	.	.	.	.	.	up to 50 minims.

Five minims = $\frac{1}{10}$ of a grain.

Saponine	.	.	.	.	.	1½ grains
Distilled water	.	.	.	.	.	up to 30 minims.

Five minims = $\frac{1}{4}$ of a grain.

Prof. Eulenburg says that the local ill effects (sharp pain, obstinate induration, and erysipelatous redness) and the general symptoms (rigors, nausea, vomiting, paresis, and headache) contra-indicate its use for therapeutic purposes.

SCILLAININE AND SCILLIPICRINE.*

According to Jarmested, scillaine (a glucoside extracted from squill) has the same action as digitaline when injected hypodermically. Scillipicrine, another glucoside extracted from squill, has been injected subcutaneously by Dr. Fronmüller as a diuretic.

Scillipicrine	.	.	.	.	.	1 grain
Distilled water	.	.	.	.	.	up to 12 or 60 minims.

Dose.— $\frac{1}{3}$ to $1\frac{1}{2}$ grains of the active principle.

* Consult for the physiological properties of the derivatives of squill, M. König's essay, *Eine Untersuchungen über die Wirkungsart der Extractum Scillæ, Scillitin und Theverisin*, Göttingen, 1875; and also that of C. Moller, *Ueber Scillipicrin, Scillitoxin und Scillin*, Göttingen, 1878.

SCOPARINE. (See *Sparteïn*).

SERUM. (See section on *Nutrient Injections*).

SODII CHLORIDUM. CHLORIDE OF SODIUM.

The hypodermic injection of saline solutions causes sharp pains and is followed by induration, sometimes even by abscess.

Bertin and Gray state that when preceded by an injection of atropine sulphate, the solution of salt does not cause pain.

Injections of salt solutions are mostly used in the treatment of neuralgia, sciatica, lumbago, angina pectoris, torticollis, and muscular spasms. M. Lubanski, of Nice, has administered them in the diarrhoea of phthisis to aid appetite and digestion; he never saw local accidents result. A 1 in 20 solution of choride of sodium has been used for hypodermic transfusions (see sections on NUTRIENT INJECTIONS and SODIUM SULPHATE).

SODII IODIDUM. IODIDE OF SODIUM.

M. Arcari has used this salt hypodermically. The dose required by this method is one third of that required in administration by the mouth, and it does not produce any local trouble. (*Gazetta Medica Saint Lombardia*, 1885, no. 11. See POTASSIUM IODIDE).

SODII LACTAS. LACTATE OF SODIUM.

Lactate of sodium which was proposed by M. Preyer for use as a hypnotic, in doses ranging to upwards of four drachms, has been used subcutaneously in doses of nine grains. No hypnotism was induced, and the point of injection was the seat of intense pain.*

SODII SALICYLAS. SALICYLATE OF SODIUM.

Salicylate of sodium is freely soluble in water.

Principal physiological effects.—Buckholtz, Binz, Domingos, and Freire assert that salicylate of sodium arrests fermentation and prevents putrescence, but Kolbe and others deny this action. It causes slowing both of the circulation and of respiration, and lowers the temperature and blood pressure. *In large doses* it causes copious perspiration, nausea, vomiting, and tinnitus aurium. *In poisonous doses* it causes convulsions and asphyxia from paralysis of the respiratory centre. *Elimination* is effected by the kidneys.

It must not be forgotten that salicylate of sodium is contra-indicated in alcoholism, cerebral lesions, cardiac adynamia and renal diseases.

Local effects.—According to Messrs. Domingos and Freire, with the exception of ecchymosis, local troubles are very rare if the drug is sufficiently diluted. Hence, when it is desirable to inject a large dose, this must be done by

* The experiments made by M. Bötticher in the clinique of Prof. Nothnagel, show that this salt is at best but a feeble and uncertain hypnotic.

means of several punctures.* These authors have recommended hypodermic injections of salicylate of sodium in yellow fever in doses of 16 and 24 grains and upwards in the first, and of $1\frac{1}{2}$, 2, and 3 grains, in the second stage.

Salicylate of sodium	.	.	.	4 grains
Distilled water	.	.	.	up to 16 minims.

Salicylate of sodium should be absolutely neutral, and the solution should be made, and filtered, only when required. The solution which has been used by Dr. Dujardin-Beaumetz and others produces neither pain nor local ill effects. Caffeine is associated in it with the sodium salicylate.

Caffeine	.	.	.	.	16 grains
Sodium salicylate	.	.	.	.	12 grains
Distilled water	.	.	.	.	up to 32 minims.

[In connection with the subject of hypodermic injections of quinine, salicylic acid, and salicylate of sodium as antithermic agents, it may not be very much out of place to supplement the observations in "The Manual" by some remarks on this subject by recent authors. In the first place it should be observed that in cases of pyrexia, not dependent on malarious influences, quinine is, as a general rule, not available by hypodermic injection, for this reason that, as Dr. Lauder Brunton points out, large doses (from five to twenty grains) are required to produce an antipyretic effect, and that it is more effectual in this way when given in one, or, at the most, two doses per diem. The difficulty of doing this without producing

* M. Collard, of Liège, who has used salicylate of sodium hypodermically in typhoid fever, had to discontinue its use owing to the local injury to which it gave rise.

serious local inconvenience at the point of injection is self-apparent.

Dr. Dujardin-Beaumetz (*loc. cit.*, p. 117) says that, except in the case of malarial affections, the salts of quinine are inferior in antithermic power to other drugs, and that to obtain appreciable effects in pyrexia it is necessary to administer them in gramme doses, which, he adds, are fraught with danger to the heart and brain, as well as to other organs. There is, however, one condition of pyrexia in which Professor Jaccoud* has obtained most encouraging results, that, namely, which characterises the period of excavation in ordinary phthisis (*Fièvre d'ulcération ou d'excavation*). The plan adopted by this author is to administer the first day, at intervals of ten minutes, four capsules containing each seven and a half grains of hydrobromate of quinine; the patient takes in this way 3 ss in half an hour. If the temperature compared with that of the previous evening does not fall a degree, he administers twenty-two grains, in the same way, on the second evening; then on the third day, even if the evening temperature does not exceed that of the morning, two doses of seven or eight grains each are given, with an interval of ten minutes between them. After this there is an interval of two days, after which, if necessary, the same method is resumed. If, for any reason, this plan is inadmissible, Prof. Jaccoud substitutes for it the following:—15 grains of quinine hydrobromate are dissolved in 80 minims of distilled water; 16 minims of this solution, or a Pravaz syringeful, (= 3 grains of the quinine salt) are injected. This dose is equivalent to $7\frac{1}{2}$ grains per os. Hence two injections = 15 grains, four injections = 30 grains, and so on. Proceeding according to this method, three injections are made the first

* *Curabilité et Traitement de la Phthisie Pulmonaire*, Paris, 1881.

day, two the second, and one the third; then comes an interval of two days, after which the same routine is followed. "These injections," Prof. Jaccoud adds, "are not more painful than morphine injections; they give rise to no serious trouble, provided only that they are made into the subcutaneous cellular tissue, and not merely into the deep layer of the derma; sloughing, abscess, erysipelas, or glandular enlargement never results, as I can assert after a large experience; an erythematous redness develops round the point of puncture, which rarely extends beyond the size of a five franc piece, and which disappears in two or three days; but it must be remembered that a hard indolent nodosity remains, which adheres to the deep surface of the skin, and that this induration, which entails no further inconvenience, persists for at least from six weeks to two months." (See also some remarks by Prof. Nothnagel, on the use of quinine as an antipyretic, and especially on its abuse, in the *Medical Times and Gazette*, 1884, vol. ii., p. 797). In the fever due to re-absorption of the products of softening and excavations in phthisis, Prof. Jaccoud recommends salicylic acid or salicylate of sodium. If the stomach is tolerant of the former drug, it is administered in its natural condition in capsules containing eight grains; if neither salicylic acid nor salicylate of sodium is well borne by the stomach, the latter drug is administered hypodermically, six grains of the salt being injected into each arm. In this way a fall of temperature was obtained equal to that obtained by one drachm of salicylic acid, but the antipyretic effect was generally delayed to the day succeeding the injection. *Trans.*]

SODII SULPHAS. SULPHATE OF SODIUM.*

Gubler was the first to use this salt hypodermically, but without producing purgation; it was subsequently used by Luton ($1\frac{1}{2}$ grains in 16 minims of water) with slight laxative effects.

Sodium sulphate	.	.	.	10 $\frac{1}{2}$ grains
Distilled water	.	.	.	up to 112 minims.
16 minims = 1 $\frac{1}{2}$ grains.				

The use of sulphate of sodium hypodermically has been recommended by M. Luton in the different forms of vomiting and in cholera. He uses a syringe with a capacity of 5 grammes (80 minims). The injections should be made deeply and in regions well supplied with subcutaneous cellular tissue. He uses a 1 in 10 solution.

In some cases, especially in athrepsia,† M. Luton recommends either the sodic sulphate or the following solution:—

Sodium sulphate	.	.	10 $\frac{1}{2}$ grains
Sodium phosphate	.	.	5 grains
Distilled water	.	.	up to 112 minims.

Minimum dose, 80 minims administered once a week.

* Hiller (*Ueber die subcutane Anwendung von Abführmitteln.*—*Zeitsch. f. Klin. Med.*, Berlin, 1882, pp. 481, 497) has experimented with a large number of purgatives by the hypodermic method, among which may be mentioned aloin and colocynthine, which produced serous stools, in from 4 to 6 hours, and intense local pain (1 in 10 solution was used), citrulline, the extract of colocynth, elaterine, the cathartic acid of senna, leptandrin, euonymin, baptisin, etc. This writer, as a result of his experiments, concludes that there is no advantage to be gained by the administration of purgatives hypodermically, and that this method should only be adopted in those cases in which internal administration is impossible.

† [Athrepsia "is a term used to denote a profound disturbance of the nutritive functions in children, consequent on neglect of hygienic measures, and especially on defective supply of wholesome food." *Sydenham Society's Lexicon*. See also vol. xix. of Ziemssen's *Cyclopædia of Practice of Medicine*. Trans.]

SOLANINE.

[Although the existence of this alkaloid has been known since 1821, its therapeutic properties have only recently been studied, and it is to Dr. Genenil that we are chiefly indebted for a knowledge of its actions. It is obtained from potato shoots and also from the parings of very young or very old potatoes. Solanine belongs to the same class of poisons as atropine, eserine, and pilocarpine, its first physiological effect being to paralyse the nerve-terminals of non-striated muscular fibre. It occurs in the form of crystals which are insoluble in water, slightly soluble in ether, and readily so in hot alcohol. It forms salts with acids. The hydrochlorate of solanine, which is a gelatinous body, readily soluble in water, may be given in doses ranging from one to three or four grains daily. In some cases Dr. Genenil does not hesitate to give as much as eight grains daily. He regards it as a narcotic to the medulla, spinal cord, and nerve-trunks, and as a paralyrant to the terminal ends of sensory and motor nerves. It does not produce cerebral congestion, but in poisonous doses it is said to affect the cerebral cortex, causing headache, delirium, cyanosis, and somnolence.

The drug is best administered hypodermically, as it is apt, when administered by the mouth, to cause nausea, vomiting, and a desire to defæcate.

Solanine does not produce the unpleasant after effects which are apt to follow upon the administration of morphine and atropine, and it has no cumulative action.

Therapeutics.—Solanine may be prescribed to combat excitement, spasm, and pain. It has produced excellent results in the treatment of sciatica and rheumatic neuralgia, and it has proved of service in the treatment of

gastritis, acute dyspepsia, the vomiting of pregnancy, bronchitis, bronchial asthma, cardiac asthma, and emphysema. It has been used in cystitis, prurigo, and in some nervous affections in which restlessness and insomnia were prominent symptoms.

It may safely be prescribed for young children and old persons.* *Trans.*]

SPARTEINE.

Sparteine is an oily, fluid alkaloid, extracted from the *Cytisus scoparius* (Leguminosæ—Papillionacæ), the shoots of which contain besides another principle, scoparine.† The decoction of the shoots, of a brownish or orange-red colour, possesses purgative, diuretic, and slightly narcotic properties. The physiological properties of sparteine closely resemble, according to Messrs. Nothnagel and Rossbach, those of conicine. (See also an essay by Rymon, Paris, 1880).

Sparteine sulphate	.	.	2 grains
Distilled water	.	.	112 minims.

Fronmüller, Sen.

The diuretic effects appear after doses of $\frac{2}{7}$ of a grain (16 minims of solution).

* For further details, see Dr. Genenil's paper in the *Bulletin Général de Thérapeutique*, and notices of the original essay in the *London Medical Record*, vol. xiv., p. 496, and in the *Therapeutic Gazette*, vol. xi., p. 56.

† These two alkaloids have been extracted by M. Merck (*Chemiker Zeitung*, iii., 1879, p. 380). Scoparine, a yellow powder, in which crystalline needles can be distinguished by the aid of the microscope, is sparingly soluble in water and readily so in alcohol and glycerine. It has been administered hypodermically in $\frac{1}{2}$ grain doses as a diuretic.

Scoparine	.	.	.	.	6 grains
Glycerine	.	.	.	.	30 minims
Distilled water	.	.	.	.	up to 96 minims.

Eight minims = $\frac{1}{2}$ a grain.

STRYCHNINA. STRYCHNINE AND ITS SALTS.

Strychnine is obtained from the seeds of *Strychnos nux vomica*, and *St. Ignatius' bean*. The bark contains more brucine than strychnine. The bark of the *Strychnos Tieuté* and of the *Hoàng-nan* also contains strychnine. It is very sparingly soluble in water, alcohol, and ether. Its salts are all soluble in water and are more poisonous than the pure alkaloid. The hydrochlorate and the nitrate are more active than the sulphate.

Chief physiological actions. Increase of tactile sensibility, tinglings, salivation, anxiety, vertigo, rapid breathing, stiffness of the nuchal muscles, tetanic spasms in rapid succession, merging into one another, with opisthotonos and forcible extension of the lower limbs and of the trunk, trismus (from the action of the poison on the bulb and spinal marrow), dilatation of the pupils, elevation of blood pressure, abolition of energy of the motor nerves, slowing of cardiac pulsations, death by asphyxia, arrest of the heart, and unascertained modifications of the nerve centres. Strychnine is also possessed of decided antiputrescent and antifermentative properties. The cumulative action of strychnine is generally admitted; Leube and Rosenthal assert that habituation can be acquired by prolonged use.

Local effects. Sulphate of strychnine does not cause any local trouble, and the same thing is true of the nitrate. Erection of the hair-follicles (goose-skin) has been observed at the point of puncture.

Dose. According to Husemann, the minimum lethal dose is $\frac{1}{2}$ of a grain. It should at first be administered in very minute doses—from $\frac{1}{140}$ to $\frac{1}{70}$ of a grain, cautiously increased until the appearance of certain toxic phenomena

(stiffness of muscles of neck, spasms, etc.), when the administration must be suspended.

Antagonisms. Calabar bean (Watson and Keyworth), chloroform inhalations (?), and chloral (Liebreich, Rajewsky). A pseudo-antagonism exists between strychnine and curarine.

[Urethan is alleged by Prof. Anrep to be nearly as efficient and much less dangerous an antagonist than chloral. Dr. Bignon (of Lima) concludes, from experiments made upon dogs, that cocaine is a physiological antagonist to strychnine. Up to a certain point after the ingestion of poisonous doses of strychnine, the animal could always be saved by hypodermic injections of cocaine, but when too large doses of strychnine were administered it always perished from the correspondingly large doses of cocaine required.* *Trans.*]

Nitrate of strychnine . . . $\frac{1}{2}$ grain
 Distilled water . . . up to 112 minims.
 Eight minims = $\frac{1}{28}$ of a grain.

Sulphate of strychnine . . . 1 grain
 Distilled water . . . up to 288 minims.
 Sixteen minims = $\frac{1}{18}$ of a grain.
 Four minims = $\frac{1}{72}$ of a grain.

Bartholow.

Sulphate of strychnine . . . 3 grains
 Distilled water . . . up to 336 minims.

Eight minims (= $\frac{1}{14}$ of a grain) to be injected, *in divided doses*, round the anus, every two days, in the rectal prolapse of children.

Dolbeau.

* *Therapeutic Gazette*, vol. xi., pp. 42, 43.

Nux vomica and strychnine have been recommended by Luton and others in the treatment of delirium tremens:

Sulphate of strychnine	.	.	1 grain
Cherry laurel water	.	.	112 minims
Distilled water	.	.	up to 224 minims.

Sixteen minims = $\frac{1}{14}$ of a grain. An injection every half hour till four have been given, after that every hour. (Luton says the dose should reach $\frac{2}{7}$ to $\frac{4}{7}$ of a grain of strychnine sulphate). Savory's discs contain $\frac{1}{70}$ of a grain.

Tincture of nux vomica has been used hypodermically by M. Luton in threatened asphyxia from catarrh, in the death agony, and in the last stage of conditions of adynamia in doses of as much as 80 minims. As to the local effects, this writer has observed slight swelling, heat, and a moderate degree of pain, all of these symptoms disappearing in an hour or two.

Therapeutic uses. Paralysis of the vocal cords, of the crico-thyroid muscles (Waldenburg, Neudorfer), saturnine palsy (Lorent), rectal prolapse in children, (Wood, Foucher, Dolbeau, Büdder, Lorent, Gualla, Heusch).*

In various forms of paralysis, such as hemiplegia, paraplegia, paralysis from compression of the radial nerve, Bell's paralysis,† hemeralopia, amaurosis, writer's cramp, urinary incontinence, the lightning pains of tabes, sciatica, pulmonary emphysema, cholera, chloral poisoning, diphtheritic paralysis, infantile paralysis, progressive muscular atrophy, and locomotor ataxy.

Maestro Perez has recommended injections of 4 to 5

* Guersant and Giralès never obtained any benefit from its use.

† In Bell's paralysis M. Courty injected hypodermically, with success, from 6 to 12 minims of a 1 or 2 per cent. solution every second or third day.

minims of a 2 per cent. solution in the second stage of cholera.

[I have thought it desirable in this, as well as in a few other places, to omit a long list of names of writers who have used the remedy in the various diseases named, chiefly because the authorities quoted are not readily accessible to English readers.

Atropine has been used to antagonise the poisonous effects of strychnine. In the *British Medical Journal*, (vol. i., 1880, p. 671) two cases of strychnine poisoning successfully treated by atropine by Dr. Roberts are quoted from the *Philadelphia Medical Times*. In one of these cases the strychnine had been administered in whiskey, and Dr. Roberts found that after the exhibition of ten minims of this solution in a cat, the poisonous symptoms, which were produced within five minutes, were overcome by giving atropine in powder by the mouth.

Gubler (*Commentaires du Codex*, 2nd edit., p. 761) says that possibly atropine is antagonistic to strychnine, but Bartholow (*Hypodermatic Medication*, 4th edit., p. 258) strongly combats this view and asserts that atropine intensifies the effects of strychnine, and hastens death "by contributing to the tetanic fixation of the muscles of respiration." This opinion is confirmed by McReddie (*British Medical Journal*, vol. i., 1883, p. 973) who, after experimenting on dogs, found that atropine, as well as chloroform, amyl nitrite, and eserine, neither prevented the fatal result nor arrested the convulsions. McReddie's results as regards the antagonism between strychnine and amyl nitrite are probably fallacious; they are contradicted by the experimental researches of the late St. Clair Gray, of Glasgow (*Glasgow Medical Journal*, 1871, p. 188), and by the clinical experience of Dr. Barnes (*British Medical Journal*, 1882, vol. i., p. 458) in a case of accidental

poisoning by strychnine. Dr. H. A. Hare, of Boston, (quoted in *London Medical Record*, vol. xiii., p. 75) finds that nitrite of amyl does prolong life in strychnine poisoning, but that its action is so fleeting that it can be only used to tide over the patient until other more persistent remedies can be administered. He recommends an injection in the first instance, the effect being then kept up by means of inhalations.

Physostigma has been used as an antidote. Dr. White, of Glasgow, used it successfully in a case of strychnine poisoning, but chloroform inhalations were used simultaneously (*Glasgow Medical Journal*, 1871, p. 488). Dr. Byrne, of Russelville, Ky., records a case of recovery after a dose of ten grains of strychnine had been taken, three doses of 4 minims each of extract of calabar bean having been administered, but in this case also it is impossible to say how far the physostigma contributed to the successful result, as ipecacuanha, chloral, and chloroform had also been administered (*Lancet*, vol. ii., 1882, p. 1105). Dr. Fothergill has shewn that strychnine is an antidote to aconitine.

Strychnine administered hypodermically has been found of the greatest value in cases of cardiac failure. The experiments of Lauder Brunton and Cash* shew that this drug stimulates the motor ganglia of the heart, and the former authority states that "the action of strychnine on the motor centre in the heart is probably similar to its action on the vaso-motor and respiratory centres."

Dr. Herbert Habershon points out† that in this respect strychnine differs from alcohol, ether, ammonia, and digitalis, which are to a large extent muscle stimulants.

* Dr. Brunton's *Pharmacology*, p. 887.

† *St. Bartholomew's Hospital Reports*, vol. xxii., p. 117.

Hence why in some cases strychnine will succeed when other stimulants have failed. He recommends the hypodermic use of strychnine in the following classes of cases :—

“(1) In many cases where the feebleness of the heart's action depends primarily upon an acute lung affection, such, for instance, as in some cases of acute pneumonia, or a case of renal disease in which a sudden œdema of the lung supervenes, accompanied by rapid and feeble action of the heart. In these the double action of strychnine on heart and lungs alike renders it of especial value. (2) In cases of cardiac disease where, by the primary affection of the heart, the arterial system is unfilled, the great nerve centres in the brain suffer from a want of nutrition, and are, so to speak, starved. (3) In a third class of cases the feeble action is due to a reflex cause (also in the course of cardiac disease); for instance, “shock” produced by exhaustion, by a local cause, such as embolus in the brain, by extreme cold, or emotional excitement or fright.”

Strychnine hypodermically has been recommended and used in threatened failure of respiration occurring in opium poisoning, but I have been unable to find the reference. *Trans.*]

STRYCHNINÆ ARSENIAS. ARSENIATE OF STRYCHNINE.

[A new remedy discovered and clinically tested by Russel, for which it is claimed that it possesses the properties both of arsenic and strychnine in combination. The preparation is readily soluble in glycerine and water, and as it is easy of absorption and produces no local dis-

turbance when given subcutaneously, it is well adapted for that purpose.

Arsenate of strychnine	.	.	1 grain
Glycerine	}	equal parts up to 256 minims.	
Distilled water			

Dose. Should begin with 4 minims, gradually increased to 8 and then to 16 minims ($= \frac{1}{64}$, $\frac{1}{32}$ and $\frac{1}{16}$ grain respectively).

Therapeutics.—Arsenate of strychnine possesses powerful antiseptic properties, in virtue of which it is of the highest value in the early stages (prodromata) of acute infectious diseases. When administered in the initial stage of infectious fevers, it overcomes the symptoms of general malaise, muscular lassitude, etc., and the patient experiences relief even after a single injection. Dr. Russel has found the drug of special use in the treatment of typhoid fever, which disease, he asserts, it aborts in the early stages or simplifies when administered after the fever is fully developed; and he attributes these effects to the power which the remedy possesses of “sterilising, as it were, the soil on which the patho-genetic micro-organisms of typhoid fever vegetate.”* *Trans.*]

SULPHAS ATROPINÆ. (See *Atropina*).

SULPHAS CUPRI. (See *Cuprum*).

SULPHAS MAGNESII. (See *Magnesium*).

SULPHAS SODII. (See *Sodium*).

* *Therapeutic Gazette*, 1887, vol. xi., p. 35.

TANNIN. ACIDUM TANNICUM.

Tannin has been used as a derivative by Messrs. Luten and Schwalbe in doses of from 16 to 32 minims of a 1 in 10 or 1 in 5 solution. Iodo-tannate solutions, which have been recommended by Guilliermond in the treatment of varix, are not within the scope of this work.

[A series of interesting and important researches have recently been carried out by Messrs. Arthaud and Raymond, on the etiology and treatment of tuberculous diseases. Six rabbits were treated for a month with doses of eight to sixteen grains of tannin. "In spite of two successive inoculations, one effected with pulmonary substance taken from a guinea-pig which had died from acute tuberculosis, the other inoculation with miliary tubercles from a hospital patient, no trace of infection was observed, whilst three other rabbits to which tannin had not been given succumbed in consequence of the inoculations." In consequence of these results, over fifty tuberculous patients were treated with considerable doses of tannin with the most encouraging results, and it has been concluded that patients under the influence of the tannin treatment shew increased resistance to the tuberculous virus. Assuming the accuracy of these results and of the deductions drawn from them, it would appear as if some tangible benefit might be derived from the treatment of phthisis by hypodermic injections of tannin;—nay, more, it does not seem unreasonable to surmise that some part at least of the benefit accruing from the administration of tannic and gallic acids in the treatment of hæmoptysis, may find its explanation in something above and beyond the astringent action of these drugs. *Trans.*]

TARTRAS FERRI. (See *Ferrum*).

TARTRAS ANTIMONII. (See *Emetic, Tartar*).

TAYUYA.

Tayuya, which is obtained from the root of the *Dermophylla pendulina* (Cucurbitaceæ), has been introduced into medical practice by M. Ubicini, of Pavia. The Italian physicians use it as a bitter tonic and ascribe to it anti-syphilitic and anti-scrofulous properties. In scrofula and syphilis they appear to have obtained almost magical results from the use of this drug. Messrs. Ambrosoli, of Milan, and Gamberini, of Bologna, used tincture of tayuya hypodermically. The former injected it pure in doses of sixteen minims in 3 cases of constitutional syphilis, and observed only a very trifling local reaction. In 2 cases, 1 injection (!!) sufficed to effect a cure; in the third case the injection was repeated in 8 days, after which recovery was complete (!).

Professor Gamberini began with injections of tincture diluted with half its bulk of water, and then used injections of undiluted tincture; a dose of 16 minims was well borne, but it gave rise to a hard indolent swelling. Many other Italian physicians, following these observers, have used tayuya and frequently with the same success, especially in scrofula. Dr. Eulenburg, who has experimented with the tincture of tayuya of M. Ubicini, has not found any real benefit result from its use in full doses, Messrs. Geber,* Concetti, Pelizarri, Marcacci, Zanarelli,

* Geber used it internally and subcutaneously with comparative success, slight syphilitic eruptions yielding under its influence.

Rasori and Zeissl obtained similar negative results, while Prof. Sigmund, of Vienna, found that tayuya was not only inefficacious but positively injurious.

TEREBINTHINÆ OLEUM. OIL OF TURPENTINE.

Pure oil, or spirit, of turpentine has been administered hypodermically in doses of 16 minims by M. Luton, but without success, in a case of obstinate sciatica. The injection caused intense pain and was followed by abscess. Turpentine injections have been used successfully in the treatment of carcinomata, sarcomata, and other neoplasms by Vogt, but they are included in the class of interstitial injections which do not fall within the scope of our enquiry. (See Vaseline, p. 267).

THALLINE.

Thalline is a derivative of quinoline. It was discovered by Skraup and was first used by Jaksch, of Vienna. All the salts of thalline, the tartrate, sulphate, hydrochlorate and acetate, dissolve readily in water. The hydrochlorate rapidly undergoes change by exposure to the light. The sulphate, which is generally used for therapeutic purposes, dissolves in 5 times its weight, and the tartrate in 10 times its weight of cold water. Ethylthalline and its salts are equally soluble in water. Concentrated solutions of thalline have a bitter, saline taste; and dilute solutions have an aromatic flavour.

Jaksch* was the first to discover the antipyretic proper-

* Jaksch. *Thallin, ein neues Antipyreticum* (Wien. med. Woch., 1884, No. 48, and *Deutsche medicinische Blätter*, Nov. 1884). The name of thalline has been given to this substance on account of the green colour which it produces on contact with perchloride of iron.

ties of thalline. He used the hydrochlorate, sulphate, and acetate of thalline, and the hydrochlorate of ethylthalline in doses of $3\frac{1}{2}$, 7 and $10\frac{1}{2}$ grains. The fall of temperature was considerable, amounting to several degrees, but he frequently observed sweats coincidently with the fall of temperature, succeeded by rigors and an ultimate rise of temperature. Collapse never occurred. There have also been observed increase of blood pressure (Pisenti), and a fall in the pulse and respiration. The minimum of temperature was reached in from 2 to 3 hours after exhibition of the drug, which, further than this, exercised no influence on the progress and duration of the various diseases for which it was prescribed.

The effects produced by thalline last longer than those obtained from kairin; it is more active than antipyrine ($3\frac{1}{2}$ grains of the former = 16 grains of the latter), but the effects of antipyrine last longer. In doses of 8 to 12 grains the salts of thalline did not produce any toxic phenomena in rabbits, and doses of 7 grains did not produce any symptoms in a healthy man. All the salts of thalline arrest fermentation. According to Jaksch, elimination is effected by the kidneys. Messrs. Brouardel and P. Loyer have demonstrated that thalline has the same *modus operandi* as kairin, that it acts, namely, by destruction of the hæmoglobin. (*Société de Biologie*, Jan., 1885).

Dr. Alexander* has experimented in the clinic of Dr. Biermer with the sulphate and tartrate of thalline, and has obtained results identical with those of Jaksch. With a dose of 4 grains the effect lasted, on an average, only two hours, hence it was necessary in order to obtain a con-

* Alexander. *Ueber die Wirkungen der Thallinsalze*, (*Centralbl. f. klin. Medizin*, Feb., 1885).

stant effect to repeat the dose of the drug every two hours. M. Grocco, of Pavia, has used *acetate of thalline*, which he found was a powerful antipyretic in doses of 4 grains. The symptoms observed after its use were profuse sweats, and diminution in the frequency of the pulse and respirations. In some cases where there was intolerance of the drug, he administered it without inconvenience by the hypodermic method in doses of $1\frac{1}{2}$ grains. The average duration of the action of this salt varied between four and six hours.

M. Mingazzini has used the *sulphate* and *tartrate* of thalline. He has moreover used the following solution hypodermically :—

Sulphate of thalline	.	.	3 grains
Distilled water	.	.	up to 16 minims.

As there is a precipitate from this solution in the cold, it is necessary always to use it warm. This solution did not cause abscess or other local accident. In a dose of $1\frac{1}{2}$ grains, which is equivalent to 4 grains administered per os, the lowering of the temperature reached 2.1° to 2.3° and persisted for a period of six to nine hours.

M. Pisenti* also states that solutions of sulphate of thalline in water used hypodermically are perfectly safe.

Thalline has this advantage over antipyrine, that the dose required is much smaller, and that it but rarely induces vomiting. Antipyrine, on the other hand, produces effects which last longer, as a rule does not cause rigors, lowers the pulse rate as well as the temperature, and finally, according to certain writers, it exerts a favourable influence on the joints in acute articular rheumatism.

* Pisenti. *Sull'azione fisiologica della Tallina* (*Annali di chimica medico-farmaceutica*, etc., March, 1885.

[For further information on the value of thalline as an antipyretic, see papers in the *Practitioner*, vol. xxxv., p. 222, and vol. xxxvi., p. 256; *London Medical Record*, vol. xiii., p. 455; *British Medical Journal*, 1886, vol. i., pp. 83 and 608.

Professor Ehrlich and Dr. Laquer treated sixteen cases of typhoid fever with doses of thalline, ranging from $\frac{1}{2}$ to $1\frac{1}{4}$ grains every half hour or hour. In all the cases the temperature was reduced to the normal standard in from four to five days, on an average. The dose which suits an individual case having been ascertained, it may be administered at frequent intervals without risk. These authors regard thalline as a specific in typhoid fever. Jannsen found this drug much inferior in therapeutic value to quinine in malarial fever, but of great service in phthisis, as very small doses sufficed to control the fever. Dr. Ewald (*Medical Record*, *loc. cit.*) says of thalline, kairin, and antipyrine—"they are by no means antipyretic remedies in the sense that they possess the power of reducing the temperature itself, *i.e.* the increased oxydation which causes the rising of the temperature, and manifests itself by the measurable temperature of the surface of the body; they are merely antithermic remedies. Their action may be compared with the effect of opening the windows of an overheated room. The temperature will sink near the window but will increase in proportion as we approach the fireplace, where the heat will remain unaltered. The same is the action of these remedies; they induce an increased radiation of heat to the surrounding media, probably by dilatation of the blood vessels, but they have no influence whatever on increased oxydation and on the pathological process itself. The blood nearer to the focus of the inflammation will receive heat, and give it off again on the surface of the body. This explains

why, on discontinuing the remedy, such immediate and rapid rising of the temperature will take place, which is not the case with the genuine febrifuge medicines, such as quinine, the action of which is more permanent."

Professor Jaccoud reports most favourably of the value of thalline as an antipyretic. In the *Gazette des Hôpitaux*, he gives the results obtained from its use in the treatment of typhoid fever, the fever of tuberculosis, pneumonia, and erysipelas. He considers thalline to be the most valuable antipyretic agent we possess, and he states that by its systematic use, in small doses, it is possible to maintain a permanent condition of apyrexia in febrile cases. (A short extract from this paper may be found in the *Bristol Medico-Chirurgical Journal*, vol. iii.). *Trans.*]

THEBAINA. THEBAINE.

Thebaine has been used hypodermically in the treatment of neuralgia by Prof. Eulenburg, who found that it caused severe smarting pain at the point of puncture, and by M. Waldemar, of St. Petersburg.

TRANSFUSIO HYPODERMICA. HYPODERMIC
TRANSFUSION. (See *Nutrient injections, Sulphate and Chloride of Sodium.*)

U.

ULMUS. ELM. (See *Distilled waters*).

URETHANE.

[Urethane occurs in the form of white crystals, is free from odour, has no disagreeable taste, and is freely

soluble in water. "It is the æthylic ether of carbaminic acid, and its chemical composition may be represented by the formula $C_3H_7NO_2$."*

Von Jaksch, of Vienna, considers that this drug is peculiarly suited for administration to children. It is most useful in simple uncomplicated insomnia, but it is apt to prove ineffectual when there is acute pain.

Although as much as 30 to 60 grains may safely be given to adults, Dr. Saundby has obtained good results from the exhibition of two grain doses in cases of cardiac insomnia. Mr. Jackman used urethane, in 4 grain doses every 2 hours, with success in a case of tetanus after chloral, given in 20 grain doses every 3 hours, had failed to do more than relieve the pain.† Dr. Sprimon, of Moscow, verified the statements of Jaksch by experiments on himself, patients, and animals (rabbits and cats). He found that hypodermic injections were painless, even when 16 grains were introduced (in an experiment on himself).‡

Dr. Savage administers it in cases of insanity in doses of five grains hypodermically, or one to two drachms by the mouth.§ *Trans.*]

V.

VALDIVINE.

This principle has been obtained by M. Tanret from the seeds of the *Simaba valdivia* (Simarubaceæ), a tree indigenous in Columbia. It is very sparingly soluble in water

* *British Medical Journal*, 1886, vol. i., p. 354.

† *Lancet*, 1886, vol. i., p. 112.

‡ *London Medical Record*, vol. xiv., p. 209.

§ *Practitioner*, vol. xxxviii., p. 35.

(1 in 600 parts), is soluble in alcohol (1 in 60 parts), less so in absolute alcohol (1 in 190 parts), dissolves readily in chloroform, but is insoluble in ether.

Valdivine has very pronounced poisonous properties; it produces death in rabbits in doses of $\frac{1}{34}$ to $\frac{1}{17}$ of a grain according to the size of the animal, but it must be observed that its effects are very slow in developing. During the first four or five hours the animal appears to be as well as before administration; there are often observed, however, especially after very large doses, a rise of temperature and an increase in the number of the heart beats. M. Restrepo, from whom we derive all our information, has noticed vomiting as well, in the dog and man, after a dose of $\frac{1}{17}$ of a grain. The physiological researches of this author are still incomplete, and valdivine requires further investigations.

The dose administered to man has never exceeded $\frac{1}{17}$ of a grain. Locally we find that sometimes "there is slight puffiness at the points of puncture."

Valdivine	.	.	.	1 grain
Distilled water.	.	.	up to 1 ounce,	80 minims.

16 minims = $\frac{1}{35}$ of a grain.

Drs. Restrepo and Dujardin-Beaumetz have administered it unsuccessfully in intermittent fevers, and experiments made with it at the *Jardin des plantes* in the bites of venomous serpents (*Crotalus adamanteus* and *durissus*) have also been without result.

M. Nocard has experimented with valdivine in rabbits which had contracted dumb rabies. It appears that no further result was obtained than a sedative action in the most severe cases.

VASELINE.

[M. Mennier, of Lyons, considers that vaseline diffuses itself very rapidly through the body, its diffusibility varying inversely with its consistence, and he states that antiseptics combined with it as a vehicle give rise to no local pain or reaction when injected hypodermically. It is essential, however, that the vaseline should be absolutely pure. The best test for impurity is warm sulphuric acid, which does not blacken pure vaseline.

Eucalyptol and turpentine have thus been injected, the former in phthisis, the latter in sciatica, according to the following formulæ :—

Pure eucalyptol	.	.	.	.	5 parts
Pure vaseline	.	.	.	.	20 parts.
(by weight).					

From fifteen minims to three drachms to be injected daily into the outer part of the thigh.

Berthelot's turpentine	.	.	.	75 minims
Pure vaseline	.	.	.	5 drachms.

Dose.—From ℥ xv. to 3 ijss., daily.

Iodoform, phenol, iodine, and camphor may in this form be injected in the strength of one per cent., thymol in half per cent., and menthol in ten per cent.* *Trans.*]

* See, for further details, *Lancet*, vol. i., 1887, p. 542; *Bulletin Général de Thérapeutique*, Jan. 15, 1887; and *Therapeutic Gazette*, vol. xi., p. 249.

VERATRINA. VERATRINE.

Veratrine is obtained from the rhizome of the *Veratrum album* (Colchicaceæ), of the *Veratrum viride*, and from the seeds of the *Sabadilla officinalis*. It is insoluble in water, but dissolves in alcohol and ether. All its salts, and especially the nitrate, are soluble in water.

Doses of $\frac{1}{14}$ to $\frac{1}{7}$ of a grain suffice to produce decidedly toxic phenomena in all species of animals, man included.

Chief physiological effects.—It is an antipyretic. When administered by the mouth, it produces a sensation first of heat and then of burning, nausea, vomiting, colic, diarrhoea, tinglings in the limbs; the respiratory movements become infrequent and painful, the pulse, which in the first place is accelerated, becomes slow and irregular. The temperature falls, there are intense headache, involuntary muscular contractions, collapse and fainting with pupillary dilatation. Salivation and emesis are the two most constant symptoms. Linon states that the exhibition of veratrum may be persisted in despite the vomiting in cases in which the antipyretic effect has not been attained, as this effect is generally produced only after emesis. The fall in the pulse-rate always precedes the fall in temperature. Its action appears in from two to three hours after administration, and it does not accumulate in the system.

Veratrine	1 grain
Dilute alcohol	72 minims
Distilled water	up to 144 minims.

Two to six minims of this solution are equivalent to $\frac{1}{72}$

to $\frac{1}{24}$ of a grain of veratrine. Erlenmeyer states that tincture of veratrum viride has been injected in some cases.

Therapeutic uses.—Pneumonia* and neuralgia (Lorent), neuralgic and rheumatoid pains (Bois), rheumatism (Eulenburg and Hiffelsheim), toothache and neuralgic rheumatism (Erlenmeyer used it in this latter affection without benefit); continued fevers and symptomatic fever (Eulenburg and Seitz).

Prof. Eulenburg observed abscess after the injection of an alcoholic solution, 1 part in 250; and afterwards he used the same strength of solution prepared with equal parts of water and alcohol. Messrs. Lorent, Erlenmeyer, Hiffelsheim, and Eulenburg were all obliged to abandon its use hypodermically owing to its local irritant effects.

M. Bois made use of a 1 per cent. aqueous solution of veratrine nitrate; he injected doses of $\frac{1}{140}$ to $\frac{1}{70}$ of a grain with success. But, he adds, "the contact of the solution with the tissues produced such intolerable pain that the remedy was found to be worse than the disease, otherwise it gave rise to no local disturbance." M. Linon in his essay (Strasburg, 1868) states that he has seen the tincture administered both per os and hypodermically.

M. Hepp had prepared it by dissolving the resinous extract in alcohol at 56°, in the proportion of 5½ grains of veratrum to 160 minims of alcohol. The same author adds, a few pages further on, that this solution produced a phlegmonous abscess at the point of puncture, and that M. Hepp purposed trying a solution of the resinous extract in glycerine, in the hope that this solution would be less irritating. Veratrine has been used by Messrs. Cagny

* It must not be forgotten that pneumonia does not admit of vague general treatment.

and Leblanc in veterinary medicine (45 to 90 minims of a 1 in 25 alcoholic solution, in the horse, (*Congrès de Blois*, 1884).

Z.

ZINCI CHLORIDUM. CHLORIDE OF ZINC.

M. Luton has used a 1 in 50 solution of chloride of zinc in various forms of neuralgiæ, among others in sciatica (*loc. cit.*, p. 112).

ZINCI SULPHAS. SULPHATE OF ZINC.

Sulphate of zinc has been administered hypodermically by M. Wyschinski in dilute solution in the treatment of obstinate dyspepsia.

TABLE OF ANTIDOTES AND ANTAGONISMS.*

Aconite and its preparations (extract of aconite, aconitine, etc.) . . .	} Antidotes . . .	Ammonia (used successfully by Richardson).
		Atropine.
		Brandy (or some other form of alcohol).
		Digitalis (10 to 20 drops of the tincture).
		Ether.
		Nitrite of Amyl.
		Strychnine.
Agaricine	Antidote	Atropine.
Antimony	} Antidotes . . .	Apomorphine (to induce vomiting).
		Morphine (after subsidence of acute symptoms).
Arsenic	} Antidotes . . .	Apomorphine.
		Morphine (as in poisoning by antimony).

* For General Poisoning see Therapeutic Index. This table is by no means intended to be a complete toxicological chart; it simply comprises remedies which have been, or may be, used hypodermically as antidotes or antagonists. The list has been compiled from numerous works, among which may be mentioned the manual itself, Ziemssen's *Cyclopædia of the Practice of Medicine*, vol. xvii.; Neale's *Digest*; and my friend Dr. Murrell's invaluable little handbook, *What to do in Cases of Poisoning*, 5th Edition. There are also numerous quotations from the *Lancet*, *British Medical Journal*, *Medical Times and Gazette*, *Practitioner*, *London Medical Record*, and Braithwaite's *Retrospect*.

Atropine and Bel- ladonna	{	Antidotes . . .	{	Apomorphine. Chloral Hydrate. Morphine.
		Antagonists . .	{	Muscarine. (?) Physostigma. Pilocarpine.
Caffeine		Antagonist . . .		Morphine.
Calabar Bean, pre- parations of	{	Antagonists . .	{	Atropine. Strychnine.
		Antidotes . . .	{	Chloral. Camphorated Oil. Ether.*
Camphor		Antidotes . . .	{	Alcohol. Apomorphine. Ether.
Camphor Mono- bromate	}	Antagonist . . .		Strychnine.
Cannabis Indica . . .		Antagonist . . .		Strychnine.
Cantharidine		Antidotes . . .	{	Apomorphine. Morphine.
Carbolic Acid	{	Antidotes . . .	{	Alcohol. Apomorphine. Atropine. Ether. Nitrite of Amyl.
Carbonic Oxide . . .		Antidote		Ergotine.
Chloral Hydrate . . .		Antidotes . . .	{	Apomorphine.† Nitrite of Amyl.‡

* Ziemssen, *loc. cit.*, p. 704.

† Mentioned by Dr. Murrell, condemned by David. (See note—
Apomorphine, p. 59).

‡ *Brit. Med. Jour.*, 1879, vol. i., p. 969.

Chloral Hydrate	Antagonists	{ Picrotoxine. Strychnine.*
Chloroform	Antidotes	{ Ammonia.† Atropine. Digitalis. Ether. Nitrite of Amyl. Strychnine.
Conine	Antagonist	Strychnine. (?)
Conine	Antidote	Atropine. (?)
Curarine	Antidote	Strychnine.
Daturine	{ Antagonist Antidotes	{ Eserine. Morphine.‡ Pilocarpine.
Digitalis and Digi- taline	{ Antidotes	{ Aconitine. Alcohol. Apomorphine.
Digitalis and Digi- taline	{ Antagonist§	{ Hydrochlorate Pereirine.
Duboisine	Antagonists	{ Jaborandi and Pilo- carpine. Muscarine.
Emetine	Antagonist	Strychnine.||

* Levinstein asserts that Strychnine is a true antidote to Chloral. He reports recovery in a case of poisoning by 372 grains, after two subcutaneous injections, of $\frac{1}{22}$ and $\frac{1}{33}$ of a grain respectively, of strychnine. In a case of accidental poisoning (absorption from chloral dressings in amputation above the knee) in the Edinburgh Royal Infirmary, under the care of Dr. John Duncan, I administered three doses of $\frac{1}{32}$ of a grain each of strychnine. The patient recovered.

Husemann and Kröger recommend atropine as an antidote. (See *London Medical Record*, vol. xii., p. 182).

† May be injected intravenously or hypodermically.

‡ Neale's *Digest*, 1882 (378·5).

§ In effects on the heart.

|| Martindale and Westcott's *Extra Pharmacopœia*.

Ergot, Extract of, Ergotine, etc. . . .	} Antidotes . . .	{ Alcohol. Ammonia. Camphor. Ether. Nitrite of Amyl.	*
Ether	Antidote	{ Nitrite of Amyl. (See Note p. 297).	
Gelsemine	Antidotes . . .	{ Alcohol. Atropine. Ether.	
Hydrocyanic Acid . .	Antidotes . . .	{ Alcohol. Ammonia. Atropine.† Ether.	
Hyoscyamine	Antagonises . .	Eserine partially.	
Lead	Antidotes . . .	{ None certain. Cayo- ponine has been tried, but with in- jurious results.	
Mercury	Antidote	Pilocarpine.	
Morphine and Opium	} Antidotes . . .	{ Alcohol with Coffee.‡ Atropine.§ Caffeine. Camphor Cocaine.|| Coffee (better admin- istered per rectum). Ether. Nitrite of Amyl. Strychnine.	

To avert cardiac paralysis.

† Böhm (Ziemssen, *loc. cit.*, p. 511) says that recent experiments shew that atropine cannot be recommended as an antidote.

‡ See case reported by Flood—quoted p. 49.

§ Johnstone (*Medical Times*, 1872—1873) saw eleven recoveries out of seventeen cases of opium poisoning by the atropine treatment.

|| Of great use in chronic poisoning.

Mushrooms	Antidotes . . .	{ Apomorphine. Atropine.
Nicotine	Antidotes . . .	{ Apomorphine. Strychnine.
Nitroglycerine	Antidotes . . .	{ Atropine. Ergotine.
Picrotoxine	Antidote	Chloral.
Pilocarpine	Antidotes . . .	{ Atropine. Homatropine.
Resorcine	Antidotes . . .	{ Alcohol. Ammonia. Atropine. Nitrite of Amyl.
Strychnine and Nux Vomica. . . . }	Antidotes . . .	{ Aconitine. (?) Apomorphine.* Atropine. Calabar Bean. (?) Camphor. Cannabis Indica. Chloral Hydrate. Cocaine.† Curarine. Emetine. Eserine. Morphine. Nicotine. (?) Nitrite of Amyl.‡ Prussic Acid.§

* *British Medical Journal*, vol. ii., 1878, p. 374.

† *Lancet*, vol. i., 1885, p. 439.

‡ "Nitrite of Amyl appears to be one of the most reliable antidotes. It may be administered hypodermically or by inhalations."—Dr. Barnes, *British Medical Journal*, vol. i., 1882, p. 457.

§ Hydrocyanic acid, according to Dr. Ladell, is an undoubted antidote, but not free from danger as, to be of any use, it must be administered in toxic doses. (*British Medical Journal*, vol. ii., 1883, p. 355).

POSOLOGICAL TABLE.

- ACIDUM ARSENIOSUM. (See *Arsenium*).
- „ BENZOICUM. $\frac{3}{4}$ to $1\frac{1}{2}$ grains several times daily.
- „ CARBOLICUM. $\frac{1}{14}$ to $\frac{1}{7}$ of a grain.
- „ CHRYSOPHANICUM (Chrysarobin). $\frac{1}{560}$ to $\frac{1}{140}$ of a grain.
- „ HYDROCYANICUM. $\frac{2}{7}$ to $\frac{6}{7}$ of a minim of medicinal acid in solution. (See also *Potassium Cyanide*).
- „ OSMICUM. $\frac{1}{14}$ to $\frac{1}{7}$ of a grain.
- „ SCLEROTINICUM. $\frac{1}{2}$ to $4\frac{1}{2}$ grains, increased cautiously to 9 grains.
- ACONITINA. $\frac{1}{240}$ to $\frac{1}{60}$ of a grain of Morson's preparation. The dose may be carefully increased up to $\frac{1}{24}$ of a grain.
- AGARICINA. $\frac{1}{14}$ of a grain.
- ALCOHOL. No definite dose can be fixed. To be given according to urgency. (In cases of post partum hæmorrhage the translator has found benefit from 40 minim doses of brandy repeated frequently).
- ALCOHOL AMMONIATUM. 5 to 10 minims.
- ALOES. $1\frac{1}{2}$ grains in aqueous solution.
- ALOIN. Produces too much local irritation to be useful for hypodermic purposes.
- AMMONIÆ LIQUOR. 2 to 5 minims.
- AMYL, NITRITE OF. (See *Nitris Amyl*).
- ANTIHYDROPIN. Sixteen minims of tincture.
- ANTIMONIUM TARTARATUM. (See *Emetic, Tartar*).

ANTIPYRIN. 25 to 30 grains at intervals of an hour, till three injections have been made. In children $1\frac{1}{2}$ grains for each year of age.

APOCODEIN, HYDROCHLORATE OF. $\frac{1}{5}$ to $\frac{1}{3}$ of a grain.

APOMORPHINE HYDROCHLORATE. $\frac{1}{16}$ to $\frac{1}{7}$ of a grain. (To be used with caution, alarming symptoms having been caused by $\frac{1}{15}$ of a grain. 2 to 8 minims of a 2 % solution.

APONARCEIN HYDROCHLORATE. Not in use.

AQUA. In varying quantities, with or without salines, and either iced (in hyperpyrexia), or at a high temperature.

ARBUTIN. Seldom used subcutaneously. Dose, by mouth, 15 grains, subcutaneously, 4 grains.

ARGENTI NITRAS. $\frac{1}{6}$ to $\frac{1}{3}$ of a grain.

„ CHLORIDI. $\frac{1}{14}$ of a grain

ARSENIIUM. $\frac{1}{7}$ to $\frac{2}{7}$ of a grain of arsenious acid has been injected by Lipp in cases of psoriasis and chronic eczema. 2 to 8 minims of Fowler's solution. Arseniate of sodium $\frac{1}{36}$ to $\frac{1}{18}$ of a grain.*

ARSENIAS STRYCHNINÆ. (See *Strychninæ Arsenias*).

ASPIDOSPERMIN SULPHATE. $\frac{3}{4}$ to $1\frac{1}{2}$ and 3 grains.

ATROPINÆ SULPHAS. $\frac{1}{140}$ to $\frac{1}{70}$ and $\frac{1}{35}$ of a grain.

* Bartholow (*loc. cit.*, p. 243) recommends the liquor sodii arseniatis, in preference to Fowler's solution, for hypodermic purposes, in doses of 5, 10, or even 15 minims. It is claimed for this salt that it is less irritant in its local effects, that it is less apt to produce arsenical poisoning, and that it possesses greater osmotic power than Fowler's solution. The injections are made on alternate days, and in different situations so as to minimise the local effects.

Mr. Jonathan Hutchinson thinks that the therapeutic effects of arsenic are best obtained by a combination of the arseniates of potassium and sodium.

AURI CHLORIDUM. $\frac{1}{35}$ of a grain.

AURI ET POTASSII CYANIDUM. $\frac{2}{7}$ to $\frac{3}{7}$ of a grain.

BROMINE. 1 minim doses, in hospital gangrene.

CAFFEINE. $\frac{1}{7}$ to $1\frac{1}{2}$ grains.

CALABAR BEAN. $\frac{1}{4}$ to $\frac{1}{2}$ of a grain of extract. $\frac{1}{8}$ of a grain of physostigmine.

CAMPHORA. $1\frac{1}{2}$ to 3 grains.

CAMPHORA MONOBROMATA. $1\frac{1}{2}$ to 3 grains.

CANNABIS INDICA. 2 to 5 minims of tincture.

CANTHARIDIS TINCTURA. 10 to 20 minims.

CANTHARIDINA. $\frac{1}{1400}$ to $\frac{1}{170}$ of a grain.

CEDRINE. $\frac{1}{16}$ of a grain (maximum dose).

CHLORAL HYDRAS. $2\frac{1}{2}$ to 7 grains.

CROTON CHLORAL HYDRAS. $\frac{1}{2}$ to 4 grains. Unsuitable for hypodermic use on account of its irritant action.

CHLOROFORM. 15 to 40 minims.

CINCHONIDINÆ HYDROBROMAS VEL SULPHAS. 1 to 8 grains.

COCAINA. $\frac{1}{7}$ to $\frac{1}{2}$ of a grain.

CODEINA. $\frac{1}{8}$ to $1\frac{3}{4}$ grains.

COLCHICINA. $\frac{1}{35}$ of a grain.

CONINA. $\frac{1}{72}$ to $\frac{1}{18}$ of a grain.

CICUTINÆ HYDROBROMAS. $\frac{1}{3}$ of a grain.

COTOINE. 4 grains.

CREASOTUM. 3 to 6 minims.

CROTONIS OLEUM. Unsuitable for hypodermic purposes.

CUPRI SULPHAS. Unsuitable for hypodermic purposes.

CURARA. $\frac{1}{12}$ to $\frac{1}{2}$ of a grain.

CURARINA. $\frac{1}{70}$ to $\frac{1}{14}$ of a grain.

DATURINA. $\frac{1}{120}$ to $\frac{1}{60}$ of a grain. (See *Stramonium*).

DIASTASE. $1\frac{1}{2}$ to 3 grains.

DIGITALINE. $\frac{1}{70}$ of a grain, cautiously increased. (Tincture of digitalis may be given hypodermically; besides causing less irritation than does digitaline, it is a safer remedy).

DUBOISINE. $\frac{1}{140}$ to $\frac{1}{70}$ of a grain.

EAU DE VIE. (See *Alcohol*).

EMETINA. From $\frac{1}{70}$ of a grain as an expectorant, to $\frac{1}{14}$ of a grain as an emetic.

EMETIC, TARTAR. $\frac{1}{4}$ of a grain.

ERGOT, AQUEOUS EXTRACT. $\frac{1}{2}$ to 1 grain.

ERGOTINE. $1\frac{1}{2}$ to 2 grains.

ERGOTININE. $\frac{1}{35}$ of a grain.

ETHER. 16 minims and upwards.

EUCALYPTOL. 15 minims and upwards of a 20 per cent. solution in vaseline. (See *Vaseline*).

FERRI ALBUMINAS. (See *Formula*, p. 141).

„ AMMONIO-CITRATIS PYROPHOSPHAS. $1\frac{1}{2}$ to 3 grains.

„ CITRAS. 1 to 2 grains.

„ PEPTONAS. $1\frac{1}{2}$ to 3 grains.

GELSEMINÆ HYDROCHLORAS. $\frac{1}{140}$ to $\frac{1}{70}$ of a grain.

GLYCERINUM. $\frac{1}{2}$ to 1 drachm, as a substitute for cod liver oil.

GUACHAMACÆ EXTRACTUM. $\frac{1}{7}$ of a grain.

HOMATROPINÆ HYDROBROMAS. $\frac{1}{5}$ of a grain.

HYDRARGYRI ALBUMINAS. (See pp. 154 and 160).

„ BICHLORIDUM. $\frac{1}{160}$ to $\frac{1}{60}$ of a grain.

„ BICYANIDUM. $\frac{1}{10}$ of a grain.

„ BINIODUM. $\frac{1}{14}$ to $\frac{1}{7}$ of a grain.

„ CHLOR-ALBUMINAS. $\frac{1}{14}$ of a grain.

„ CHLORIDUM. $\frac{3}{4}$ to $1\frac{1}{2}$ grains.

HYDRARGYRI CYANAS. $\frac{1}{14}$ to $\frac{1}{7}$ of a grain.

„ CYANIDUM. $\frac{1}{14}$ to $\frac{1}{7}$ of a grain.

„ FORMIAMIDAS. 8 to 16 minims of a 1 per cent. solution.

„ GLYCOCOLAS. $\frac{1}{14}$ to $\frac{1}{7}$ of a grain.

„ PEPTONAS. $\frac{1}{7}$ of a grain.

„ ET SODII IODIDUM. $\frac{1}{5}$ of a grain.

HYDRARGYRUM CUM UREÂ. (See p. 160).

HYOSCINÆ HYDRIODAS. $\frac{1}{200}$ to $\frac{1}{50}$ of a grain.

HYOSCYAMINA. $\frac{1}{70}$ of a grain.

HYPNONE. 2 to 4 minims; is not adapted for hypodermic use.

ICHTHYOL. 16 minims of a 5 to 10 per cent. aqueous solution.

INJECTIONES NUTRIENTES HYPODERMICÆ. (Oils—almond, cod-liver, and olive; sugar, milk, beef juice, defibrinated blood, blood serum, etc.). (See p. 173).

ODOFORM. 1 to 3 grains.

KAIRIN. $1\frac{1}{2}$ to 8 grains.

LITHII BROMIDUM. $\frac{2}{7}$ of a grain (unsuitable for hypodermic use).

MAGNESII CHLORIDUM. (Of little use).

„ SULPHAS. (Of little use).

MORPHINÆ ACETAS. $\frac{1}{10}$ to $\frac{2}{5}$ of a grain.

„ BIMECONAS. $\frac{1}{4}$ to $\frac{1}{2}$ of a grain.

„ HYDROCHLORAS. $\frac{1}{7}$ to $\frac{1}{4}$ of a grain.

„ SULPHAS. $\frac{1}{7}$ to $\frac{1}{4}$ of a grain.

„ TARTRAS. $\frac{1}{7}$ to $\frac{1}{4}$ of a grain.

(GLYCEROLE OF NEPENTHE. 5 to 10 minims).

MOSCHI TINCTURA. 16 to 48 minims per diem.

MUSCARINA. $\frac{1}{3}$ to $\frac{3}{4}$ of a grain.

NAPELLINA. $\frac{1}{7}$ to $\frac{1}{2}$ of a grain.

NARCEINÆ HYDROCHLORAS. $\frac{1}{18}$ to $\frac{1}{7}$ of a grain.

NARCOTINA. Dose uncertain.

NICOTINA. $\frac{1}{70}$ of a grain.

NITRATE OF SILVER. (See *Argentum*).

NITRATE OF VERATRINE. (See *Veratrine*).

NITRIS AMYL. 8 to 12 minims of 10 per cent. alcoholic solution.

NITRO-GLYCERINE. 2 to 6 minims, in the 24 hours, of 1 per cent. alcoholic solution. ($\frac{1}{240}$ to $\frac{1}{60}$ of a grain. Martindale and Westcott).

OLEANDRINE. 1 grain.

OLEUM AMYGDALÆ. 1 to 4 drachms. (Cod-liver and olive oils may be given in the same doses).

„ TEREBINTHINÆ. (See *Terebinthina and Vaseline*).

OPIUM, AQUEOUS EXTRACT AND TINCTURE OF. Not used now.

PAPAVERINE, HYDROCHLORATE OR PHOSPHATE. 6 to 12 minims of a 1 to 12 solution.

PARACOTOINE. 1 to 2 grains.

PARALDEHYDE. 4 minims.

PEREIRINE. $\frac{2}{3}$ to $1\frac{1}{3}$ grain.

PICROTOXINE. $\frac{1}{140}$ to $\frac{1}{48}$ of a grain.

PILOCARPINE HYDROCHLORATE OR NITRATE. $\frac{1}{14}$ to $\frac{1}{7}$ of a grain.

POTASSII BROMIDUM. $\frac{1}{2}$ a grain to 8 grains.

„ CYANIDUM. $\frac{1}{32}$ to $\frac{1}{16}$ of a grain.

„ IODIDUM. 1 to 8 grains.

„ PERMANGANAS. $\frac{1}{4}$ to $\frac{1}{3}$ of a grain.

QUINIDINE AND ITS SALTS. Are unsuitable for hypodermic use.

QUININE. (Ethereal solution). 1 to 4 grains.

„ BIBROMHYDRATE. 2 to $3\frac{1}{2}$ grains.

„ CARBOLATE. 5 to 15 grains.*

„ DISULPHATE. 1 to 4 grains.

„ HYDROBROMATE. 1 to 4 grains.

„ HYDROCHLORATE OF THE CARBAMIDE OF. 16 minims of a 10 per cent. solution.

„ SULPHATE. 1 to 4 grains.

„ SULPHO-VINATE. $2\frac{1}{2}$ grains.

„ TARTRATE. 1 to 4 grains.

QUINOIDINE.† $2\frac{1}{2}$ to 5 grains.

„ HYDROCHLORATE.‡ $2\frac{1}{2}$ to 5 grains.

QUINOLINE CITRATE.

„ HYDROCHLORATE. } 3 to 15 grains.

„ TARTRATE. }

QUINONE. 3 grains.

„ HYDRO-. 5 to 10 minims of a ten per cent. solution. Two injections, one into each arm, to be made simultaneously.

RESORCINE. $\frac{1}{2}$ to 3 grains.

SAPONINE. $\frac{1}{8}$ to $\frac{1}{4}$ of a grain.

SCILLIPICRINE. $\frac{1}{3}$ to $1\frac{1}{2}$ grains.

SODII CHLORIDUM. (See p. 60).

„ IODIDUM. $4\frac{1}{2}$ to 9 grains.

„ LACTAS.§ 9 grains.

* Has been used in cholera.

† Eulenburg condemns the hypodermic use of this drug. (See p. 234).

‡ This salt is readily absorbed and has been found useful in hypertrophy of the spleen.

§ Not well adapted for hypodermic use.

„ SALICYLAS. 1 to 8 grains.*

„ SULPHAS. $1\frac{1}{2}$ to 3 grains.

„ PHOSPHAS. $1\frac{1}{2}$ to 3 grains.

SOLANINE. From 1 to 3, 4, or even 8 grains daily.

SPARTEINE SULPHATE.† $\frac{2}{7}$ to $\frac{1}{2}$ of a grain.

STRAMONIUM EXTRACT. $\frac{1}{16}$ to $\frac{1}{3}$ of a grain.

STRYCHNINE ARSENIATE. $\frac{1}{64}$ cautiously increased to $\frac{1}{16}$ of a grain.

„ NITRATE. $\frac{1}{64}$ to $\frac{1}{28}$ of a grain.

„ SULPHATE. $\frac{1}{64}$ to $\frac{1}{16}$ of a grain.

TANNIC ACID. From 16 to 32 minims of a 1 in 10, or 1 in 5 solution.

TAYUYA TINCTURE. 16 minims.

THALLINE SULPHATE. $1\frac{1}{2}$ to 3 grains (repeated at frequent intervals, as required).

TURPENTINE. From 15 minims to $2\frac{1}{2}$ drachms daily.‡

URETHANE. 5 grains and upwards.

VALDIVINE. $\frac{1}{35}$ to $\frac{1}{17}$ of a grain.§

VERATRINE. $\frac{1}{72}$ to $\frac{1}{24}$ of a grain.

* As much as 16 grains has been given in the first stage of yellow fever. (See p. 245).

† Sulphate of sparteine administered hypodermically in doses of $\frac{2}{7}$ to $\frac{1}{2}$ of a grain, in conjunction with the internal administration of nitro-glycerine, has proved in the hands of Professor Ball and Dr. Oscar Jennings, of Paris, of inestimable service in the treatment of morphinomania. The indication for its use is furnished by the sphygmograph and by the feeling of depression experienced by the patient. *Lancet*, 1887, vol. i., p. 1278).

‡ Best administered with pure vaseline as a vehicle.

§ Maximum dose.

1. The first part of the paper is devoted to a general discussion of the problem of the origin of life. It is shown that the problem is one of the most important and interesting in the history of science. The author discusses the various theories of the origin of life, and shows that the most probable one is that of spontaneous generation. He also discusses the evidence in favor of this theory, and shows that it is supported by the facts of the case.

2. The second part of the paper is devoted to a discussion of the problem of the origin of the human race. It is shown that the problem is one of the most important and interesting in the history of science. The author discusses the various theories of the origin of the human race, and shows that the most probable one is that of spontaneous generation. He also discusses the evidence in favor of this theory, and shows that it is supported by the facts of the case.

3. The third part of the paper is devoted to a discussion of the problem of the origin of the human mind. It is shown that the problem is one of the most important and interesting in the history of science. The author discusses the various theories of the origin of the human mind, and shows that the most probable one is that of spontaneous generation. He also discusses the evidence in favor of this theory, and shows that it is supported by the facts of the case.

4. The fourth part of the paper is devoted to a discussion of the problem of the origin of the human soul. It is shown that the problem is one of the most important and interesting in the history of science. The author discusses the various theories of the origin of the human soul, and shows that the most probable one is that of spontaneous generation. He also discusses the evidence in favor of this theory, and shows that it is supported by the facts of the case.

5. The fifth part of the paper is devoted to a discussion of the problem of the origin of the human body. It is shown that the problem is one of the most important and interesting in the history of science. The author discusses the various theories of the origin of the human body, and shows that the most probable one is that of spontaneous generation. He also discusses the evidence in favor of this theory, and shows that it is supported by the facts of the case.

THERAPEUTIC INDEX OF DISEASES.

Abscess.

Cocaine injected before operation, 102

[The effect is increased by applying a ligature above the part operated on in the first instance. Major operations have also been performed under the local anæsthetic influence of cocaine. Dr. Varick (*New York Med. Jour.*, 1886) has in this way performed amputation through the thigh, and Mr. Mayo Robson, of Leeds (*Brit. Med. Jour.*, vol. ii., 1886, p. 859), has excised a portion of the tongue ten minutes after injection of one grain of cocaine hydrochlorate without causing the slightest pain. TRANS.]

Adynamia.

Alcohol, 48
Ammoniated alcohol with anise, 49
Ammonia, 51
Camphor, 87
Musk, 192

After pains.

Chloral hydrate.
Chloral and ergotine, 132
Morphine.
Morphine and atropine.

Ague (see Fever, intermittent).

Albuminuria.

Caffeine (inferior to other diuretics), 81
Cantharidine (in chronic albuminuria), 92
Nitrite of amyl.
Nitro-glycerine.
Scillipicrine, 242
Scoparine, 250
Sparteine, 250

Alcoholism.

Ammonia (used successfully in a case complicated with sun-stroke), 51

Alopecia.

Pilocarpine, 211

Amenorrhœa.

Ferruginous preparations.

„ „ with quinine.
„ „ with strychnine.

Anæmia.

Alcohol (in form of brandy or whiskey), 49
Alcohol with ammonia, 49
Blood, human (used successfully), 174
Blood, human, intraperitoneal injection, 175
Ferruginous preparations (have succeeded by hypodermic, after failure by ordinary methods), 139
Nitro-glycerine, 200
Opium, preparations of, in cerebral anæmia, 184 note †

Aneurism.

Ergot and its preparations (extract of ergot, ergotine, ergotinine), 131

[“From $\frac{1}{2}$ to $4\frac{1}{2}$ grains of watery extract of ergot dissolved in a mixture of one part of glycerine to five of alcohol, or in glycerine and water, equal parts have been injected over or in the neighbourhood of the tumour at intervals varying from half a day to several days.” Cure of subclavian, radial, and even of abdominal aortic aneurism has been obtained by Langenbeck, Wolff, and others. Ziemssen's *Cyclopædia of Practice of Medicine*, vol. vi., p. 452. TRANS.]

[Fibrin-ferment, recommended by Dr. Arthur Gamgee, has been used by Mr. Southam. This treatment was unsuccessful, but Mr. Southam recommends further experiments.

The ferment is injected into the sac (*Brit. Med. Jour.*, vol. ii., 1883, p. 321). **TRANS.**]

Iron, preparations of, by interstitial injections, 141

Angina Ludwigi. Ludwig's angina. (Malignant or phagedænic sore throat).

Apocodeine, 59

Apomorphine, 59

Aponarceine, 59

Carbolic acid (interstitial injections), 35

Emetic, tartar.

Emetine.

Angina pectoris.

Aconite, preparations of (extract of aconite, aconitine), 46

Conine, 107

Hydrocyanic acid, 39

Nitrite of amyl, 198

Nitro-glycerine, 200

Sodium chloride, 243

Anus, fissure of.

Iodoform, 178

Anus, prolapse of.

Ergotine, 130

Strychnine, 253

Aorta, diseases of (see **Heart diseases**).

Nitrite of amyl, 198

Nitro-glycerine, 200

Aphonia.

Strychnine (when the disease is of paralytic origin), 253

Appetite, loss of.

Cotoine, 109

Paracotoine (disadvantageous on account of its sparing solubility), 203

Sodium chloride (used by Lubanski to stimulate appetite and digestion in phthisis), 243

Arthritis.

Iodoform, 177

Nitrate of silver, 66

Arthritis deformans.

Aconitine, 46

Ascites (see **Dropsy**).

Asphyxia.

Apocodeine, 59

Apomorphine, 59

Aponarceine, 59

Asthma (see also **Dyspnœa**.)

Aspidospermin, 71

Atropine, 75 and note on same page.

Codeine, 103

Conine, 107

Duboisine, 121

Hyoscine, 167

Morphine.

Nitrite of Amyl.

Nitro-glycerine, 200

Solanine (both in bronchial and cardiac asthma), 250

Athrepsia (**Infantile Atrophy**).

Sodium sulphate with sodium phosphate, 248

Atrophy (see **Emaciation**).

Atrophy, progressive muscular.

Strychnine, 253

[Arsenic and nitrate of silver hypodermically and internally, and phosphorus internally, have been used, but without encouraging results. Prof. Eulenburg has used strychnine extensively (*Ziemssen, loc. cit.*, vol. iv., p. 150), but without any benefit. **TRANS.**]

Bites of venomous serpents.

Ammonia, hypodermically and intravenously, 51

Cedrine, 93

Permanganate of potassium, 217

Valdivine (has not proved to be of any use), 264

Bladder, catarrh of.

Arbutine, 64

Blepharospasm.

Conine, 107

Bright's Disease.

Caffeine (as a diuretic, inferior to other diuretics), 81

Cantharidine (in chronic forms), 92

Digitaline.

Nitrite of amyl, in interstitial nephritis, 200

Nitro-glycerine, in interstitial nephritis, 200

[Nitro-glycerine is said to diminish

albumen and to increase the diurnal quantity of urine. Rossbach asserts that it prolongs life and cuts short grave attacks. TRANS.]

Bronchitis.

Benzoic acid and benzoate of sodium, 32

Conine, 107

Solanine, 250

Water to which a few drops of cherry laurel water have been added, 61. One syringeful to be injected into the neighbourhood of parts in which painful sensations are experienced.

Bubo.

Iodoform, 178

[Carbolic acid, chloride of ammonium, bichloride of mercury, and sulphate of copper have also been used hypodermically. TRANS.]

Calculi, (biliary, renal and vesical).

Atropine and morphine.

Morphine.

Cancer.

Aloes and aloin for constipation, 50

Chloroform, 99

Cinnamon as local stimulant, 99

Iodoform, 178

[Ruscoin (*Brit. Med. Jour.*, vol. ii., 1885, p. 357), has obtained benefit from injections of cocaine for the relief of pain in uterine carcinoma. He obtained still better results from a combination of cocaine and morphine, while the combination of atropine with cocaine was comparatively ineffectual. TRANS.]

Carbuncle.

Carbolic acid, 35

Mercury (interstitial injection), 160

Catalepsy.

Curare has been injected hypodermically, but without benefit. (See Ziemssen, *loc. cit.*, vol. xiv., p. 382. TRANS.)

Catarrh.

Apocodeine, 59

Apomorphine, 59

Aponarceine, 59

Tincture of nux vomica in suffocative catarrh, 253

Chest-pains.

Saponine (for intercostal neuralgia), 242. Not adapted for hypodermic use.

Chlorosis.

Iron, preparations of, 138

Iron with arsenic.

Choking.

Apocodeine, 59

Apomorphine, 59

Aponarceine, 59

Emetic, tartar.

Emetine.

Cholera.

Ammonia with spirit of pepper-mint has been used successfully, 52

Ammonium sulphate, 52

Arsenic, 69

Caffeine, 80

„ with benzoate of sodium, 80

„ „ salicylate of sodium, 80

Camphor, (Ziemssen, *loc. cit.*, vol. xv., p. 244)

Chloral hydrate, 95

Cotoine, 109

Cotoine with chloral, 109.

Ether, 134

Morphine before collapse, 189

Morphine with atropine in intermediate stage, 189

Atropine during collapse, 189

Musk, 192

Nitrite of amyl, (of no use), 197

Paracotoine, 203

Pilocarpine with pepsine, 210

Potassium iodide in stage of asphyxia, 214

Quinine, 233

Quinine with carbolic acid (1st stage), 230

Sodium chloride, 60, (*London Medical Record*, vol. xiv., p. 108)

Sodium sulphate, 248

Strychnine, (2nd stage), 253

Tannin, (*London Medical Record*, vol. xiv., p. 108)

Water, subcutaneously, intravenously and intraperitoneally, 60

Water, with salines, morphine, opium or camphor, 60 (*see note p. 63*)

Chorea.

Arsenic, 67-69

Atropine, 75

Calabar bean and its preparations, 85

Conine, 107

Curarine, 115

Hyoscyamine, 169

[Morphine and opiates are of the greatest value in some cases. TRANS.]

Choroido-scleritis.

Pilocarpine, 210

Colic.

Atropine.

Atropine with morphine.

Chloroform, 98

Water (especially hot water), 61

Eserine in veterinary practice, 86

Collapse.

Ammonia, hypodermically and intravenously, 52

Ammonia with alcohol, 49

Benzoic acid, 32

Brandy, 49

Ether (sulphuric, acetic, and Hoffman's fluid), 134

Musk, 192

Nux vomica tincture, 253

Strychnine, 256

Coma, (see also Uræmia).

Ether, when coma is due to excessive hæmorrhage, 134

Constipation.

Aloes and aloin, 53

Atropine, 75

Castor oil. (Recommended by Shoemaker.)

Croton oil (to be avoided), 110

Magnesium chloride, 182

Magnesium sulphate, 182

Sodium sulphate, 248

Contracture.

Guachamacá, 143

Physostigmine, (Ziemssen, vol. xiii., p. 187)

Convulsions.

Apocodeine.

Apomorphine, and other emetics, 59

Ergotine, 131

Ether, in infantile convulsions at beginning of a pneumonic attack, 135

Quinine, 233

Convulsions, puerperal.

Potassium bromide, 211

[Chloral has frequently been administered subcutaneously with marked success; morphine, nitrite of amyl and pilocarpine have also been used. TRANS.]

Cough.

Agaricine, useful in phthisis, 47

Conine, 107

Cherry laurel water.

Ergotine, 129

Cannabis Indica, in phthisis, 90

Homatropine, in phthisis, 144

Morphine with tartar emetic, 188

Croup.

Apomorphine and other emetics, 59

Calomel, 165

Cystitis.

Solanine, 250

Delirium tremens.

Digitaline.

Strychnine, 253

[Opium, morphine and hyoscyamine have also been given subcutaneously. Some authors speak of strychnine as a specific. TRANS.]

Diabetes insipidus. Polyuria.

Ergot and its preparations, especially ergotin, 131

Pilocarpine, 210

Diabetes Mellitus.

Carbolic acid, 35

Codeine, 104, (*see Ziemssen, loc. cit.*, xvi., 994)

Diastase, 118

Ergotine, 131

Morphine, 191

Diarrhœa.

Cinnamon, 99

Cedrine, 93 (in chronic diarrhœa)

Cotoine, 109 (except when diarrhœa is due to ulceration, alcoholism or cirrhosis).

Opium, 203

Resorcine, 241

Sodium chloride in phthisis (acts by stimulating appetite and digestion), 243

Diphtheria.

Benzoate of sodium, 32
Carbolic acid, 35
Apomorphine and other emetics, 59
Mercury, preparations of, 160
Permanganate of potassium, 218
Pilocarpine, 210

Dropsy.

Antihydropin, 53
Caffeine (in dropsy associated with fatty degeneration of the heart), 81
[Digitaline. TRANS.]
Ether, 135
Pilocarpine, 210

Dysentery.

[Camphorated oil (Ziemssen, *loc. cit.*, vol. i., p. 567). TRANS.]

Dyspepsia.

Apomorphine, 59
Physostigmine in veterinary practice, 86
Sodium chloride in phthisis, 243
Solanine, 250

Dysphagia (of Phthisis).

Cocaine, 102

Dyspnoea.

Aspidospermin, 70
Conine, 107
[Morphine is of special use according to Dr. Beckart in those forms of asthmatic dyspnoea associated with œdema of the lungs, as it occurs in the obese and the cachectic, and in those suffering from valvular lesions of the heart, from gout, and from renal disease (uræmic asthma). "In these circumstances the injection of $\frac{1}{2}$ of a grain of morphine acts like a charm." *Brit. Med. Jour.*, vol. ii., 1880, p. 80. TRANS.]
Nitrite of amyl.

Dysuria.

Scoparine, 250
Sparteine, 250

Eclampsia.

Conine, 107
Hydrocyanic acid, 39
Hydrate of chloral, 95

Hyoscine, 167

Musk (especially in infants), 192

Nitro-glycerine, 200

Pilocarpine, 210

Ecthyma.

Ichthyol, 172
Iodoform, 178

Eczema.

Arsenic (in chronic forms), 70
Chrysophanic acid, 37
Ichthyol, 172

Elephantiasis.

Mercury by interstitial injections, 160

Emaciation.

Defibrinated blood, 175
Oils (almond, cod-liver, and olive), 173
Peptones, 175
Solution of sugar, 174

Emphysema.

Apomorphine (when there is bronchitis), 59
Conine, 107
Daturine, 117
Solanine, 250
Strychnine, 253

Enuresis.

(See Incontinence).

Epilepsy.

Apomorphine, 59
Arsenic, 70
Atropine, 75
Camphor (see *Medical Times and Gazette*, vol. ii., 1878, p. 108).
Conine, 107
Curarine, 115
Napelline, 194
Nitrite of amyl,
Nitro-glycerine, 200
Oleandrin (used unsuccessfully), 201
Pilocarpine, 209
Potassium bromide, 213
Saponine (of doubtful efficacy), 242

Epileptiform neuralgia.

Morphine.
Nitrite of amyl, 198
Nitro-glycerine, 200

Epistaxis.

Ergotin, 131

Erysipelas.

- Carbolic acid, 34
- Quinine,
- Quinoline, 236
- Resorcine (*London Medical Record*, vol. xi., pp. 15, 196).

Exophthalmos.

- Duboisine, 121
- Ergotine and Ergotinine, (Braithwaite's *Retrospect*, vol. xc., p. 128)

Fever.

- Antipyrin, 54
- Aspidospermin, 70
- Cedrine, 93
- Conine, 107
- Kairine (not to be used when there is diminished hæmatosis), 180
- Pereirine, 207
- Quinine hydrobromate, 221
- Quinone and hydroquinone, 237
- Sodium salicylate, 245
- Strychnine arseniate, 257
- Thallin, 261
- Veratrine, 269

Fever, intermittent.

- Aconitine, 47
- Arsenic, 69
- Carbolic acid with quinine, 34
- Cedrine, 93
- Ether with quinine, 134
- Iodoform, 178
- Pereirine, 207
- Pilocarpine, 210
- Quinine, 233
- Quinoline, 236
- Valdivine (of little use), 266

Fibroids, uterine.

- Cornutin, 42
- Ergotine, 128, 130
- Sclerotinic acid, 42

Gangrene.

- Bromine, 77
- Iodoform, 178

Gastralgia.

- Hydrocyanic acid, 39
- Iodoform.
- Morphine.
- Potassium iodide, 214
- Strychnine, 252

Gastric Ulcer.

- Milk and beef juice alternately, 1 drachm every two hours used with success, 174

Dog's and chicken's blood, 174

Morphine.

Potassium iodide, 214

Glandular enlargements.

- Iodoform, 178
- Potassium iodide, 213
- Saline solutions, 63

Glaucoma.

- Aloes and aloin (recommended by Klein to diminish inflammation and tension), 50

Goitre.

- Iodoform, 173

Gout.

- Cedrine, 93
- Colchicine, 104
- Nitrate of silver, 66

Gummata, interdigital.

- Iodoform, 178

Hæmatemesis.

- Ergot (extract), ergotine, ergotinine, 131
- Sclerotinic acid, 42

Hæmaturia.

- Ergotine, 131

Hæmoptysis.

- Apomorphine, 59
- Atropine (of great value), *Brit. Med. Jour.*, vol. i., 1887, p. 842.
- Ergotine, (in phthisis without pyrexia), 129
- Phosphoric acid, 40
- Sclerotinic acid, 42

Hæmorrhage.

- Alcohol, 49
- Atropine, 75 (said by Tacke to be better than ergot)
- Ergotine and ergotinine, 131
- Ether (specially useful in cases of placenta prævia and post-partum hæmorrhage), 135

Hæmorrhoids.

- Ergotine, 131

Headache (including migraine).

- Aconitine, 46
- Antipyrin, (*Brit. Med. Jour.*, vol. i., 1887, p. 1177).
- Caffeine, 81
- Cocaine, 102

Ergotine and ergotinine, 130
Nitrite of amyl,
Nitro-glycerine, 203

Heart Diseases.

Caffeine, 81 (*see note, p. 81*)
Convallaria majalis, 108
Digitaline, 120
Hyoscyamine, 169
Hyoscyne hydriodate, 167
Nitrite of amyl.
Nitro-glycerine, 200
[Dr. Mitchell Bruce, (*Practitioner*, vol. xxxvii., p. 324), reports a case of double aortic disease with cardiac dilatation, dropsy and albuminuria, in which hydriodate of hyoscyne was administered to control the wandering delirium. Compensation was practically re-established. TRANS.]

Hectic fever.

Aspidospermin (of doubtful efficacy), 72

Hernia.

Caffeine, 81

Herpes Zoster.

Chloroform, 99
Morphine.

Hydrophobia.

Atropine.
Cannabis indica.
Cedrine, 93
Curarine, 115
Hyoscyamine, 169
Hyoscyne hydriodate to control spasms and produce sleep, 167
[Morphine subcutaneously over laryngeal nerve (Neale, *Practitioner*), vol. ii., 1831, p. 218).
Morphine with atropine (*Lancet*, vol. i., 1885, p. 525).
Physostigmine, (*Lancet*, vol. i., 1878, p. 862). TRANS.]
Pilocarpine (useless), 211
Potassium bromide.
Quinine, 233
Valdivine, as a sedative, 263

Hysteria.

Caffeine, 81
Conine, 107
Gold chloride (in hysterical anæsthesia), 77
Nitrite of amyl, 193

Nitro-glycerine, 200
Valerianate of ammonium, 52

Hystero-Epilepsy.

Apomorphine, 59
[See case reported by Williams, *Med. Times and Gaz.*, vol. ii., 1883, p. 655. TRANS.]

Incontinence of Urine.

Atropine, 75
Benzoic acid, (Neale's *Digest*, Appendix, 1048·2).
Calabarine and physostigmine, 85
Cantharidine, 91
Chloral hydrate, (Neale's *Digest*, 1048·2).
Ergotinine, 130
Strychnine, 253

Influenza.

Apomorphine, 59

Insanity.

Aloes (watery extract and aloin used by Kohn in constipation in the insane without any benefit), 50
[Cannabin Tannate of Merck for insomnia, 91. TRANS.]
Codeine, 103
[Digitaline. Used by Sheppard in doses of $\frac{1}{8}$ to $\frac{1}{4}$ of a grain. (*Med. Times and Gaz.*, vol. ii., 1872, p. 482). TRANS.]
Hyoscyne hydriodate in various forms of insanity characterised by wild or restless delirium and insomnia. This comparatively new remedy promises to yield excellent results, 167
Hyoscyamine (*see note, p. 170*)
Morphine.

Insomnia.

Caffeine, in alcoholic insomnia without delirium, 81
Cannabin tannate, 91
Cannabis Indica, useful in phthisical, not of much use in other forms, 90
Croton chloral (uncertain), 96
Chloroform, 98
Guachamaca, 143
Homatropine, in insomnia of phthisis, 144
[Hyoscyne hydriodate in $\frac{1}{10}$ to $\frac{1}{3}$ of a grain doses, 167. TRANS.]

Morphine, 184 note
 Napelline, 194
 Opium in insomnia due to cerebral anæmia, 184, note.
 Paraldehyde, 204
 Potassium bromide, 211
 Sodium lactate (ineffectual), 244
 Solanine, 250
 Urethane.

Keratitis.

Aloes and Aloin, 51

Labour.

Cedrine, 93
 Chloral hydrate, 95. [Especially in cases of rigid os. TRANS.]
 Chloral hydrate with ergotine, 95
 Cornutin, 43
 Ergot (extract of), ergotine, ergotinine, 131
 Morphine. } [To
 Morphine with Atropine. } stop ineffectual pains. TRANS.]
 Sclerotinic acid, 43

Laryngismus stridulus.

Apomorphine, 59
 Conine, 107

Laryngitis.

Apocodeine, apomorphine and other depressants and vomitives.
 Conine (to relieve spasm), 107
 Morphine.
 Mercury, (especially in specific form). (See Croup).

Lichen.

Arsenic (especially in lichen ruber), 67
 Chrysophanic acid, 37

Lightning pains.

Morphine,
 Pilocarpine, 211
 Sodium salicylate. [Better by internal administration as recommended by Dr. Byrom Bramwell. TRANS.]
 Strychnine, 253

Locomotor ataxy.

Arsenic (Ziemssen, vol. xiii., p. 615),
 Hyoscyamine, 170
 Morphine (See Lightning Pains).
 [Nitrite of amyl, *Practitioner*, vol. ii., 1878, p. 218. TRANS.]

Secale, preparations of (Ziemssen, vol. xiii., p. 615),
 Silver, salts of, 66
 Strychnine, 253. [Erb, (Ziemssen, vol. xiii., p. 615), considers the use of this alkaloid objectionable. TRANS.]

Lumbago.

Antipyrin, *Brit. Med. Jour.*, vol. i., 1887, p. 1177.
 Atropine,
 [Carbolic acid, *Med. Times and Gaz.*, vol. ii., 1875, p. 343. TRANS].
 Cherry laurel water, 39
 Chloroform, 98
 Ether, 135 (*Med. Times and Gaz.*, vol. ii., 1882, p. 429 and *Brit. Med. Jour.*, vol. i., 1883, p. 511).
 Hyoscyamine, 170
 Morphine.
 Napelline.
 Nitrite of amyl (in one case it produced convulsions), 198
 Sodium chloride, 243

Lung, acute diseases of.

Aconitine in early stages, 47

Lupus.

Arsenic, 67
 Mercuric chloride (*Lancet*, 1887, vol. ii., p. 75)
 Sulpho-ichthyolate of sodium intracutaneously, 172

Lymphoma.

Arsenious acid, 69

Mania.

Apomorphine, 59
 Chloral hydrate,
 Curarine (of no use), 115
 Hydrocyanic acid, 39
 Hyoscyamine, 169, and hyoscine hydriodate, 167
 Quinine, 232

[The following remedies have also been used:—

Atropine,
 Cannabis tincture,
 Cocaine,
 Conine,
 Daturine,
 Digitaline. TRANS.]

Melancholia.

Caffeine, 81
 Cocaine, 101
 Hydrocyanic acid, 39

Paraldehyde, 205

[Hyoscine hydriodate is useful in melancholia with insomnia. TRANS.]

Meniere's disease.

[Quinine by internal administration recommended by Prof. Charcot (*Lectures on Diseases of the Nervous System*, New Syd. Soc. Trans., vol. ii.), might be tried hypodermically in the form of hydrobromate. TRANS.]

Nitro-glycerine, 200

Meningitis.

Curarine, 115

Metrorrhagia.

Ergotine, 130

[Strychnine, is a most effectual remedy in most forms of uterine hæmorrhage. TRANS.]

Morphine habit.

[Cocaine, in $\frac{1}{4}$ grain doses of great value (*London Medical Record*, vol. xiii., p. 107). TRANS.]

Tincture of nux vomica.

Bromhydrate of quinine, 229

Sparteine sulphate of great value, (*Lancet*, vol. i., 1887, p. 1278)

Multiple Sclerosis.

[Arsenic, } Ziemssen, *loc.*
Hyoscyamine, } *cit.*, vol. xiii., p.
Nitrate of silver, } 512. TRANS.]

Nævus.

Absolute alcohol.

Carbolic acid, 35

Iron (by interstitial injections), 141

Neuralgia.

Aconitine (of special use in neuralgia of the trigeminal), 46

Arsenic, 70

Atropine, 75. [This alkaloid was regarded by Anstie as the remedy, *par excellence*, in abdominal pains and pelvic neuralgia. TRANS.]

Atropine with morphine, 74

Caffeine, 81

Carbolic acid, 35

Cedrine, 93

Chloral hydrate, 95

Croton-chloral, 96

Chloroform (in trigeminal neuralgia), 98

Cocaine, 102

Codeine (of doubtful efficacy), 103

Colchicine, 104

Conine, 107

Daturine, 117

Ergotine and ergotinine, 130

Gelsemine, 142

Hyoscyamine (uncertain), 169

Iodoform, 178

Morphine.

Napelline (in hysterical and lumbosacral neuralgia), 194

Nitrite of amyl, 198 note.

Nitro-glycerine, 200

Osmic acid (uncertain in its effects), 40

Quinine, 233

Quinoline, 236

Saponine, 242

Sodium chloride, 243

Solanine, 249

Thebaine, 264

Veratrine, 269

Water (*see note*, p. 61), 61

Zinc chloride, 270

Obstruction, intestinal.

Atropine, 75

Edema (see Dropsy).

Edema, malignant.

Carbolic acid, 35

Ovariectomy.

Ether for lowered temperature after operation, 135

Pain.

Alcohol, 49

Atropine, 75

Atropine with morphine, 73

Cantharidine, 92

Chloroform, 98

Cocaine for local pain, 102

Iodoform, 178

Morphine.

Water, 61-63

Palpitation.

Aconitine.

Atropine.

Nitrite of amyl, 198

Nitro-glycerine, 200

Paralysis.

In hemiplegia and paraplegia of old-standing, in facial and radial paralysis, and in paralysis of the vocal cords and of the crico-

thyroid muscle, Strychnine, 253.
In glosso-labio-laryngeal paralysis, Picrotoxine, 208

Paralysis agitans.

Arsenic, 67
Curarine (*see* Ziemssen, *loc. cit.*, vol. xiv., p. 409).
Daturine, 117
Hyoscamine, 170
Morphine.

Parturition (see Labour).**Perspiration, excessive.**

Aconitine.
Agaricine, 47 (especially in the night sweats of phthisis, in which, however, it is inferior to atropine).
Atropine, 75
Cotoine, 109
Duboisine, 121
Homatropine hydrobromate, 144, (according to Dr. Murrell this is of less use than atropine).
Hyoscyamine (to control sweating in phthisis and intermittent fever), 169
[Muscarine, (*Practitioner*, vol. xxv., p. 89)
Nitrite of amyl, (*Practitioner*, vol. ii., 1879, p. 97). *TRANS.*]
Picrotoxine, 208
Pilocarpine, 210
Physostigma, preparations of.
[Quinine, (*Brit. Med. Jour.*, vol. i., 1878, p. 952). *TRANS.*]

Pertussis.

Aconitine, 46
[Atropine, *London Medical Record*, vol. viii., p. 308. *TRANS.*]
Conine, 107
Quinine,
Quinoline, 236
[Resorcine has been used successfully as a topical application to the rima glottidis, but it does not appear to have been used hypodermically as yet. *TRANS.*]

Phthisis.

Benzoate of sodium, 32
Carbolic acid, 34
Cotoine (when excessive diaphoresis), 109
Creosote, 110
Eucalyptol and other microbicides,

(*Brit. Med. Jour.*, 1887, vol. i., p. 528).

Iodoform, 178

Quinine hydrobromate, (*see* note, p. 246),

Water injected over larynx to relieve cough and irritation, 61

Placenta, retained.

Nitrite of amyl (*Brit. Med. Jour.*, vol. i., 1882, p. 457).

Pleurisy.

Caffeine when there is effusion; of doubtful efficacy, 81

Cherry laurel water.

Conine, 107

[Morphine, in acute pleurisy to relieve pain. *TRANS.*]

Pilocarpine, 210

Pleuropneumonia.

Carbolic acid, 35

Pneumonia.

Apocodeine
Apomorphine } as depressants, 59
Aponarceine }

Antimony.

Antimony with morphine.

Benzoic acid, used successfully by Rohde in a case of imminent danger, 31

Conine, 107

Pilocarpine, 210

Quinine and Quinoline, 236

Strychnine, 256

Veratrine, 269

[Antipyrin has often been given with marked benefit per os, but as yet it has not been administered hypodermically in pneumonia. *TRANS.*]

Poisoning, general.

Apomorphine. (This remedy is to be avoided in poisoning by chloral, chloroform and morphine), 59

Emetine.

Emetic, tartar, 125

(*See* also Table of antidotes and antagonisms).

Protopalgia.

Aconitine, 46

Prostate, enlargement of.

Iodoform, 178

Prurigo.

Carbolic acid, 34

Chrysophanic acid, 37
Solanine, 250

Psoriasis.

Arsenic, 68
Chrysophanic acid, 37

Ptosis.

Calabar bean, extract of, and physostigmine, 85
[Strychnine recommended by Erb, (Ziemssen, *loc. cit.*, vol. xi., p. 436). TRANS.]

Puerperal fever.

Aconitine, 47
Ammonia by intravenous injection.
Antipyrin.
Arsenic (of doubtful value), 69
Benzoate of sodium, 32
Carbolic acid (of no use), 35
Eucalyptol, 267
[Quinine hydrobromate. TRANS.]
Thalline, 264

Purpura hæmorrhagica.

Ergotine, 131

Pustule, malignant.

Carbolic acid, 35
[According to some recent researches of Dr. Klein's (*Practitioner*, vol. xxxiv., p. 233), it appears that carbolic acid is neither the only nor the most efficient germicide. He found that phenylpropionic and phenylacetic acids exert a powerfully destructive influence on the bacilli of anthrax, though they have no effect on the spores. The practical value of these agents in anthracoid diseases has not yet been tested. TRANS.]

Iodine, 176

Pyæmia.

Carbolic acid (*Lancet*, vol. i., 1885, p. 784).
Cedrine.
Quinine and quinoline, 233

Retention of urine.

Ergotine, 130
[I have found injections of atropine and morphine useful. TRANS.]

Rheumatic arthritis.

Colchicine, 104
Potassium iodide (of little value), 213

[Quinine salicylate in the hands of Dr. Pollock and others has yielded good results by internal administration. Owing to its sparing solubility it is not adapted for hypodermic use. TRANS.]

Rheumatism, acute.

Aconitine, 46
Antipyrin.
Carbolic acid (may be discarded now for salicylic acid), 35
Colchicine, 104
Ichthyol, 172
Morphine.
Quinine, 233
Pilocarpine, 210

Rheumatism, chronic.

Aconitine, 46
Arsenic, [I have used two drop doses of Fowler's solution with four grains of sodium salicylate hypodermically in one case of chronic rheumatism with considerable benefit. TRANS.]

Atropine.
Colchicine, 104
Ichthyol, 172
Napelline, 194
Nitrate of silver, 66
Quinine, 233
Veratrine, 269
Water.

Retina, detached.

Pilocarpine, 210

Rickets.

Iodoform, 78

Rupia.

Arsenic.
Iodoform, 178
(Mercury in rupia syphilitica).
Quinine.

Salivation.

Atropine.
Cotoine and paracotoine, 109

Sarcoma.

Arsenic, in general sarcoma of the skin, 67
Turpentine by interstitial injections, 260

Sciatica.

Cantharidine (of little use), 91
Chloroform, in obstinate cases, 97
Colchicine, 104

Creosote with morphine, 110
 Ether, 135
 Hyoscyamine (unsatisfactory), 169
 Morphine.
 Napelline.
 Resorcine, 239
 Saponin, 242
 Sodium chloride, 243
 Solanine, 249
 Strychnine, 253
 Turpentine (of no use), 260
 Water, iced, 62
 Zinc chloride, 270

[To the above list may be added—

Atropine.

Atropine with morphine.

Nitrate of silver.

Osmic and hyperosmic acids (see Neale's *Digest*, Appendix, 1237·6 and 1240·3. See also a report of some experiments by Fränkel, extracted from the *Berliner Klinische Wochenschrift*, 1884, No. 15., in the *Practitioner*, vol. xxxiv., p. 48. It appears from these experiments that although the effects of osmic acid are local, they are permanent (the axis cylinders are stained by osmic acid during life in the same way as after death), and caution in its use is therefore necessary.

Quinine and morphine.

Secale.

Water. TRANS.]

Scrofula.

Iodoform, 178

Pereirine hydrochlorate.

Tayuya, (said to have yielded marvellous results in the hands of some Italian physicians. These results have not been obtained by German and other investigators), 259

Shock.

Alcohol.

Ammoniated alcohol.

Ether and Hoffman's fluid, 135

Small pox.

Ether, in collapse, 134

Opium and ether, (*London Medical Record*, vol. xiv., p. 112).

Spasm.

Conine, 107

Solanine, 249

Sphincters, paralysis of.

[Strychnine. Recommended by Erb, Ziemssen, vol. xiii., p. 189. TRANS.]

Spinal cord, diseases of.

The following list is chiefly compiled from Professor Erb's valuable treatise in Ziemssen, *loc. cit.*, vol. xiii. Most of the remedies enumerated have been used, and all of them may be used, hypodermically in diseases of the cord.

Arsenic. Improves general nutrition and exerts a tonic influence on the nervous system.

Atropine. Has been recommended by Brown-Séquard in fluxionary hyperæmia.

Conine. Controls reflex spasm.

Curarine. Is so uncertain in its effects that it should be discarded.

Ergot and ergotine. Useful in fluxionary hyperæmia and paraplegia. Dose of the watery extract $\frac{1}{4}$ to $1\frac{1}{2}$ grains hypodermically.

Gold and sodium chloride. The precise mode of action of this remedy on the spinal cord is, as yet, unknown.

Nitrate of silver. Is of the greatest use in the various forms of sclerosis of the cord.

Quinine in spinal pains and weakness and in affections of the cord having a malarious origin.

Physostigmine and physostigma extract are used in cases of exaggerated reflex action, *e.g.* tetanus, strychnine poisoning and reflex contracture.

Strychnine nitrate in doses of $\frac{1}{32}$ to $\frac{1}{8}$ of a grain; to be used only in old cases of paralysis, or "when the principal lesion has been repaired without a full recovery of function." It is positively injurious in tabes, myelitis and irritative diseases.

Spleen, enlargement of.

[Arsenic. Peiper, of Greifswald, has used parenchymatous injections of a whole syringe of Fowler's solution, about once a week, in cases having a malarial origin. This method cannot be used in leucocythæmia or in the hæmorrhagic

diathesis (*London Medical Record*, vol. xii., p. 161).

Quinine (Neale's *Digest*, 1882, 989'4). TRANS.]

Quinoidine, 234

Sprain.

Sodium chloride, 243

Sunstroke.

Ammonia, in a case complicated with alcoholism, 51

[Antipyrin (3 grain doses in a 50 per cent. solution; causes little or no irritation). See two interesting cases recorded by Dr. Westbrook (*Medical Times and Gazette*, 1885, vol. ii., p. 410). In one of these cases after the injection of 3 grains of antipyrin the temperature fell in 35 minutes from 110° to 101°. TRANS.]

Quinine, 233

Syncope.

Alcohol, 49

Ammonia, 52

Ether, 135

Nitrite of amyl, 198

Nitro-glycerine, 200

NOTE. [Nitrite of amyl and nitro-glycerine will prove of service in those cases of syncope which are due to spasm of the vessels of the surface, and are characterised by small pulse and laboured action of the heart. This condition is sometimes seen in anæsthesia produced by ether, and, if not promptly treated, is one of imminent peril. In experiments on rabbits I have found that this effect of ether (which is very apt to occur in these animals) is quickly overcome by the administration of amyl nitrite. These phenomena probably find their explanation in the effects produced by various agents on the depressor fibres of the vagus nerve. Cyon has shown that the function of these fibres is to transmit impressions from the heart to the vasomotor centre, so as to inhibit the action of this centre, and thus cause dilatation of the smaller vessels. Now, if ether causes contraction of the smaller vessels while at the same time it paralyses the de-

pressor fibres, it follows that the heart will become fatigued by its efforts to force blood into the larger vessels where there is great arterial tension. The effect of amyl nitrite is to antagonise this action of ether. TRANS.]

Syphilis.

Calomel, 163, 164

Gold chloride, 77

Iodoform, 178

Metallic mercury.

Mercury bichloride with atropine, 151

Mercury bichloride with cocaine, 151

Mercury bichloride with morphine, 148

Mercury bichloride with sodium chloride, 150

Mercury biniodide, 151

Mercury with blood serum, 159

Mercury formiamidate (in mild cases), 158

Mercury glycolate, 159

Mercury with urea, 160

Pilocarpine, 210

Potassium and gold double cyanide, 153

Potassium iodide (of doubtful efficacy), 213

Potassium iodide with morphine, 215

Sodium iodide, 244

Tayuya, 259

Tabes spinalis (see Locomotor ataxy).

Teeth, diseases of (Toothache).

Chloroform, 96, (must be used with caution).

Cocaine, occasionally useful, 102

Iodoform, 178

Veratrine, 269

Tetanus.

Aconitine, 47

Atropine, 75. (Administered successfully by, among others, Mr. Greenwood, in doses of $\frac{1}{60}$ to $\frac{1}{20}$ of a grain every six hours, see *Lancet*, 1883, vol. ii., p. 725).

Calabar bean, extract of, physostigmine, and eserine, 82

Cannabis Indica, 90

Chloral hydrate, 95

Conine 107

Curarine, 115

Daturine, 115

[Morphine (combined with internal administration of nitrite of amyl) used successfully by Dr. Dunlop of Glasgow (*Lancet*, 1882, vol. i., p. 481). Morphine injections by themselves were tried unsuccessfully as far back as 1859 by C. Hunter. (Braithwaite's *Retrospect*, vol. xxxix., p. 56). TRANS.]

Narcotine, 197

Tic, convulsive.

Curarine, 115

Tremor.

Arsenic, 69

Calabar, extract (of little use).

Chloral hydrate, 95

Daturine, 115

Hyoscyamine, 169

Morphine,

Trismus neonatorum.

Physostigmine, 85

Tuberculosis.

Cannabis Indica (in chronic form), 90

Carbolic acid, 35

Quinine, 233

Quinoline, 236

Tubercular intermittent fever.

Quinine, 233

Tumours.

Cocaine, as a local anæsthetic before operation, 101

Osmic acid, 39 } by interstitial
Turpentine, 260 } injection.

Typhoid fever.

Ammonia, solution of, in collapse (*London Medical Record*, vol. xiii., p. 286).

Ammonium carbolate and carbolic acid, 35

Antipyrin, 54

Aspidospermine, 71

Ether in adynamia, 134

Eucalyptol and other microbicides, *Brit. Med. Jour.*, 1887, vol. i., p. 588

Milk, dilute, acts both as a nutrient and an antipyretic, 174

Musk, in adynamia, 192

Quinine and Quinoline, 226, 236

Sodium salicylate (as a rule unsafe).

Strychnine arseniate, 257

Water, iced, 62

Typhus fever.

Ammoniated alcohol (in adynamia), 49

Benzoic acid, 32

Quinine carbamide, 231

Ulceration (cancerous and syphilitic).

Iodoform, 178

Uræmia.

Antihydropin, 53

Benzoic acid, 32

[Morphine, to control convulsions, has been used successfully in a child of 6 years (*Brit. Med. Jour.*, 1885, vol. ii., p. 700).

Pilocarpine, 211. In two cases of post-scarlatinal convulsions in children I have used nitrate of pilocarpine lately with the happiest results. TRANS.]

Urticaria.

Benzoate of sodium.

Chrysophanic acid, 37

Vaginismus.

Atropine, 75

Cocaine.

Varices.

Ergotine, interstitially, 131

Vomiting.

Atropine, 75

Hydrocyanic acid, 39

Iodoform.

Morphine.

Sodium sulphate, 248

Solanine, 250

Zinc sulphate.

Water, 62

Worms.

Cedrine, 93

Wounds, sluggish.

Iodoform, 178

Writers' cramp.

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- Biniodide of mercury (*see* Mercury).
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PRACTICAL POINTS IN HYPODERMIC MEDICATION.

Alkaloids and active principles differ so much from poisons generally, in their proneness to decompose, that manufacturers have to take the greatest precautions, (putting them in coloured bottles, keeping them dry, &c.), in order that they may not undergo a change. Experiments (and indeed professional experience) with them in solution, or on gelatine, have shown what a mistake it is to keep them in solution. Even on the directions of a well-known ergotinin solution are the instructions to filter; and it is well-known that filtering does not remove all the trouble. How soon, too, a solution of apomorphine turns green; Meyer has shewn how easily pilocarpine can be changed into jaborine—an agent which acts like atropine. The employment of a "standing solution" of cocaine has been made to account for suppuration after operations on the eye. Codein, ergotinin, and sclerotinic acid, are also of a highly unstable nature, soon decomposing if precautions are not taken to preserve them. The cloudiness which occurs in all alkaloid solutions being due to the *penicilium* (growing at the expense of the alkaloids), a solution which has been long kept, although it may not be turbid, or if turbid has been filtered, will, when injected, often cause an indurated and painful swelling, which may remain for months, sometimes undergoing absorption slowly, and at others, suppurating.

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Curare	1/20 gr.
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*Ergotinin	1/300 and 1/150 gr.
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Morphine	...	1/6 gr.	...	"	1/180 gr.
Morphine	...	1/4 gr.	...	"	1/150 gr.
Morphine	...	1/3 gr.	...	"	1/120 gr.
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