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THERAPEUTICS

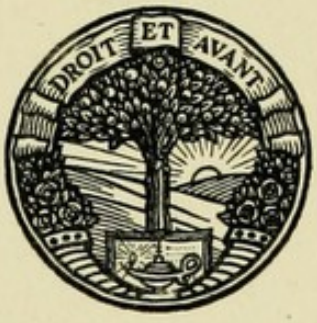
OF

INFANCY AND CHILDHOOD

BY

A. JACOBI, M.D., LL.D.

THIRD EDITION



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THIS BOOK, IN ITS THIRD EDITION, IS AGAIN INSCRIBED TO MY FRIEND AND LATE CHIEF OF CLINIC

DR. FRANCIS HUBER

IN DUE APPRECIATION OF HIS VALUABLE AND UNREMITTING SERVICES RENDERED THESE TWENTY-FIVE YEARS (UNTIL THE LAST HOUR OF OUR COMMON LABORS) TO ME, TO THE COLLEGE OF PHYSICIANS AND SURGEONS OF NEW YORK, TO OUR STUDENTS, AND TO NUMBERLESS CLINICAL PATIENTS

"Die Frucht der Heilung wächst am Baume der Erkenntniss. Ohne Diagnostik keine vernünftige Therapie. Erst untersuchen, dann urtheilen, dann helfen."

C. GERHARDT.

PREFACE TO THE THIRD EDITION

The past four years have not added very much to pedology as a special science and art, notwithstanding greatly increased literature and the contributions of many men active and well known in general medicine and pediatrics. The much-discussed subject of infant feeding has enjoyed its universal interest, as formerly; no unanimity of opinions, however, will ever be reached so long as infants insist upon being individualities. The author finds no reason to change to any great extent his convictions as laid down in previous editions on many questions connected with that subject; after all, the soundness of a man's teaching is best demonstrated by the soundness of infant digestion and the number of living and healthy children.

In this revision I have made many additions to my book, but no actual changes in its general character. The profession seems to have approved of my attempt at founding therapeutics on etiology. Their connection I have tried to make still closer, and the reader will find that in a concise manner much that belongs to pathological anatomy, etiology, and diagnosis is utilized in the interest of treatment. In this way the book, I think, is a comprehensive treatise on "theory and practice," the former being the foundation of the latter.

To those who offered available criticisms of former editions, and principally to those who by their writings during these few years added to my knowledge and suggested new thoughts, I herewith beg to express my best thanks. These are mainly due to the fifty-three gentlemen who contributed to the Festschrift published in my honor more than two years ago. Indeed, I know of no collection of fifty-three monographs on scientific and practical subjects, almost all directly connected with pediatrics, of equal value. It has been, as this book will show, a fruitful source of information to me, besides being the greatest honor that ever was conferred on me or on any other man. To all its contributors, both in this and in foreign lands, mainly to those whom I have not thanked in person, I take this opportunity of again expressing my heartfelt gratitude.

A. Jacobi.

19 East Forty-Seventh Street, New York,
January, 1903.

PREFACE TO THE FIRST EDITION

Much of what is contained in this work may be claimed as common property. Much of it I have taught before. Indeed, very few books can ever be written that will be entirely new. Pediatrics is not new to-day; nor was it so when, in 1860, I established the first systematic course, in our country, of clinical instruction in the diseases of children. Having since that time appeared before the medical public with essays and monographs only, I was repeatedly reminded by friends of my obligation to submit to the profession which has afforded me so many facilities and advantages a compact picture of the therapeutics of infancy and childhood as I have it in my mind.

A large part of this work is devoted to diet and hygiene, a good deal also to the consideration of the action of medicines. For, indeed, I believe in medicines. Advancing years and experience during a period of increasing exactness in medical methods have rather strengthened my belief than otherwise. What the knife is to the surgeon, drugs are to the physician. The knife does not make the surgeon, nor do medicines make the physician; both, however, are indispensable. To employ them with benefit takes skill and experience, both individual and collective, as also judgment and honesty.

Indications for the administration of medicines are furnished by etiology and symptomatology. Both of these occupy a prominent place in this book. Without a diagnosis of the morbid process and of its evolution, and without the appreciation of its influence on the patient, no rational therapy can be thought of. Consequently I have taken particular pains to offer clear, though brief, statements of differential diagnoses.

I have tried to write a book for those who are sufficiently prepared by previous studies to build their therapeutical measures on the foundation of an exact recognition of the conditions they have to deal with. It is intended for those to whom neither the principles of diagnosis nor the facts of materia medica are mysteries. Therefore, I have abstained from ornamenting my pages with numerous recipes. While aiming at accuracy in dosing, I have trusted, as regards the actual writing of prescriptions, to the knowledge and in-

telligence of the reader. On account of our present period of transition to the metric system, I beg to be pardoned for alternating the old method with the new.

In view of what I have included within the frame of this volume, it might almost claim the name of text-book. I prefer, however, to call it therapeutics only, intending to emphasize the fundamental truth that everything in medical science, in order to be both scientific and humanitarian, should be conducive to the prevention or to the cure of disease.

The preparation of this book has extended over a long period. The first essays embodied in it were published in the *Archives of Pediatrics* of 1888. As a consequence the reader may discover occasional incongruities, which, however, he will find to be more those of style than of matter.

A. JACOBI.

110 WEST THIRTY-FOURTH STREET, NEW YORK,
October, 1895.

PREFACE TO THE SECOND EDITION

THE revision of this book was begun immediately after its publication. The criticisms of reviewers and of correspondents have been carefully considered and taken advantage of. The final composition of the work as I now offer it represents the labor of a few months. In this way the drawbacks, resulting from the fact that the book which was commenced in 1888 was not published until 1896, were avoided.

Some of the chapters are entirely rewritten; a few new ones are added; there is hardly one that has not been somewhat enlarged or otherwise changed. Indeed, every page has been scrutinized. In order to adapt the book more to the wants of the practitioner I have, while still adhering to the general views expressed in my former preface, been more explicit in the discussion of doses of drugs, and have added to the text a number of prescriptions. Altogether I have tried to avoid verbosity, to condense my teaching in as few words as possible, and thus, while conveying knowledge to the beginner in a most concise shape, to offer the well-informed medical man a repertory of the science and art of modern pediatrics, with the addition of my own views and experience. The remark made by critics, that the book is a personal one, I wish to deserve.

A. JACOBI.

110 WEST THIRTY-FOURTH STREET, NEW YORK,
December 16, 1897.

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THERAPEUTICS

OF

INFANCY AND CHILDHOOD

I

Feeding of Sick Children

DIETETICS should be considered a part of therapeutics. The two must always go hand in hand. Ancient physicians knew the fact that many diseases are removed by a correct mode of living and nutrition; and the men who established therapeutical schools on certain positive principles or on preconceived ideas arranged their dietetical and their medicinal and surgical rules on the same basis. Thus, Broussais, among others, while he purged and bled, crowned his work with starvation to such an extent that Graves, in 1843, had to come forward with the declaration that the systematic starvation of the disease ended in the destruction of the patient. It was Chossat, finally, who proved that inanition had many of the symptoms of fever, and that a starvation diet was liable to increase the dangers of an illness.

Still, there are no universal rules for feeding, as there are none for medication. There are, however, certain indications which can always be fulfilled in the treatment of individual cases. As intellect and knowledge are required for finding these indications, so there is need of tact and experience to apply and fulfil them. Some of them are plain enough. It is clear that in conditions of great debility there must be no further reduction of strength; an irritated cerebrum should not be excited; hemorrhages, peritonitis, dysentery, perityphlitis, require absolute rest; a hyperæsthetic stomach must not be overfed; a gastro-enteritis resulting from the presence of ferments should do without milk; convalescence should be shielded and acute inflammatory fevers guarded. Still, there are chronic fevers with fair digestion which permit of generous feeding. All these indications and rules are equally valid for both the adult and the young. But

the latter have some peculiarities which alter the application of general rules to a considerable extent, for several reasons. Of these I shall mention but a few at this time. Habits, which play an all-important part in the nosology of adults, such as alcohol, narcotics, sexual abuses, are not observed—unless very exceptionally—in the child. Cardiac debility, which is the constant danger of the senile period, and a frequent one in the adult, is in the beginning of a morbid process not so frequent in the very young, partly because the heart, compared with the rest of the body, is larger and more powerful, and partly because it has not had so much time and opportunity to become diseased. On the other hand, general metamorphosis is very rapid in the young, because both of the rapidity of the vital processes and of the constant necessity of adding to the tissues of the body, besides keeping up the equilibrium. Therefore inanition through insufficiency or incompetency of food is not tolerated for a long time. The very fever referred to above appears to depend on the absorption and elimination of albuminoids, both those which are stored in the tissues and those which are circulating in the blood, and of the disintegrated carbohydrates. Thus the child cannot long remain without being fed, and, therefore, its digestive organs require permanent attention. Their physiology must be carefully studied both in the healthy and morbid conditions. What the child eats is important, but of little consequence compared with what it digests. Nor are its subjective sensations the proper guides for the selection of foods or for the times of feeding. It is not always true that when there is no appetite there is no digestion. Nor are the pangs of hunger or the temptations of whimsical cravings safe counsellors. Nor does the condition of the tongue, to which we are apt to turn as one of our advisers in many of the ailments of the adult, deserve the same confidence in the young, for the frequent local processes in their oral cavities are apt to mislead us in regard to their significance.

The feeding of sick infants and children must be a modification of their normal feeding only, in the same way that their ailments and diseases are only modifications or changes brought about by abnormal influences in their physiological conditions. That is why the question of normal feeding for both infants and children should be the first to be answered. Then only the duty of altering the normal food to meet the requirements of aberrations from the usual healthy condition is to be taken into consideration.

For the newly-born and the infant the proper food is his mother's milk, if any be secreted, both in health and illness, or the milk of

some other woman if there be no mother or no maternal breast, always provided it agrees with him. For milks are not identical. A baby may thrive on the milk of one woman and not on that of another; and the constituents of woman's milk are only "more or less constant" (Monti). Johannessen and Wang (*Zeitsch. f. phys. Chemie,* vol. xxiv.) found in breast-milk the following differences: albumin 0.9 to 1.3 per cent., fat 2.7 to 4.6 per cent., sugar 5.9 to 7.55 per cent. They also found the amount of sugar to be less, but that of albumin and of fat larger towards the end of nursing, and the fat to reach its minimum in the course of the night. Indeed, the tens of thousands of recorded analyses of woman's milk are contradictory; no two are alike. Besides, a woman's milk will change during nursing from minute to minute, from morning to night, by variety of food, state of health, menstruation, lactation, emotions, etc. But, after all, human milk is *the* food for the human young. Modifications, however, are indicated during illness. As a rule, the quantities of food supplied during illness should be less because less is digested; feverish diseases require less substantial food and more water; in fact, water may have to replace the former altogether temporarily; indeed, there are conditions in which even woman's milk is not borne at all. In gastritis no food and no water are tolerated; in enterocolitis milk may not be permitted, and cereal decoctions or a mixture of egg albumin and water may have to take its place.

Such and similar changes, if required even for those who are fed on the most normal substance, are demanded when artificial feeding has to take the place of breast-milk. Now, the majority of our babies are in that position, either from birth or soon after, and the question of the methods of procuring the most advisable food for infants has for that reason engaged the anxious attention of the profession. Whatever is the best artificial food in health is the best in disease, with such modifications as are required by the changed physiological conditions.

No artificial food for the infant can be thought of except the milk of some animal,—viz., the cow,—which is the only one that is accessible in the vast majority of cases, with the exception of the goat, or the ass, in some localities. That is why a brief consideration of the physical and chemical properties of cow's milk, compared with those of human milk, should precede the discussion of the mode of its administration, whether pure or mixed or modified.

The differences between the casein of woman's and of cow's milk have been studied extensively since Hammarsten (one-third of a century ago), but to this moment it is not clear whether the albuminoid

which is found (more in the woman than in the cow), besides casein, is coördinate to it or derived from it, and the result of disintegration. Koplik even asserts that woman's casein contains an additional albuminoid which is not identical with either the known casein or albumin (*N. Y. Med. Jour.,* April 13, 1895). In Immanuel Munk's opinion (*Virch. Archiv,* vol. cxxxiv.), the part played by nitrogen in the albuminoids of woman's and cow's milk is different. There is more syntonin in cow's milk casein and more lime (6.6 per cent. compared with 3.2 per cent. in woman's milk—Lehmann), more phosphorus in woman's milk (0.84) than in cow's milk (0.68), less sulphur in woman's milk (0.75) than in cow's milk (1.11). "Lab" ferment coagulates cow's milk in coarser lumps than it does woman's milk, and the nature of this coagulation depends also on the introduction of milk-sugar, of fat, of sodium chloride, or of dextrinized or other flours.

According to Schlossmann, of the albuminoids in woman's milk sixty-three per cent. are casein, thirty-seven per cent. lacto-albumin, which being directly absorbable constitutes an essential difference from cow's milk; all of the latter has to be transformed during the digestive process before it can be assimilated.

The casein of woman's milk is not so easily thrown out by acids—for instance, lactic acid or salts—as that of cow's milk, and is more readily dissolved in an excess of acid. Some years ago Wroblewski demonstrated the difference in solubility of the two milks. Woman's casein retains, during pepsin digestion, its nuclein (proteid rich in phosphorus) in solution: it is fully digested; in cow's casein the nuclein is not fully digested: a "paranuclein" is deposited undissolved and undigested.

K. Wittmaack and M. Siegfried published lately (*Zeitsch. f. phys. Chem.,* vol. xxii.) their essays on the nucleon (the phosphoric acid of muscle) in the milks of cow, woman, and goat, and on phosphorus in the milks of the cow and the woman. Their conclusions are accepted by E. Salkowski as correct, which, I should say, proves them to be so. Cow's milk contains 0.057, goat's milk 0.110, and woman's milk 0.124 per cent. nucleon. In cow's milk the phosphorus of the nucleon amounts to six per cent. of the total amount of phosphorus contained in the milk; in woman's milk 41.5 per cent. That means that in cow's milk not one-half of its phosphorus is in the organic combinations of casein and nucleon; in woman's milk almost all of it. In cow's milk the phosphorus not utilized for organic combinations is contained in the inferior phosphates. E. Salkowski adds the following remarks: "These conditions are evidently of the greatest moment

in the nutrition of the nursling. As the development of bones is more readily accomplished in nurslings fed on woman's milk than in those fed on cow's milk, the probable conclusion is this: that nucleon has an important part in the absorption and assimilation of phosphorus. The same should be said of calcium, which also combines with nucleon. Though woman's milk contains less calcium than cow's milk, more calcium is utilized out of the former, and the nucleon is evidently an important factor in its absorption also."

A certain amount of FAT is digested even in fevers of moderate severity, thus also in typhoid fever. But it is a good rule to rather reduce its quantity, because when infants were fed on cow's milk during capillary bronchitis, the fat in the fæces amounted to forty per cent. of the solid constituents. A few additional remarks will render the subject clearer, and show that it is very easy to give too much fat.

Infant fæces are comparatively copious, although the baby receive absolutely nothing but mother's milk. What has been called detritus in the fæces is not exclusively undigested casein, but principally fat and large masses of intestinal epithelium; for this so-called detritus is not soluble in water, acids, or alkalies, but quite soluble in alcohol and ether. Casein is present only when it has been taken in too large a quantity, or when there is too much free acid in the stomach. In those cases there are large quantities of it in the fæces. The normal fæces of the infant, according to Wegscheider, contain nine per cent. of fat; according to Heubner, nearly six per cent.; according to the same authority, the infant with "weak intestines" would expel fifteen per cent. of the fat introduced into the stomach. Besides, W. Knöpfelmacher (*Wiener med. Woch.*, No. 30, 1897) found that the fat of the fæces of the adult and advanced child while they were fed on milk consisted of from twelve to twenty per cent. of olein, of which the larger portion came from the digestive juices, the smaller from the unabsorbed fat of the milk. The fecal fat of the nursling, however, contained from 28.8 to 37.8 per cent. olein, only five per cent. of which was due to the digestive juices; all the rest belonged to the unabsorbed milk fat. Thus, we may conclude that the latter is less utilized by the nursling than by the adult.

One of the reasons for adding fat (cream) to cow's milk to make it a more appropriate food for the infant was its alleged low percentage in fat. Still, in a large number of analyses, though they differ ever so much, the percentage of the two milks is by no means very dissimilar. Söldner has 3.28 per cent. of fat in woman's milk; Marfan, who draws the average from the results of a number of analytic

chemists, gives us 3.7 per cent. for cow's and 3.8 per cent. for woman's milk. In the face of such facts the addition of fat (cow's cream) to cow's milk to make it more similar to woman's milk does not appear very rational.

Moreover, the fat of cow's milk differs from that of woman's milk. The latter has more oleic acid, less volatile acid than cow's milk; woman's milk holds its fat in a finer emulsion and contains from two to four times as many fat-globules as are counted in equally fat cow's milk (Schlossmann). This condition makes it more digestible; it is assumed, and reasonably so, that the fine fat-globules may be absorbed directly through the epithelia or of the intestinal villi. Moreover, cow's milk fat undergoes changes before it is used. When cream is taken after slow rising it is apt to acidulate, when sterilized and centrifuged it is changed chemically and physically, when frozen it separates from the milk and does not mix again.

All of these facts and considerations and the low percentage in fat of ass's milk, which was known to agree best with nurslings and to be inferior to woman's milk only (according to Vernois and Becquerel's analyses made fifty years ago), have led me to reduce rather than to increase the fat of cow's milk used for infant feeding. I meet with no fat diarrhœa and no excessive acidity when babies are fed according to that rule.

H. von Ranke's recent favorable experiences with ass's milk (Festschrift in honor of A. Jacobi, New York, 1900) administered to young infants, one of whom did not thrive at all previously, Klemm's report (Dresden, 1898) on ass's milk employed for two or three months, Marfan's corroborative opinion ("Allaitement," p. 299), and the earlier results of Parrot and West leave no doubt as to the favorable effect of ass's milk, with its low percentage of fat, at all events in the first few months of infant life. Ass's milk is digestible and wholesome not in spite, but because of its low percentage of fat, and in spite of its albuminoid being contained in larger quantities in ass's than in woman's milk.*

What is proven for babies in the first months I also claim for older infants. For them some fat may be added to ass's milk, perhaps, while the stools are being watched for undigested cream, but

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* According to Bunge (Phys. Chemie, 4th ed., 1899), there is in the milk of

	Women. Per cent.	Cows. Per cent.	Asses. Per cent.
Albuminoid	1.7	3.5	2.3
Fat	3.8	3.7	1.6
Ash	0.2	0.7	0.5

I know that they do better with less fat than under the influence of laboratory analyses, no two of which are alike, is generally considered their due. I insist that a series of clinical observations made prudently and critically and extensively must and will be esteemed as equivalent to the results of measures and scales and microscopes; I say equivalent, neither superior nor inferior, for there is no more virtue in the limited and boastful experimenter than in the one-sided and narrow practitioner. That is why to me it has been a source of great satisfaction to notice that in the writings of the last few years clinical experience is frequently appealed to and called in as evidence; and from that point of view I again appeal to the medical profession to revise theories and practices that I firmly believe to be wrong and dangerous.

An important practical application of this fact is the following. As it is true that fat is not completely absorbed, even under the most normal circumstances; as free fat acids are so easily formed and accumulated; as they are found in moderate quantities, even in healthy babies; as a surplus is very apt to derange digestion and assimilation and prevent the normal secretion of either of the digestive fluids; as there is a superabundance of fat in the normal food of the nursling, the conclusion is justified that we should be very careful in preparing foods for the healthy or sick. It is very easy to give too much fat. It is hardly probable that there is too little.

V. and I. S. Adriance have succeeded in proving, by exact chemical and clinical researches, some facts which were known, but perhaps not sufficiently appreciated. Both excessive fats and proteids in the milk of the mother may cause gastro-intestinal symptoms in the nursing infant; the former may be reduced by diminishing the nitrogenous elements in the mother's diet; the latter by the proper amount of exercise. Excessive proteids are especially apt to cause gastro-intestinal symptoms during the colostrum period, and particularly during that of premature confinement, when their percentage is higher. Premature infants are, therefore, in particularly great danger, and their food ought to be greatly modified and watered.

Under the head of "Fat Diarrhœa," German journals and a few text-books speak of a diarrhœa the chief characteristic of which is the presence of a large quantity of fat in the stools.

The normal fæces of the newly-born exhibit ten or twelve per cent., sometimes more, of fat. In abnormal cases, even when the food does not contain it, the fæces may show from forty to seventy per cent. of fat.

In serious cases the microscope reveals fat, almost to the exclu-

sion of everything else, sometimes pure, and other times in more or less regular needles. The anatomical condition in fat diarrhœa may vary, but in the majority of cases we have to deal with a simple catarrh of the intestinal tract. There are changes in, and exfoliation of, the epithelium of the small intestine, swelling of the mucous membrane of the duodenum, with obstruction to the flow of the secretions of both liver and pancreas, and such hyperplasia of the mesenteric lymph-bodies as to impede the absorption and circulation of chyle. Finally, in a very few instances, anatomical changes were found in the pancreas resembling those which in the adult interfere with the emulsion of fat. In such cases the use of pancreatin appears to be indicated.

No improvement is possible unless the quantity of fat contained in the food be largely diminished. The administration of cream and the routine treatment with cod-liver oil are equally injurious in these cases; for even normal digestion disposes only of a limited quantity of fat (cream, butter, cod-liver oil); twenty-five per cent. of it in the food, as lately recommended (*Berliner klinische Wochenschrift,* June 14, 1897), is excessive. One of the preparatory stages of its assimilation is the formation of oleic acid; lipanin, which has been recommended in place of cod-liver oil, contains six per cent. of that acid, the physiological preparation of which the body is spared by its administration. There may be very few conditions in which the digestion is so low as not to insure the required transformation, but in chronic dyspepsia of different sorts fat is badly digested and absorbed, and lipanin may take its place.

An excess of fat in infant foods is considered faulty, if not dangerous, by almost every author, though Schlossmann pronounces the belief in the injuriousness of fat to be "antiquated." (Nor is the assertion of Voit, that the carbohydrates, by their power to prevent the loss of fat and albumin in the tissues, may take each other's places, so that fat, sugar, or sweets could be mutually substituted, justified by experience.) What I have wished to impress, however, is that an apparent lack of cow's milk cream is by no means a fault. Practical experience proves its good results, and its low percentage in a mixture which is greatly diluted is in reality only apparent. The diluting element is mostly water, which when containing salts and sugar is readily absorbed even in the stomach, and for that reason is no disturbing element in the relative proportion of the constituents of the artificial food.

Infants' food ought to be mixed with large quantities of water, not

for the sick only, but under ordinary circumstances. In diseased conditions of the stomach when pepsin and hydrochloric acid are wanting the free dilution of children's nourishment with water is demanded upon the following physiological facts. Only to a certain limit, if at all, will pepsin be furnished for digestive purposes. Probably a portion of this is not entirely utilized, because a great quantity of water is necessary to assist in pepsin digestion. In artificial digestion albumin often remains unchanged until large quantities of acidulated water are supplied. Without doubt many disturbances of digestion are to be explained by a deficiency of water, certainly many more than are due to an apparent excess of it, for the latter, particularly when containing salts or sugar, is speedily relieved by rapid absorption.

For the reasons given, I advocate under all conditions a plentiful addition of water to children's food. As a general observation, I would lay stress upon the fact that, as a rule, small children receive water only as they get it in their milk or milk food. Alike in summer and in winter, it is probable that the fact seldom occurs to a mother or nurse that a child may be thirsty without being hungry at the same time. Certainly, many a discomfort and even sickness in a child is conditioned upon the fact that it has been compelled to eat in order to satisfy its thirst, and often has to suffer thirst because the overstimulated and injured stomach will take no more nourishment at irregular and too short intervals. There are even normal products of digestion that are capable of disturbing the digestive process, chief among which is peptone itself, which is not absorbed unless it be greatly diluted. That is why I, when preparing the rules for the feeding of children, which the New York Health Department annually published and distributed through several decades, insisted upon giving infants, who cannot ask for it in so many words, an occasional drink of water, particularly during the hot weather. When there is the least ground for the supposition that the drinking-water is contaminated with germs of disease, or when it is unusually hard, it should be boiled before its admixture with children's food, whether the diet be milk or a mixed one. In general it will be most satisfactory to give very young infants boiled water as a matter of course, even though there be no apparent urgency for it.

There are many other indications for the administration of water in the diseases of the young. In many morbid conditions it is wanting. Perspiration, diarrhœa, general inanition, feverish diseases, diminish its quantity in the tissues and in the blood-vessels. Thus an inspissation of the blood takes place; thromboses form in the small veins of distant parts or the viscera; in the brain they lead to convul-

sions and defective innervation (hydrencephaloid), in the limbs to œdema or gangrene. The remedy is water in sufficient quantities. When the stomach rebels, the hungry lymph-ducts of the rectum will greedily absorb an ounce or much more, injected every hour or two. In many a case life is saved in this manner. In extreme cases the subcutaneous infusion of a sterilized salt-water solution (6 to 1000) is required. From two to six hundred cubic centimetres (six to twenty ounces) will readily be absorbed in the subcutaneous tissue.

When general metamorphosis is slow, water in abundance increases the elimination of urea and carbonic acid. When the urine is scanty and of too high a specific gravity, water protects the kidneys from undue irritation. It acts on the mucous membranes as it does on the external integuments. In laryngitis and bronchitis it liquefies viscid expectoration, in many forms of constipation it acts beneficially by increasing the secretion of the muciparous glands of the intestines. Ice and ice-water, or iced carbonated water, in small quantities, but frequent doses, relieve hyperæsthesia of the stomach and stop vomiting. Warm water acts as an emetic, hot water injected into the rectum combats collapse. In connection with this subject, however, I may allude to what good may be done by abstinence from water. In some forms of acute gastro-enteritis, where vomiting and diarrhœa are excessive, the only salvation is in total abstinence for from four to eight or ten hours. Not infrequently the turning-point in the course of the threatened danger dates from the commencement of what appears to be cruel starvation.

A regular addition to the milk food of infants and children is that of SUGAR. Its percentage in the milk of the woman, ass, and mare is larger than in that of the cow. Immediately after the milking of the cow the milk-sugar begins to change into lactic acid. This process, after rennet has exerted its coagulating effect, together with the gradual conversion of fat into acid, is the final cause of curdling. The large amount of sugar (after the first week of life) in woman's milk, together with its smaller percentage of casein (about one per cent.) and butter, gives it the peculiar bluish color and furnishes the colostrum of the first days after birth—which contains plenty of salts besides—its tendency to loosen the bowels. This property becomes manifest, sometimes under abnormal circumstances. Thus in the milk of anæmic women sugar is occasionally found to an unusual degree. In their cases the other solid matters may, however, be diminished; still, this is not uniformly so. In such instances the infants are liable to suffer from obstinate diarrhœa.

The conversion of milk-sugar into lactic acid takes place very rapidly. Under its influence cow's milk turns sour at once. Not infrequently, however, it is acid from the first: it has been found to be so in the udder; in most cases it is "amphoteric," neutral. Thus the question arises what kind of sugar is to be used as the addition to the food of children both well and sick, provided the milk-sugar of woman's and that of cow's milk be identical, which is very doubtful, and provided further that the milk-sugar in the market be not, as it frequently is, impure. That alone makes it desirable, or rather advisable, to substitute cane-sugar for milk-sugar if the former afford the same advantage. These four dozen years I have made this substitution. For their absorption is about as easy, even in the stomach, as that of dextrin, peptone, and salt solutions.

Most of the milk-sugar of the milk is changed into lactic acid by the bacterium lactis aërogenes and a number of other bacilli. When eight-tenths of one per cent. of the milk-sugar contained in the whole milk in the stomach is changed into lactic acid, no more lactic acid is produced. Ordinarily, however, this limit is reached when about one-fourth of the milk-sugar has been changed into lactic acid. If at this period, however, lactic acid be neutralized by an alkali, then more milk-sugar is changed into lactic acid. In this way the amount of lactic acid present in the digestive tract depends on accidents only,—that is, mainly on the presence or absence of an alkali,—and it appears that in every preparation containing cow's milk that is selected for the use of an infant there is milk-sugar enough to supply the needs of the digestion of the whole ingesta. Moreover, a goodly part of the milk-sugar introduced, even in woman's milk, is eliminated unchanged, for Blauberg ("Studien über Säuglingsfäces," p. 55) found the nursling's desiccated fæces to contain from 0.22 to 0.59 per cent. of milk-sugar. Escherich found that peptones which form in milk previous to normal absorption are destroyed by acid fermentation, and concludes that for that reason another carbohydrate should take the place of milk-sugar in order to avoid the excess of lactic acid.

It appears after all this that it *is easier to give too much milk-sugar than too little,* and that the careful measuring and weighing of copious quantities of milk-sugar are of doubtful value, even if you know, or believe you know, that the milk-sugar you give and the milk-sugar of woman's milk are identical. Immediate fermentation in the intestine, moreover, should be carefully avoided for other known reasons. Lately Dr. Helen Baldwin has published (*Journal of Experimental Medicine,* vol. v.) investigations which prove the

formation of oxalic acid as the result of intestinal fermentation. It appears, therefore, that my method of adding to the cow's milk mixtures destined for infants and children, not milk-sugar but cane-sugar, in moderate quantities estimated rather than anxiously weighed, was correct and justified by modern research.

Cane-sugar is not so easily transformed. Indeed, it is utilized for the purpose of counteracting the rapid conversion of milk-sugar and for the preservation of articles of food in general. Trade is not so slow in availing itself of the results of organic chemistry as the profession. Condensed milk remains unchanged a long time, on account of the plentiful addition of cane-sugar, in spite of the original presence of milk-sugar in it. That is why condensed milk, though not an ideal food or food constituent at all, is still a beneficent make-shift for something better among the hundreds of thousands in our large cities to whom good milk, or approximately good milk, is inaccessible. Many manufacturers of proprietary foods employ grape-sugar instead of milk-sugar, reminding us that every sugar is changed into grape-sugar. Cane-sugar is most accessible, serves the same purpose, and is of the same composition as milk-sugar ($C_{12}H_{22}O_{11} + H_{22}O$). Therefore it is not at all an indifferent matter whether milk-sugar or cane-sugar be added to the food of infants and children. I have always insisted upon the selection of the latter for that purpose. Biedert employs cane-sugar in his cream mixture, Marfan sees "no inconvenience" in using it.

Joseph Prechtl (*Jahrb. f. Kinderh.*, vol. liii., 1901) doubts the propriety of adding milk-sugar to infant milk, for the reason that it coagulates the casein of the cow's milk. In the latter, casein is kept in solution by calcium phosphate, which is decomposed by lactic acid. The result of this chemical decomposition is the throwing out and the coagulation of casein. Normally, cow's milk contains three times as much casein as does human milk and much less milk-sugar (3 to 5 or 6). In this relative proportion cow's casein remains in solution. When this proportion is disturbed by adding an undue quantity of milk-sugar to cow's milk (say as much as is contained in woman's milk) the lactic acid formed out of it makes its casein indigestible through coagulation. The proper quantity of milk-sugar (which is always insisted upon by professional dietarians) to go with a cow's milk mixture ought to be the relative quantity met in cow's milk which keeps cow's milk in solution, and not the percentage of milk-sugar as contained in woman's milk which is in excess in its relation to cow's milk casein. It is only woman's casein that, though in a percentage three times smaller than that which is contained in

cow's milk, is not thrown out by its larger quantity of (milk-sugar-born) lactic acid.

All of which proves that the casein of the cow and the casein of the woman are chemically different, and that the practice of adding the weight of milk-sugar required to keep woman's casein in solution is in excess of that which is tolerated by that of the cow.

In the sick the absorption of sugar is slower than in the healthy. Besides, during most diseases, particularly those of the alimentary canal, there is more abnormal ferment in the mouth and stomach. Thus but little sugar ought to be given, and never in a concentrated form. Grape-sugar and dextrin are absorbed equally. Cane-sugar, according to Pavy, is partly inverted into grape-sugar and partly absorbed. All appear to be changed, when given in moderate quantities, into carbonic acid and water, even during moderate fevers.

Large quantities of milk-sugar cause diarrhœa; that is why it has been recommended as a purgative, and why dyspeptics bear so much less of it than even the healthy. Cane-sugar does not have the same effect to the same extent, but in that form of constipation of small infants which depends on a relative absence of sugar and superabundance of casein in the breast-milk, the addition of sugar acts very favorably. A piece of loaf-sugar (a teaspoonful or less) dissolved in tepid water (or oatmeal water) should be given before each nursing, and will often prove the only remedy required to regulate the bowels. On account of this gently purgative effect cane-sugar is frequently given by the attendants to the new-born in warm water or in some warm aromatic tea. Such a medication is rarely demanded, for meconium is not often so solid or the mucus of the colon so inspissated as to require dilution. Still, there are occasional indications for interference. But A. Keller declares sugar to be by no means indifferent or uninjurious, and advises saccharin instead, "to which there can be no serious objection." Nothing but "tea" with saccharin should be given the first day of life, because "Jansen made experiments on newly-born calves with boiled milk, which almost always resulted in hemorrhagic diarrhœa" (!).

The physiological effect of SODIUM CHLORIDE is very important, no matter whether it is directly introduced through the mother's milk or added as a condiment to cow's milk or to vegetable diet. Both of the latter contain more potassium than sodium, and neither ought ever to be given, to the well or sick, without the addition of table salt. A portion of that which is introduced may be absorbed in solution; another part is, however, broken up into another sodium salt and hydrochloric acid. Thus it serves directly as an excitant to the secre-

tion of the glands and facilitates digestion. Therefore, during diseases in which the secretion of gastric juice is interfered with, or in the beginning of convalescence, when both the secreting faculties and the muscular power of the stomach are wanting, and the necessity of resorting to nitrogenous food is apparent, an ample supply of salt ought to be furnished. The excess of acid which may get into the intestinal canal unites with the sodium of the bile in the duodenum, and assists in producing a second combination of sodium chloride, which again is dissolved in the intestines and absorbed. Its action in the circulation is well understood: it enhances the vital processes, mainly by accelerating tissue-changes through the elimination of more urea and carbonic acid.

A very important fact is also this: that the addition of sodium chloride prevents the too solid coagulation of milk by either rennet or gastric juice. Thus cow's milk ought never to be given without table salt, and the latter ought to be added to woman's milk when it behaves like cow's milk in regard to solid curdling and consequent indigestibility.

Habitual constipation of children is also influenced beneficially, for two reasons: not only is the food made more digestible, but the secretions of the alimentary canal, both serous and glandular, are made more effective by the presence of sodium chloride.

What is it that a sick infant or child ought to eat? That question is so grave because the young when quite well are easily disturbed in their health by mistakes in their diet; indeed, the large majority of the diseases of infancy are those of the alimentary canal; and an error in diet during the course of a disease is liable to prove fatal. Advanced childhood is not so endangered; that is why my first remarks are due to infancy. If the literature dedicated to its physiological and pathological conditions were as profitable as it is copious, the gain would be immense by this time. For, indeed, the hygiene and the pathology and therapeutics of early age do not lack contributions. Particularly the former, being the main prop and staff of infant (as of all) therapeutics, has roused the zeal and industry of many workers, among them some of the very best of modern times.

In feeding the sick, no new principles must be sought for. The sick child is still the child, and the physiological laws hold their own under changed circumstances. No new articles of food can be discovered or invented, only the preparation or mixture of those in ordinary use may change temporarily, or a restriction in their number or amount may take place. Thus, I cannot undertake to give in full the

methods of feeding infants and children. In several previous publications I have done so, and must refer to them. I will only repeat a few rules, leaving the reasons for them to the thoughtfulness or the recollection of the reader.

The principal SUBSTITUTES for breast-milk are those of the cow and the goat. The mixed milk of a dairy is preferable to that of one cow. Cow's milk must be boiled before being used. Condensed milk is not a uniform article, and its use precarious for that and other reasons; still, to a great extent, under our present social conditions, unavoidable. Goat's milk contains too much casein and fat, besides being otherwise incongruous. Skimmed milk obtained in the usual way, by allowing the cream to rise in the course of time, is objectionable, because such milk is always acidulated. The caseins of cow's and woman's milk differ both chemically and physiologically. The former is less digestible. There ought to be no more than one per cent. of casein in every infant food. Dilution with water alone may appear to be harmless in many instances, for some children thrive on it. More, however, appear only to do so; for increasing weight and obesity are not synonymous with health and strength. A better way to dilute cow's milk, and at the same time to render its casein less liable to coagulate in large lumps, is the addition of decoctions of cereals or, as Biedert says, dextrinized flours (malt). It will be shown that a small amount of starch is digested at the very earliest age. But cereals containing a small percentage of it are to be preferred. Barley and oatmeal have an almost equal chemical composition; but the latter has a greater tendency to loosen the bowels. Thus, where there is a tendency to diarrhœa, barley ought to be preferred; in cases of constipation, oatmeal. The whole barleycorn, ground for the purpose, should be used for small children, because of the protein being mostly contained just inside and near the husk, and perhaps also on account of its fair percentage of iron. The newly-born ought to have its boiled milk (sugared and salted) mixed with four or five times its quantity of barley-water, the baby of six months equal parts. Gum arabic and gelatin may also be utilized to advantage in a similar manner. They are not only diluents, but also, under the influence of hydrochloric acid, nutrients. Thus, in acute and debilitating diseases which furnish no, or little, hydrochloric acid in the gastric secretion, a small quantity of the latter, well diluted, must be provided for. This, my method of infant feeding, which is suited to the stomachs and purses of the rich and poor alike, is, however, not the only one proposed and found satisfactory. No single method, indeed, is the only one, nor does it suit every case. It is only an occasional chemist

who expects the organic stomach to behave like a chemical reagent; clinicians, however, admit exceptions to the working of their rules and regulations, though their conception were ever so correct and physiological. Still, the endeavors to improve the diet of the young, and thereby to remove the dangers of intestinal disorders and the sources of excessive mortality and invalidism, are going on. Nothing has been more successful in that direction, in spite of such dangers as will be mentioned below, than a rational practice of sterilization and pasteurization of cow's milk. Both are the logical development of the plan of treating milk by boiling which I have persistently advised these forty years at least, and detailed in my "Infant Diet," in Gerhardt's "Handbuch," in Buck's "Hygiene," in "Intestinal Diseases of Infancy and Childhood," * and in my clinical lectures delivered these more than forty years. There can hardly be a doubt that if raw milk could always be had unadulterated, fresh, and untainted, and as often as it was wanted, it would require no boiling. It would even contraindicate it, for high temperatures destroy not only some of the dangerous, but also those bacteria whose action is desirable for normal digestion. Besides, there are those who justly believe that boiling causes chemical changes. But such ideal milk can rarely be had so long as cows are tuberculous, or scarlet fever and diphtheria are met with in the houses and about the clothing and on the hands of the dairymen and women, and typhoid stools are mixed with the water which is used for washing utensils.

Now, what is it that boiling can and will do? Besides expelling air, it destroys the germs of typhoid fever, Asiatic cholera, diphtheria, and tuberculosis, also the many bacteria which cause the change of milk-sugar into lactic acid and the rapid acidulation of milk with its bad effects on the secretion of the intestinal tract. Some varieties of proteus and most of bacterium coli are also rendered innocuous by boiling. Thus it prevents many cases of infant diarrhœa and vomiting, but not all of them, for the most dangerous bacteria are influenced neither by plain boiling nor by the common methods of sterilization. Besides, "diarrhœa" is but a symptom of many causes, and "cholera infantum" is a name for a condition occasioned by

* Page 18. "After boiling, milk destined for the use of a baby during the day should be kept in clean bottles containing from three to six ounces, filled up to the cork, and the bottles then turned upside down in a cold place; such will keep longer than milk preserved in the usual way. Before being used it should be heated in a water-bath; and by repeating this heating of the whole amount of the day's milk several times during the twenty-four hours, fermentation will be retarded and digestibility improved."

many. Indeed, Ebstein emphasizes the fact that babies at the breast are subject to cholera infantum, particularly in southern climates, also in public institutions. The influence of external temperature is a very important factor; its sudden changes produce intestinal disorders. Babies taken from a hot railroad car to the deck of a lake steamer, from a warm bed to a draughty room, or those that are kept outside their beds with wet diapers, may develop a catarrhal enteritis which disposes to worse forms of disease, for the morbid condition of the epithelium caused by such sudden changes is a proximate cause of disease because it opens the way to all sorts of infecting substances. Poisons in the food of cows, indigestible baby foods,—either indigestible *per se* or through a morbid condition of the digestive organs,—produce diarrhœa of many varieties. It need not even depend on ingested food, for, according to W. Schild's careful investigations (*Zeitsch. f. Hyg. u. Infect.,* vol. xix.), since confirmed, germs of diseases may be found in the intestine of the newly-born in from ten to seventeen hours after birth (minimum four, maximum twenty). The meconium of the newly-born, being free of germs, is supplied through the mouth with the bacterium coli, and through the anus with the bacillus fluorescens, subtilis, and proteus. Even adults are infected through the same inlet. Linen, the bath, the air, the blood, and perhaps more than anything else the hands of the nurse are sources of local invasion. In such cases what is the sterilization of artificial foods to accomplish? They are not reached by it.

Not even the natural food, breast-milk, is free of germs possibly attended by dangers. M. Cohn and H. Neumann found germs in the healthy breast-milk, even after the mamma and nipples had been washed with alcohol and with solutions of corrosive sublimate. A. Palleske met with the staphylococcus pyogenes albus in one-half of all healthy women, F. Honigmann (*Zeitsch. f. Hyg. u. Infect.,* vol. xiv.) in most of them, and H. Knochenstein (Inaug. Diss., 1893) in the mammæ of eight puerperal and nursing women. He thinks they had emigrated from outside; they proved innocuous. But who can doubt that if the epithelium of the milk-ducts had been abnormal there would have been a chance for mastitis, or if the staphylococcic milk had come in contact with a sore stomach or intestine there would have been an opportunity for gastritis or enteritis? Many more observers have come to the same conclusions. Several species of cocci, particularly staphylococcus pyogenes albus, are found in most (perhaps in all?) specimens of the milk of healthy women. In that of sick women many more bacteria may be met with; for instance, streptococcus albus, streptococcus pyogenes aureus (in mastitis by

Cohn and Neumann), coccus pneumoniæ (in pneumonia of the mother by Foa and others). Puerperal women with fever had several bacteria in their milk (Escherich). Whether such milks are safe cannot yet be either asserted or denied.

Boiling, or sterilization, is by no means a safe protection under all circumstances. Aërobic bacteria, the so-called hay or potato bacilli, have very resistant spores, which develop in time. They are found in cow-dung and in the dust of stables, of the soil and streets, and of hay; they render the milk strongly alkaline and bitter; they peptonize casein and liquefy it and make the milk still more bitter. They are very poisonous; their pure culture gives young dogs a fatal diarrhœa. It takes hours of sterilization to kill them; in some instances it required five or six hours. Even the bacillus butyricus takes an hour and a half. But such a protracted sterilization, besides being far from certain in its effect, is a clumsy procedure and one not calculated to benefit the milk. Thus, hay feeding is an absolute necessity, if cows are to give a milk fit to be taken by babies, for by a six weeks' drying the bacilli are destroyed. Besides, it is important to keep the stables scrupulously clean, to avoid dirt and dust, to employ peat instead of straw for bedding, to wash the udder and tie the tails before milking, to throw away the first milk, and to remove foreign material from the milk by filtering. Centrifuging for that process is not safe, for it may change the character of the milk. But no absolute security can be guaranteed. Indeed, there are exceptions to this universal efficacy. Heins found cholera bacilli in sterilized milk after four weeks, typhoid after four months, and according to Dr. Lydia Rabinowitsch (*Deutsche med. Woch.*, 1900, p. 490), experiments made in the Institute for Infectious Diseases in Berlin appear to prove that occasionally tubercle bacilli are not killed by less than 100° C. Organisms surrounded by fat seem to require more than the average heat to be destroyed; in accordance with the findings of Ignard, which appear to prove that unsterilized butter would preserve cholera and tubercle bacilli much longer than unsterilized milk. If that be beyond doubt, butter and rich milk would retain their infecting qualities longer than average milk with a *moderate percentage of fat*. So there may be a danger in fat milk which does not exist in milk that contains less fat.

Whatever I have here brought forward is certainly not to disparage the boiling of the milk; it is meant to prove the danger of relying on a single preventive when the causes of intestinal disorders are so many. It is true, however, that the large majority of the latter depend on causes which may be met by sterilization, but not by sterili-

zation only; also by pasteurization,—that is, heating the milk to 70° C. = 158° F., and keeping it at that temperature for thirty minutes, —a procedure which destroys the same germs that are killed by a more elevated temperature without much change in the flavor and taste of the milk.

One of the questions connected with the employment of sterilized or pasteurized milk is this: whether the milk to be used for a child ought to be prepared at home, or whether the supply may be procured from an establishment where large quantities of milk believed to become immutable for an indefinite period by sterilization are kept for sale. In regard to this problem, Flügge plaintively expresses his regrets that "we have allowed ourselves to be guided by people who are neither hygienists nor physicians, but chemists, farmers, or apothecaries, and whose actions have been based on three false beliefs. Of these the first is that boiling for three-quarters of an hour destroys germs, the second that whatever bacteria remain undestroyed are innocuous, and the third that proliferating bacteria can always be recognized by symptoms of decomposition." Nothing is more erroneous. Soxhlet himself, the German originator of sterilization, knew at an early period that the fermenting process is now and then but partially interrupted by boiling, that butyric acid may be found in place of lactic acid, that a strong evolution of gas may be caused after such boiling, and that such milk may give rise to flatulency. Aye, milk which happens to contain the resistant spores of bacteria becomes a better breeding-ground for them by the very elimination of lactic acid, and the longer such sterilized milk is preserved and offered for sale the worse is its condition. It may be true that these conditions are not met with very frequently, but an occasional single death in a family caused by poisonous milk will be more than enough. Therefore, the daily home sterilization is by far preferable to the risky purchase from wholesale manufacturers who cannot guarantee because in the nature of things they cannot know the condition of their wares.

Another alteration of a less dangerous character, but far from being desirable, is the separation of cream from sterilized milk which is preserved for sale. Renk (*Arch. f. Hyg.*, vol. xvii.) found that it took place to a slight extent during the first weeks, but later to such a degree that 43.5 per cent. of all the cream contained in the milk was eliminated.

According to A. Weber (*Arb. aus d. kaiserl. Gesundheitsamt*, vol. xvii., 1900, p. 108), the present wholesale procedures of sterilizing milk cannot furnish milk that is absolutely free from germs. The

nearer the milk he investigated approached absolute sterilization the more readily could the gross chemical and physical changes occasioned by sterilizing be noticed.

He found Flügge's "poisonous peptonizing bacteria" three times in one hundred and fifty specimens of commercial sterilized milk. They were "hay bacilli," which cause a strong decomposition of albumin and copious development of hydrogen sulphide. It is particularly this rapid putrefaction which proves dangerous to the nursling.

While in sterilized milk the anaërobic microbes are neither numerous nor important, according to the same author, the aërobic kinds are able to peptonize milk in from one to two days (some species in from five to seven), and to cause putrefaction and produce hydrogen sulphide. Raw milk is indeed protected by its milk-sugar, which by being transformed into lactic acid destroys the effect of peptonizing bacteria; in sterilized milk the latter are apt to predominate.

Consequently, domestic *daily* sterilization (or pasteurization) is to be preferred to wholesale production, unless this be *daily*. That is why even Henri de Rothschild's advice is not unobjectionable. He attributes all the failures of sterilization to its erroneous methods only; he advises not to use the wholesale product when it is more than from eight to ten days old, and only in flasks of from fifty to one hundred and fifty cubic centimetres. He also prefers daily home sterilization of forty-five minutes each. Even in this, as we shall see, there are mistakes.

The taste of milk begins to change at 75° C. (Duclaux), the milk albumin is altered at about from 65° to 70°, according to some at 60° C. Dairymen ascertained that fact from their experience in cheesemaking. Jemma found that pepsin and hydrochloric acid digest milk sterilized at 100° C. more slowly than raw milk. During sterilization lime salts are thrown out, phosphorus combinations are disintegrated, nitrogenous substances are liable to be decomposed into tyrosin, peptotoxin, and ammonium, lecithin is destroyed, fat changed both chemically and physically. During a long-continued sterilization casein and nucleon are likely to undergo marked changes, and the sugar has been found at the bottom as a brown deposit. That is mainly so when excessively high temperatures are employed,—for instance, 110° C. by wholesale sterilizers ("surchauffage"), which cause the production of peptone by the action of chlorine on casein, or from 100° to 105° C. in steam heat. But even these high temperatures do not accomplish actual and complete sterilization in all cases. Chemical toxins are not changed by them or even by greater heat, and spores

are very obstinate, such as those of bacterium subtile and tyrothrix, which resist the usual methods.

But, after all, the destruction of microbes by heat is such a progress over all previous methods of employing milk, provided it cannot be obtained fresh and fairly sterile, that its disadvantages are too apt to be overlooked. In some cases heat is insufficient in its effects, obstinate bacteria not being destroyed; in other instances its excessive effect proves dangerous by destroying milk elements. While appreciating the latter danger, which is due to prolonged heating mostly, we should never forget, however, that the advantages of heating derived from the destruction of microbes, which are either directly pathogenous or indirectly so by increasing the virulence of saprophytes, are incalculable. But with every degree beyond pasteurization the disintegration of the milk becomes more marked; therefore it appears that no greater heat than from 65° to 68° C. should be employed, though it may be found wiser to extend the process over a longer time.

The lower the degree of heat which may be expected to destroy lactic or pathogenous microbes the more easily the integrity of milk is preserved. Now, Theobald Smith (*Jour. exper. Med.*, 1899, vol. iv., No. 2) found that in distilled water, in physiological solution of sodium chloride, in beef-broth, or in milk, *when heated to 60° C.* (140° F.), tubercle bacilli die mostly in from five to ten, all of them in from fifteen to twenty minutes. The membrane, however, which is formed on milk even at 60° C., keeps tubercle bacilli alive even after sixty minutes; that is why its formation should be prevented by stirring, or it should be removed.

This low temperature preserves also the taste of milk and is at the border line only of the temperature that coagulates lactalbumin. The confirmation of these observations made by one of the most reliable experimenters will not be wanting; then nothing will be required except a cheap and handy apparatus to prevent milk from getting warmed beyond 60° C., thus preserving its freshness and reducing or removing its dangers.

Sterilization has been claimed to be no unmixed boon because of its changing the chemical constitution of milk. Still, opinions on that subject vary to a great extent, the occurrence of changes being both asserted and denied by apparently competent judges. But what I have said a hundred times is still true and borne out by facts,—viz., that no matter how beneficial boiling, or sterilization, or pasteurization may be, it cannot transform cow's milk into woman's milk, and that it is a mistake to believe that the former, by mere sterilization, is a

full substitute for the latter. It is true that when we cannot have woman's milk we cannot do without cow's milk. There is no alleged substitute that can be had with equal facility or in sufficient quantity. But, after all, it is not woman's milk. Babies may not succumb by using it, and may but seldom appear to suffer from it; indeed, they will mostly appear to thrive on it; but it is a makeshift and requires modifications.

Ergo, cow's milk is not woman's milk. It is not identical with it. Sterilization does not change its character; it merely obviates such dangers as result from the presence of most pathogenic germs and from premature acidulation. The substitution of cow's milk or of sterilized cow's milk for woman's milk as the *exclusive infant food* is a mistake. Experience teaches that digestive disorders, such as constipation or diarrhœa, and constitutional derangements, such as rhachitis, are frequently produced by its persistent use, and it appears to be more than an occasional (at least co-operative) cause of scurvy.

Since the advisability of finely dividing and suspending the casein of cow's milk and of adding to the nutritiousness of the latter caused me always to teach the admixture of cereals to it, even in the very first days of infancy, the subject of infant feeding has never been lost sight of by medical men, scientists, and tradesmen. No subject has been treated more extensively, more eagerly, sometimes even more spitefully, than that of infant feeding. The philosopher's stone has not been so anxiously sought for nor so often found in medical journals, books, and societies as the correct infant food and the appropriate treatment of cow's milk. After the finally faultless thing had been discovered very many times, it was not a surprise but a source of gratification to me to meet, in the *Berl. klin. Woch.*, No. 10, 1895, an article of Heubner, who, after having contributed for years as much as any writer (if not more) to the literature of the subject, recommends the "utilization of flour in the intestines of young nurslings." Basing his remarks, first, on the researches of Schiffer, Korowin, and Zweifel (quoted in my early writings on that topic thirty years ago), who, by experimentally proving the digestibility of a certain amount of starch in the saliva (and pancreatic juice) of young infants,* justified my empirical findings of many previous

* While it took Heubner more than twenty years to remember very accessible physiological experience, a celebrity of equal rank (Philip Biedert, Handbuch der Kinderkrankheiten, 11th ed., 1894, p. 39) still appears to approve of the opinion that a nursling must have "no amylacea," because of their indi-

years, and, secondly, on what he is pleased to call "Jacobi's practical experience," the Berlin physician recommends in intestinal diseases of the very young the simplest flours, mainly of rice and oats (which have a finer microscopical structure than wheat). He pointedly adds, "Very young infants do better on a dilution of milk with a thin rice decoction than with mere milk-sugar solution. Practical experience overrides theoretical conclusions." * There is but one point in which the famous teacher does not yet agree with me, for in his expositions we meet with the remark that he "cannot approve of the colossal dilution recommended by the authority of Jacobi." The "colossal dilution" alluded to is that of milk in four or five parts of oatmeal- or barley-water for the use of the newly-born. In regard to this dilution also I trust I shall yet see my illustrious colleague siding with me. The demands of pepsin digestion and of rapid growth and the necessity of restitution of losses experienced by elimination and excretions are just so many reasons for extra allowances of water in the diet of very young infants, who have to rely on the services of others. Older children know how to find it and how to serve themselves. In addition, it is certainly true that a large amount of water passing through the kidneys removes the inconveniences and dangers of the peculiar physiological process which takes place during the first three weeks of every life,—viz., uric acid infarction,—the results of which are gravel, renal calculus (by no means rare), and nephritis, which is frequent. Indeed, since the rather frequent adoption of my plan of supplying the very young with quantities of water, I hear less of renal complaints in them than I did dozens of years ago.

Perhaps the tide is already beginning to turn in my direction. Norbert Auerbach, whose researches on the difficulty of destroying the hay bacillus and the bacillus butyricus are very meritorious, recommends larger percentages of water in infant feeding than the customary ones. His mixtures for the first and second months of life are three parts of water and one of milk; for the third and fourth, two and one; for the fifth and sixth, one and one; for the seventh and eighth, one and two. His figures are, therefore, not exactly like mine, but even they may appear heretic to my critic. In connection with this subject I am also pleased to state that Auerbach agrees with me on another subject. The sugar he adds to the milk food

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gestibility, before the protrusion of teeth. Still, he advises cereals for the dilution of his cream mixture. Before long it will be a generally accepted axiom that cereals must be given to make teeth and tissues generally when milk food alone does not suffice for their development.

* "Probiren geht über Studiren."

of infants is not milk-sugar, but cane-sugar, of which he gives twenty grammes daily, and—also according to my old teaching—more during constipation. He undoubtedly prefers cane-sugar for the reasons which guided me in my recommendations, though it is true that milk-sugar is being partly stripped of its dangers in the same degree as boiling, sterilization, or pasteurization is carefully practised.

Virtually, sterilization has been practised by me these more than forty years, and has been taught by me for thirty-five years; but actual sterilization, according to Soxhlet, was introduced in New York by A. Caillé. Then manufacturing firms took it up as a matter of course. One of them was prevailed upon by me to execute a device of Dr. A. Seibert, who advised the determination of the amount of sterilized food and the graduation of the feeding-bottles according to the weight of the infant. In most cases this plan is good, for the condition of the child can mostly be measured by the increase of its weight. Only fat, clumsy, rhachitical children are exceptions; in them the rapid increase of weight is a morbid condition rather than a symptom of healthy development. Besides, he improved his food by adding, in conformity with my practice, and sterilizing at the same time with the milk, either barley- or oatmeal-water. A recommendation of his sterilizer is its cheapness, which makes it more accessible to the poor. Before being sterilized (pasteurized) milk ought to be filtered. Most cooks employ napkins for that purpose. Dr. Seibert recommends absorbent cotton.

Both sterilization and pasteurization have conquered a fair standing in the popular mind. Unless, however, there be a rational time limit, the practice may become dangerous; the decomposition of the milk by oversterilization I have discussed before; scurvy and other ailments may be its results. In New York the writings and practical instruction of Dr. Rowland Godfrey Freeman have been of great advantage, particularly to its poor population. He insists upon pasteurization as a sufficient method of safety. The apparatus devised by him is thoroughly appropriate. As the adviser of Mr. Nathan Strauss in his successful endeavors to supply thousands with a safe article of food, he has benefited the city and aided in setting an example which should and will be imitated.

Pasteurization is also employed by Rotch. In a paper read before the American Pediatric Society at Boston, May 4, 1892,* he presented

* The Value of Milk-Laboratories for the Advancement of our Knowledge of Artificial Feeding, by T. M. Rotch, Archives of Pediatrics, February, 1893. Also Pediatrics: The Hygiene and Medical Treatment of Children, Philadelphia, 1896, 2d ed., 1901.

for the first time, among others, the following statements, which I gladly repeat, as I know his teachings to have done a great deal of good. Indeed, I was so much impressed by them that I encouraged the gentleman who had conducted a milk-laboratory on Dr. Rotch's plan in Boston to establish a similar institution in New York.

According to Dr. Rotch, " What the profession needs is the knowledge that they may have milk-laboratories where the materials are clean, sterile, and exact in their percentages. Slight changes in the three elements of milk of which we have the most accurate knowledge —namely, fat, sugar, and albuminoids—are of real practical value in managing the digestion and nutrition of the infant (normal percentage of fat, from 2.02 to 4.37; of milk-sugar, from 5.70 to 7.10; of albuminoids, from 1.08 to 3.07; of mineral matter, from 0.12 to 0.20). The digestive capabilities of infants differ just as do those of adults, and nature therefore provides a variety of good breast-milks adapted to the individual idiosyncrasy of the special infant. With this fact impressed upon us, we can well see that in artificial feeding no routine mixture will in all cases prove successful."

All this proves also that nature allows a great deal of latitude, for the milk of a woman is changing, sometimes quite rapidly, and still the baby continues to thrive. It also proves that an attempt at regulating the percentages of milk according to invariable rules, while circumstances of surroundings and individual health—perceptibly changed or not—may differ, is liable to be very deceptive. Altogether, no iron-clad rule holds good for a living body in which organic assimilation is not regulated by the fixed laws of crystallization. This is, indeed, proved by nothing better than by the variability of the constituents of good milk. According to the very figures presented by Dr. Rotch himself, fat may vary from 2.2 to 4.37, albuminoids from 1.08 to 3.27, and still the milks exhibiting these wide differences are " normal."

In regard to the percentages of fat in cow's and in woman's milk, the results of chemical analysis have lately changed in favor of the latter. But the general principles in regard to fat feeding—its effect on digestion, and the normal occurrence of fat in the healthy fæces of an infant fed on normal nourishment (breast-milk)—are not thereby altered.

Neither mathematics nor chemistry alone directs the organic economy. If that were so, the chemist Soxhlet, otherwise so deserving and justly famous, would be justified in the advice he coolly gives the physician to add milk-sugar when there is no fat in the food, and

thereby to obtain the necessary amount of carbohydrates. Fortunately, organic chemistry is not identical with physiology.

Dr. Rotch continues, "We are in need of a means by which we can prescribe exactly according to the idiosyncrasy of the digestion we are dealing with.

"A separator with many thousands of revolutions in a minute separates from the milk foreign material and divides it up into a cream of a stable percentage and separated milk. The milk-sugar and the albuminoids, also the mineral matter of this milk, are fairly well known, and thus the laboratory worker is enabled to put up any prescription, which, for a healthy baby of four months, would read: fat, 4 parts; milk-sugar, 7 parts; albuminoids, 1.50 parts. Put up eight tubes, each four ounces, with lime-water ten per cent. Pasteurize (75° C. = 167° F.) for twenty minutes. In this mixture the lime-water is just sufficient to slightly alkalize the cow's milk.* In this way the food of the child can be modified according to age and to changed conditions of health."

In a case of duodenal jaundice in a girl of six years, the doctor prescribed fat, 0.5 part; milk-sugar, 6 parts; albuminoids, 4 parts. Give four ounces every two hours. Send twelve tubes, each four ounces, lime-water ten per cent. In a case of summer diarrhœa in a

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* Cow's milk is either alkaline or neutral or acid. The constant recommendation of ten per cent. of lime-water for the purpose of alkalization is, therefore, far from exact and strictly scientific. Besides, how much alkalization is effected by three drachms of lime-water? They contain exactly, or are presumed to contain, one-quarter of a grain of lime.

Lime-water (liquor calcis) is a saturated aqueous solution of calcium hydrate whose percentage varies with its temperature. At 59° F. it contains somewhat over 0.17 per cent., in rising temperature less, at the boiling point one part of lime in thirteen hundred of water. It redissolves as the liquid cools. If the food containing lime-water be given at a temperature of 80° or 90° F., part of the lime is thrown out. Lime-water warmed loses most of its alkaline reaction; it is markedly alkaline when cold, only faintly so when boiled. An experiment made with good milk from the household supply gave the following results. Reaction acid, also on boiling. One-twentieth part of lime-water added to it changed the reaction but slightly; it remained acid. The mixture being boiled, reaction remained the same. When again cooled and shaken up it was still acid, but slightly less so than before the dilution of the milk with lime-water.

The addition of sodium bicarbonate to milk which is to be kept from souring, a procedure which is (besides lime-water) recommended by Dr. Holt also, may become a grave mistake. The very bacilli which, with their spores, resist boiling to an unusual degree, thrive best in a milk that is made thoroughly alkaline.

girl of four months, fat, 2 parts; milk-sugar, 5 parts; albuminoids, 1 part. Send twenty tubes, each one ounce and one drachm. At time of each feeding add lime-water, three drachms. Sterilize at 212° F.

One of the beliefs guiding the author of this method is as follows: "The constituents of the nutriment which nature has provided for the offspring of all animals and human beings that suckle their young are essentially animal, and not vegetable. Human beings in the first twelve months of life are carnivora. An animal food entirely and always free from any vegetable constituents has been proved to be the nutriment on which the greatest number of human beings live and the least number die."

Those who have followed my teachings at any time during the last third of a century know that I take some exception to this broad statement. Saliva and pancreatic juice are good for something better than idle elimination, and "nature" prepared the animal young from the first moment for more than mere pepsin digestion. The proof Dr. Rotch refers to is his experience only. Mine has taught me somewhat differently from the axiomatic positiveness of his assertion. But be it far from me not to present Dr. Rotch's case in full. His standing and merits are such as to give him a hearing wherever and whatever he discusses. His rules, which, moreover, may be modified by my method at any time, are thoroughly good; they are scientific, exact, and well thought out. Moreover, they have been proved to be practicable. No matter whether it is the careful handling of a cautiously prepared milk, the methodical composition according to percentages, or the faithful pasteurization, or all of them, the results are good. I know of a number of babies who in health and disease have done well on the protracted use of the laboratory milk. Only one observation struck me in many cases. The formation of the muscles, and particularly of the bones, appeared to be slow; the teeth came a number of weeks or even months too late; the cranial bones turned slightly soft in not a few instances. In many such cases I had to add animal broths or juice before the usual time; in two, when I tried phosphorus (elixir phosphori), it was rejected; in all others it was well borne and useful. But, taken all in all, the method appears to be sound and successful, so far as it can be with cow's milk and the casein of cow's milk. It is to be deplored that for the present it is a method only accessible to the rich; it required a special benevolent fund to supply one hundred and twenty-five Boston poor children with the same food; mine has the advantage of being one for the people, both rich and poor. If, or as long as, the circulars of the laboratory keep free of pretentious exaggerations,—there was

a time when they took that turn,—the profession will do well to rely on it, or its like, as one of the means of furnishing the baby a food deprived of dangers and in most cases sufficient. When it is found insufficient as regards tissue-building, cereals may always be furnished in the same mixture. The empirical knowledge of their beneficial effects with which we have been furnished for more than a generation has lately again been tested experimentally by Springer, of Paris, who improves the development of bone by a decoction of mixed cereals boiled for hours in succession. This long duration of the boiling process is, however, not demanded.

Rotch's "modified milk" feeding has become frequent in our large cities,—Boston originally, New York, Philadelphia, Chicago. It is expected that a baby has a prescription given by the doctor, and that the daily portions are prepared in and sent from the laboratory. But the most frequent procedure is at present this: that people will apply at the laboratory and the barmaid in charge will prescribe according to the printed schedules of proportions which are said to correspond with certain ages,—a very unscientific application of a method which was meant to be the very essence of scientific accuracy adapted to the individual case. One reason why Dr. Rotch insists upon the laboratory furnishing the separate meals is that he does not trust mothers in regard to accuracy and to cleanliness (Festschrift in honor of Dr. Jacobi, New York, 1900, p. 318). I must admit I am of a different opinion. I know of flies and other foreign substances in the "modified milk" bottles sent from some "laboratory." That they were also sterilized does not help the case; indeed, the larger the number of strangers and paid employees who are to do your work the greater is the possibility of mistakes.

The method is rather expensive and always must be. The annual income of many a workingman would have to be spent on the baby's feeding. The objections raised to this and the urgent necessity of finding substitutes for the population at large, rich and poor alike, made Rotch say (*Boston Med. and Surg. Journal,* September, 1895, p. 293) that "the advance in infant feeding was very much impeded by the cry in New York a few years ago for cheap food for the poor."

There can be no doubt that the end aimed at by Dr. Rotch is partly obtained by securing a reliable and approximately fresh milk and by sterilizing it in small portions. In that he has performed, with Coit and others, most valuable educational and missionary work. That, however, the six thousand eight hundred revolutions a minute should leave the milk intact, that after the mixture of its "disjecta membra" we should again have milk, is not very probable. Lunin

(Dis. Dorpat, 1880) fed mice on milk and they lived, but they died when the constituent parts of milk, after having been severed, were recompounded. I know, however, of no experience of the same nature.

The "fat milk" ("Fettmilch") of Gärtner is also obtained by centrifuging and sterilizing. According to Escherich's analysis of woman's and of cow's milk, this preparation is to contain casein 1.76, fat 3, and sugar 2.4 per cent. It is preserved in tin cans, which are favorable to occasional decomposition. Bad odor, discoloration, and fat swimming on top are frequent occurrences. It is expected to be given indefinitely, and no consideration is paid to the fact that woman's milk (not to speak of colostrum) contains more albumin and salts and less fat in the first few months, but less albumin and salts and more fat later.

Biedert prepares a cream mixture which contains one per cent. of casein, two of fat, and four of sugar. It is to be mixed with milk in different proportions. One of the reasons urged by him for the addition of cream is the necessity of greater dilution (accomplished by my cereal decoctions) of the cow casein, the difficult digestion of which he takes for granted.

In his "Kinderernährung," 2d ed., pp. 152, 170, he recommends to feed a baby during the first few months as follows: every kilogramme (two pounds) of the baby's weight is furnished two hundred grammes (six and a half ounces) of food which contains fifty of milk, one hundred of oatmeal-water, and eight of sugar. Heubner ("Säuglingsernährung und Säuglingsspitäler," 1897, p. 13) mixes one part of milk with one of a flour decoction (one teaspoonful to one-half pint) which contains 12.3 per cent. of milk-sugar. Of this mixture he gives six hundred grammes daily up to the fourth week, seven hundred and fifty to the seventh, and nine hundred after the eighth, in from eight to six meals.

The mixture of Dr. Meigs is well thought of by many physicians. In his own words, "There must be obtained a quart of good fresh milk, not too rich and not poor; average milk is best; this is placed in a high pitcher or other vessel and is allowed to stand in a cool place for three hours. The upper half or pint is then poured off, care being taken not to shake the vessel, and this upper pint of weak cream is to be kept for the use of the infant.

"There must also be made a solution of milk-sugar of the proportion of eighteen drachms to the pint of water. It ought to be kept in a fairly cool place; if it be sour it must not be used.

"Three tablespoonfuls of each, the weak cream and the sugar-

water, are then mixed with two tablespoonfuls of lime-water. They are then warmed for use in the feeding-bottle.

" In the great majority of instances where it has been fairly tried, this food has proved very successful" (Arthur V. Meigs, " Feeding in Early Infancy," 1896, p. 7).

This food of Meigs seems to be too easily influenced by irregularities and by accidents happening to what he calls cream during its formation, and to the milk-sugar solution, to be proof against frequent mistakes. Fortunately, however, digestion and assimilation are not regulated by mathematics.

Dr. N. B. Coit, who believes that cow's milk when properly prepared furnishes the sufficient diet of an infant and supplies all its needs for robust health, gives the following rules for modified milk for infant feeding, made with one quart of bottled cow's milk: " First six months, the top milk, cream one-half pint, boiled water one pint, milk-sugar seven hundred grains; from six to nine months, the top milk, cream one pint, boiled water one pint, milk-sugar nine hundred grains; from nine months to one year, the top milk, cream one and one-half pints, boiled water one-half pint, white sugar three teaspoonfuls."

From the very first month of life a distinct diastatic effect is produced by the oral secretion; it increases with every month. Even infusions of the parotids, prepared at different times after death, produce the same effect. Infusions, however, of the pancreas taken from the bodies of infants who have lived three weeks produce no such changes. The diastatic power of the pancreas begins with the fourth week only, and remains feeble up to the end of the first year. Krüger (1891) found in the fœtus of seven months a sugar-forming ferment which increases towards the normal end of intra-uterine life, is still small in quantity at birth, but grows so rapidly that it is as active about the eleventh month of life as it is in the adult.

Zweifel experimented with infusions of different glands. That of the submaxillary glands of an infant did not transform starch into sugar, even after the lapse of a whole hour. The effect of an infusion of the parotid of a baby seven days old was distinct after four minutes; however, that of the parotid of a baby which had died at the age of eighteen days, of gastro-enteritis, did not act until the lapse of three-quarters of an hour. Nor was a diastatic result obtained by a similar infusion made of the parotids of a baby prematurely born, and one who died of diarrhœa and debility.

It is a remarkable fact that different varieties of starch are not changed by saliva into grape-sugar in the same length of time. In

reference to the time required, however, there is no uniformity of opinion. Solera found that the transformation of the starch of the potato was the most rapid. Next came that of Indian corn, next wheat, and the transformation of the starch of rice was the slowest. According to Malay, raw starch changes slowly, boiled starch quickly. In his experiments, that of the potato required from two to four hours; that of wheat from one-half to one hour; of barley from ten to fifteen minutes; of oats from five to seven minutes; of rye from three to six minutes.*

It is important to know that the effect produced by saliva persists in the stomach for a period of from one-half to two hours. But it ceases altogether, and starch will no longer be changed into grape-sugar, inside the stomach, as soon as the secretion of hydrochloric acid has begun in the digestive process. This is a very important fact, because it shows that the farinaceous food of the infant or child, though it be not masticated, and pass the mouth very rapidly, is in the stomach still under the influence of the saliva.

Hydrochloric acid is not secreted at once. The first acids in the stomach while digestion is going on are organic, mostly lactic. This is found to be contained in that organ when gastric juice is removed from it in the first period of digestion. Thus in a gastrostomized boy Uffelmann found under normal circumstances, and in the absence of fever, during the first half-hour, lactic acid only; afterwards hydrochloric acid.† The latter is not met with during fevers of any kind,

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* When saliva is found insufficient at any age, medicinal aids are welcome. Taka-diastase has been recommended for the purpose of digesting starch. Friedenwald (N. Y. Med. Journal, May 29, 1897) is very enthusiastic in its praise. "It is employed in hyperacidity. It converts one hundred times its weight of starch in ten minutes, and thereby replaces saliva. It continues its action in the stomach, stimulates gastric secretion, and promotes the motor function of the stomach, and thereby the digestion of the proteids."

† This agrees with what Ewald and Boas published as the result of their experiments. But they claim to have found hydrochloric acid only when a decoction of starch alone was introduced into the stomach. Still later Th. Rosenheim (Centralbl. f. d. med. Wiss., November 12, 1887) reports as follows, after the ingestion of fifty grammes of bunn and one hundred and fifty of water. Free hydrochloric acid makes its appearance in the healthy stomach very early: 0.3 per mille after fifteen minutes, 1.0 per mille after thirty minutes. This quantity or more is found until the elimination of chyme has been completed. From beginning to end there is lactic acid to a uniform amount, —viz., 0.3 per mille. In carcinoma there was but 0.1 per mille of hydrochloric acid, in hyperacidity 1.0 per mille. In every case and in every period of digestion there was lactic acid. There was less hydrochloric acid (but 0.2

provided the temperature is high, nor during a severe gastric catarrh (and also in dilatation of the stomach resulting from congenital or other constriction of the pylorus). In these conditions farinacea (amylacea) are taken to advantage, principally because the diastatic effect of saliva is not disturbed.

Some of the main points to be remembered from the foregoing are these:

There is diminution or absence of saliva from the parotid in the very young while suffering from diarrhœa and debility. It is never copious. Thus the very young when well ought to have but little starchy food, and when sick still less, particularly as the pancreas cannot be relied on for diastatic action in the first weeks.

Whatever saliva, however, has been secreted and is swallowed, continues its action in the stomach as long as there is no hydrochloric acid in it. This in the healthy is secreted only after half an hour or later; in the feverish and catarrhal stomach very much later or not at all. Thus what saliva is present displays its diastatic action continually. Therefore the food craved for and digested by children, also by infants to a great extent, is, besides milk, farinaceous. Animal food which requires hydrochloric acid is not wanted until later, nor is it readily digested in the stomach of the very young.

In anæmia, convalescence, particularly in fevers, the functions of the stomach are impaired. In them both pepsin and hydrochloric acid are not secreted at all, or in very small amounts. In these cases fair quantities of water are required to start the secretion.

Practitioners and authors who had convinced themselves of the ill success often attending the use of milk, or watered milk, commenced at an early period to mix it with MEAT-soups, meat-tea, or egg. Bretonneau reported, as early as 1818, that "tabes mesenterica" disappeared, in the hospital of Tours, from among the children fed on beef-soup and milk. This mixture Vauquelin declared, among all preparations, to come nearest to mother's milk. The administration of some beef-soup, well made, a cupful every day (mutton-broth when there is a tendency to diarrhœa), is advisable before the end of the first year. Long before this period, indeed at any time during infancy, it is indicated in cases of early rhachitis, though there be but few

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per mille after an hour) and a fair amount of lactic acid when carbohydrates only were taken, no matter whether saliva was admitted to or excluded from the stomach.

These data are here added for the purpose of showing that the difficulties of arriving at absolute facts are exceedingly great. Still, the results of the three observers do not differ too much from the accepted doctrine.

symptoms such as rhachitical constipation, undue adiposity, or retarded teething.

Beef-tea, well made, in a bottle swimming in the water-bath, is still believed by some to be the model food. That it is not so rich in soluble albuminoids as was believed ought to be generally understood by this time. What, however, it does contain in large quantities is salts. Thus it is a dangerous article in summer diarrhœa, and must never be administered by itself. When given at all, it ought to be in combination with farinacea or raw egg albumin (which in this mixture requires very little salt, if any).

So far as albuminoids are concerned, beef-broth is about as nutritious as whey, and no more. But on account of the extractive substances of beef, kreatin, and kreatinin, it is more stimulating. The temperature of the body is not raised by it. In gastric irritation, gastritis, and acute dysentery it ought not to be given. Veal-broth is liable to increase diarrhœa, mutton-broth constipation, and the latter is therefore preferable in cases of diarrhœa. A broth of beef, which contains from 1.5 to two per cent. of albumin, is made by mixing one part of beef and six of water with a little sodium chloride and allowing it to stand from ten to twelve hours. Then it is slowly boiled and the whole mass pressed out. Still better is a modification of Liebig's beef-tea, which is obtained by adding one half-pint of water, with six or seven drops of dilute muriatic acid, to a quarter or one-half pound of finely cut lean beef, stirring it occasionally during two hours, and boiling a few minutes. Beef-juice obtained by pressing out beef after slightly broiling it contains from six to seven per cent. of albumin. It is only slightly acid, and spoils quickly.

The peptonized beef preparations are available both internally and for rectal alimentation. They may be mixed with hot water or hot broth; a few teaspoonfuls and upward are valuable additions to the daily food. Those who object to some of them because of their strong aromatic taste and color will still relish them when quite cold. Still, the administration of peptones should be controlled by a careful consideration of the condition of the digestive organs. The last product of gastric digestion is albumose; the formation of peptone is not completed until the diastatic action of the pancreas, and perhaps also of some intestinal bacteria, has reached the chyme. It was taken for granted that neither albumose nor peptone could be formed without the presence of hydrochloric acid. In part this is a mistake, for dogs deprived of their stomachs, and men with no such secretion, are known to prepare them. Still, peptones have been given for the

purpose of supplying what the stomach could not, or was supposed not to be able to, furnish. They have a bitter taste, are not always well borne, even in the rectum, and may cause vomiting or purging. A teaspoonful of most of the peptone preparations holds from three to four grammes (two to three scruples) of albumin, which is a fair addition to the nutriment of a patient whose condition requires much, and very digestible, food. Still, sight should not be lost of the condition of the digestive mucous membrane. In conditions of fever, congestion, catarrh, etc., absorption is very slow; much peptone is not absorbed, dyspeptones are formed, and a severe form of autoinfection may be the result.

Scraped beef, raw, has been highly recommended in the chronic stage of, and convalescence from, exhausting gastro-enteric catarrh these forty years. It is very digestible and, but for the danger of causing tænia mediocanellata, a valuable addition to our means of restoring health. White meats contain less fat, hæmoglobin, and extractive material than beef. Sweetbread (thymus), 22 per cent. albumin, 6 gelatin, but 0.4 fat, 1.6 salts, and 70 water.

Meat thoroughly dried in the water-bath and finely powdered, also hard egg albumin in the same condition, are easily taken in milk; they are excellent additions to a patient's diet at a somewhat advanced age (at and after three or four years).

Egg has been utilized as an admixture to milk, or as its substitute, in a great many ways. Both the yolk and the albumin have been so employed. The white of an egg, with a little salt and six ounces of water or barley-water, well beaten and shaken, is a good mixture, which can take the place of infant food only temporarily, but is an invaluable makeshift in severe intestinal catarrh, or a permanent nutriment in the same, when added to other food.

Falkland skims milk and transforms it by means of pepsin. The process does not recommend itself to general use on account of its circumstantiality. Roberts heats milk to nearly the boiling point, and treats it with liquor pancreatis and sodium bicarbonate. Fairchild's method of peptonizing milk is generally understood all over the country and is widely appreciated. J. Rudisch's method of improving cow's milk for the use of children and adults, sick and well, particularly those who suffer from gastric catarrh and do not digest milk in its usual composition, consists in mixing twenty-five minims (half a teaspoonful) of dilute hydrochloric acid with a pint of water. Then a quart of milk is added. When this mixture is boiled but a few moments it keeps well and is quite palatable and highly digestible. It does not coagulate unless there be too much acidity in it.

Somatose is one of the artificial preparations which deserves some credit, first, because of the absence of such nucleins as irritate the kidneys; second, because it is a genuine albumose, a teaspoonful of which is claimed to contain as much albumin as is held in half an egg or three tablespoonfuls of milk. Thus, a number of teaspoonfuls, well diluted in water or in broth, or now and then in milk, may be given daily in cases of anæmia, or slow convalescence, or in sickness. To recommend it, however, as a regular food is "trade;" to add it to cow's milk so as to make it "resemble human milk" (Rieth) is sheer nonsense.

G. Klemperer, who discussed the artificial nutriments of the trade (*Berliner klin. Woch.*, 1897, No. 26), took exception to every one because of their uselessness in "almost" every case. He correctly stated that the products of the trade are expensive, are mostly inferior to their promises and claims, and under ordinary circumstances should not be substituted for the direct products of nature. That is exactly the position I have always taken in regard to artificial foods; but the practitioner, who deals both with commonplace and with exceptional cases, is glad now and then to fall back on some preparation which, while not requiring all of the normal process of digestion, may save life in a given case. There is no food which suits every stomach or every case in the well or in the sick, and the greater the facility of a wholesome change the better. That is why, now and then, the artificial farinaceous foods, in which amylum is more or less transformed into dextrin, are filling a gap in the rare cases in which milk, though ever so well prepared, or the cereals, like oatmeal or barley, are not tolerated. Of the artificial foods extract of malt, which, with its albuminoids, fifty-three per cent. of sugar, and fifteen of dextrin, is so nutritious that a tablespoonful is the equivalent of an egg, may be very serviceable. The percentage of sugar it contains is very nutritious; in the same way the effect of sugar (cane- and even milk-), also of honey, ought to be utilized oftener than seems to be usual. The carbohydrates, generally, are the main food for the feeble and the feverish. Even the well will get along, but for a time only, with less albumin than was claimed by Liebig and by Voit, provided they are supplied with non-nitrogenous food. Under these conditions Hirschfeld limits the quantity of albumin demanded by an adult to thirty or forty grammes (one or one and a half ounces).

Alcohol has conquered its place among the medicinal foods in the diseases of infancy and childhood. Very little, if any, is required in catarrhal, or the first stages of inflammatory, diseases. It is contra-

indicated in the usual forms of meningitis, acute cardiac ailments, acute gastro-enteritis, peritonitis, and dysentery. It finds its application in depressed strength and vitality and in collapse; thus, in the rules for the management of infants during the hottest (the very hot only) days of summer, distributed during several decades by the Health Department of the city of New York, I recommended the administration of a teaspoonful of whiskey daily. Nobody appeared to find fault with me except some pulpits. It is also required in chronic diseases and slow convalescence.

Its action is stimulant, nutritive, antipyretic, and antiseptic. It is decomposed into carbonic acid and water, and thus may save the waste of material parts of the body. When its odor is perceptible in the breath of the patient, it ought to be stopped or diminished. That is very liable to occur, for instance, in pneumonia, in the first stage of which alcohol is but rarely indicated or tolerated. When given in sufficient quantities, it reduces the temperature; the amount required for that purpose is, according to Binz, forty grammes, corresponding to about three ounces of brandy or whiskey. Its most beneficial action is exhibited in sepsis of all forms, mainly also in the septic varieties of erysipelas, no matter whether there are brain symptoms or not, and of diphtheria. Here it is almost impossible to give too much. The doses must be watched so as to be sufficiently large. Whoever is not afraid to give, in diphtheria, six ounces of whiskey daily to a child when one or two fail, or ten or twelve when six fail, will soon convince himself of its power for good. It must never be given in concentration; the gastric mucous membrane tolerates no pure brandy or whiskey for any length of time; they must be diluted with either water or milk properly prepared. Wines, brandies, and whiskeys are not equivalent. In our country the latter is obtained pure with greater facility and at less expense, and besides has, for many, a less disagreeable taste than either of the others, which are often adulterated. The ether contained in wine militates against any antifebrile effect which may be expected from it; the fusel oil, also the furfurol (or pyromucic aldehyde), and the salicylic aldehyde, which is used in the manufacture of bitters, and the artificial bouquets, with which brandies are too frequently adulterated, act rather as paralyzing than as stimulating agents.

Alcohol is having a hard time between temperance women and sensational medical writers. We are told again and again in medical journals that when alcohol is taken in big doses a long time with no indications, the poor-house, convulsions, epilepsy, chorea, and crime are the inevitable results for the imbiber and his offspring, and for

these reasons it must not be used in medical practice. We are often told that large doses are required to have its antifebrile effect,—the same thing Binz taught us three dozen years ago; also that its stimulant effect, in small doses, depends on paralysis of inhibition only,—an explanation which does not detract from its value; that its stimulant effect is indeed imaginary only, for though it undergo combustion, some assert it does not prevent the disintegration of albumin in the tissues, and others that it does not diminish but rather increases the elimination of nitrogen. It is mainly Kassowitz who appears to have a personal grievance against alcohol (as also against diphtheria antitoxin), and to make his point is not afraid to strain the truth to the utmost, and beyond. When he holds up my recommendation of whiskey in diphtheria to the horror of mankind, he adds, "Still, the same author advises to give healthy nurslings during the summer daily a coffeespoonful of whiskey." This statement is a mistake, if nothing very much worse. What Kassowitz may have read is as follows: "in hot weather, but in the hottest weather only."

Cushney * sums up his opinions by saying that alcohol deserves a place in therapeutics as a narcotic, and to a less extent as a stomachic, and in certain conditions as a food. Let him add, that it fills a place as a stimulant in septic (and other) diseases which cannot be replaced by any other, and that great clinicians like Curschmann or Jürgensen use it as such, and he will be still more correct.

Dyspepsia is one of the functional disorders of the stomach, and depends sometimes upon slight changes in the gastric mucous membrane only. It consists in partial or complete loss of appetite, with more or less impaired digestion. In regard to this, however, in every individual case, it is good not to rely too implicitly upon the reports of mothers or nurses. Older children will complain of precordial heaviness. They will suffer, as do infants also, from eructations, which, when they result from swallowing air, are absolutely odorless, but when they consist of actual gastric gases, have a very faint odor. A sensation of oppression and frontal pain is complained of by older children; the younger ones are apt to vomit.

The causes of dyspepsia must be sought for either in anatomical changes in the organ (beyond the normal development of the intestinal glands, in contradistinction to the lymph apparatus which lags behind), which can rarely be proved, or (more frequently) in quantitative or qualitative changes in the secretion; or in a changed nervous influence, as, for instance, in fever; or in an abnormal condition

* Boston Med. and Surg. Jour., July 10, 1902.

of the food, which is the most frequent cause, and the presence and first effect of pathogenous microbes.

The treatment of this disorder consists chiefly in abstinence or in the use of the greatest care in the preparation of meals. Even mother's milk may have to be dispensed with and ice-water or small pieces of ice given instead. At all events, the casein must be greatly diminished. Milk requires boiling, peptonizing, or treating with muriatic acid according to the method I have detailed before. In every case the admixture of farinaceous decoctions and a little salt improves the digestibility of milk, though prepared as described. In many the latter alone, with or without a meat-broth, will be the only food which is tolerated. The gastric secretion of infants who have been fed artificially is liable to be hyperacid; then alkalies should be given at once. The addition of a few grains of sodium bicarbonate (baking-powder) to the food may suffice. A few grains of an alkali (magnesia, sodium, calcium, according to the indications explained elsewhere), given a few minutes before every meal, act more surely. There may be the indication for bismuth, or for resorcin in small doses (1 to 200 water), one-half to one teaspoonful every two or three hours, or for irrigation of the stomach mostly with a saline solution (6 to 1000), or for the administration of orexin tannate, which appears to increase the secretion of hydrochloric acid and the function of the muscles of the stomach.

Vomiting has been mentioned among the symptoms which accompany dyspepsia. In the infant, however, it is almost a normal occurrence. The infantile stomach is vertical and more or less cylindrical, and the fundus but little developed. Thus, whenever there is a tendency to empty the stomach the antiperistaltic motions do not press against the fundus, but directly upward. There is, therefore, less genuine vomiting than a mere overflow of the contents, which mostly takes place so easily that the babies are not disturbed by it.

The treatment of such cases, if treatment be required at all, would consist in the application of some dietetic rules. The infant should have less food and at longer intervals; should not be carried about immediately after meals; ought not to be shaken or jolted, nor carried face downward.

This overflow takes place, as a rule, immediately after the baby has been nursed; at that time the milk is still fluid. If vomiting occur a little later, the milk will be coagulated; if, then, the milk be not coagulated, the stomach is not in a normal condition. In these cases, and particularly when the baby lives on artificial food, there are uneasiness and pain associated with the vomiting. An acid mucus is

expelled, together with the contents of the stomach; these are the cases in which antifermentatives, such as silver nitrate, bismuth, resorcin, are indicated. Sometimes antacids alone will suffice, as detailed above.

Gastritis (Acute Gastric Catarrh).—The feeble, the anæmic, the convalescent, and the feverish are predisposed to this affection, but it may occur in the previously healthy as well. In all such children the production of normal gastric acid is diminished. Besides, in all of them the muscular power of the stomach is reduced.

Cold or hot ingesta, too large quantities of food, acids, spices, irritant medicines, alcoholic drinks, fat meat, cake, decomposed food with its ferment, each may be the cause of acute gastric catarrh, and must be carefully avoided; dentition, as such, is not a cause. Exposure to changes of temperature is apt to produce gastritis, but the usual cause is improper food. A single small meal, consisting of (in that case) indigestible food, increases pain, vomiting, and fever. Abstinence and cold water to the head act well when there is a tendency to convulsions. Cold applications to the heart will also reduce the temperature of the whole body. A warm bath will frequently do good; but bathing and handling the child should proceed with great caution and very gently while a convulsion is lasting. When thirst is very great, small quantities of ice-water should be given often, or Seltzer-water, or Vichy, or Apollinaris; also water to which dilute muriatic acid has been added in the proportion of one to three or ten thousand.

Solid food must not be taken. When there is a great deal of mucus, milk should be given, if at all, very much diluted, or prepared after Rudisch's method.

When the tendency to vomit is great, food and drink must be given in teaspoonful doses, and when the sensitiveness of the stomach is very marked, mucilaginous and farinaceous foods only will answer, together with small doses of bismuth repeated every one or two hours.

When acid is predominant, calcined magnesia will answer best, if given in small doses frequently repeated; also sodium bicarbonate, and very small doses of opium, one-sixtieth to one hundred and fiftieth of a grain, every hour or two hours.

Chronic Gastric Catarrh is either the termination of an acute catarrh or of the persistent continuation of injurious influences. Large and frequent meals, too cold or too hot food, and fast eating are frequent causes. That is why bottle-feeding is preferable to drinking from a cup, and why Heubner (Festschrift) emphasizes the necessity of under- rather than overfeeding children of early and of

advancing age. The stomach may be either in a hyperæmic or in an anæmic condition; it may be hyperæsthetic or atonic. Its secretion may be deficient or faulty. All of these changes may take place in the stomach without any complication on the part of neighboring organs, or these may be the only, or partial, causes of the gastric disorder; thus pre-eminently cardiac or pulmonary ailments, which result in impaired circulation of the distant organs. Indeed, many a chronic catarrh of the stomach, both in the young and adult, requires among its first indications a proper attention to the original cause. At all events, the number of meals and the amount of food must be adapted to the digestive powers. Medication can do good service in most cases, either such as is directed to the mucous membrane itself (alkalies, bismuth), or to its faulty secretion (pepsin with muriatic acid, resorcin), or to the debilitated condition of its muscular power (strychnine). At all events, the children must be taught to eat slowly. Their food must be tepid and not too much diluted, inasmuch as in many cases absorption is slow. Sugar, fat, and starch must be allowed in small quantities only.

Ulcerations of the stomach (and duodenum) demand that the organs should be kept as alkaline as possible. Abnormal acids (acetic, butyric, caprylic, or lactic in excess) must be neutralized before food is given. An occasional antacid is not sufficient to attain that end; it must be given regularly, every two or three hours, also a few minutes before a meal. Sodium and magnesium salts, which contain carbonic acid, should not be given regularly. That gas produces peristalsis. Calcined magnesia answers best in doses of one or two grains, administered every hour, or every two or three hours, in water which must not be too cold. Hot water is even better. More than that quantity is seldom tolerated because of its purgative effect (which, however, is very welcome, to a certain extent, in patients with a tendency to constipation). When a larger quantity of antacids is required, prepared chalk or calcium phosphate may be added to the magnesium, with or without bismuth (subnitrate or) subcarbonate. In such a condition the effect of lime-water is in part imaginary. If given for the purpose of neutralizing strong acids, it is a failure. That medicinal treatment must be continued through weeks or months. Without it I see no gastric or duodenal ulceration getting well, in spite of the most careful dietetic regulations.

The very function of the diseased organ is a great danger. Both the stomach and duodenum must be kept as idle as possible and their labors made easy. No indigestible food must be given, no solid food permitted. Most cases in older children bear boiled milk (in

some mixed with a little sodium bicarbonate), strained oatmeal or barley gruel, rice or arrow-root water, and stale wheat bread; a few, also, raw beef, scraped. Some tolerate nothing but boiled milk, or buttermilk. There are those who prefer koumiss, matzoon, peptonized milk, or that prepared with muriatic acid. Whatever they take must be swallowed slowly. Milk, when drank hastily, is liable to coagulate in big, hard lumps, and proves indigestible and injurious. The same milk, when taken by the mouthfuls or from a spoon, will prove beneficial. The milk should be boiled in the morning and heated over again several times during the day, or it should be sterilized. It must not be cold when taken, and may be mixed with a very small quantity of table salt only. Quite often, to avoid the formation of hydrochloric acid in the stomach, salt should be withheld altogether. Many prefer and tolerate best the mixture of milk and cereal decoctions. Such must be the food for weeks and sometimes for months; the meals must be small and more numerous. Thus the patients will get well, and thus only.

Acute and Chronic Enteritis, Intestinal Catarrh, with diarrhœa as a prominent symptom, compare with acute and chronic gastritis in their mutual relation. Acute catarrh of some duration extends mostly over the whole intestine; its worst cases are also complicated with the same condition of the stomach. The most serious forms are those of "acute gastro-enteritis." In them the diet must be a very strict one. *No raw milk, no boiled milk, no milk at all in any mixture,* in bad cases. In the very worst cases *total abstinence* for from one to six hours, or much longer; afterwards, teaspoon doses of a mucilaginous or farinaceous decoction from time to time. A good preparation is the following: five ounces of barley-water, one or two drachms of brandy or whiskey, the white of one egg, salt, and cane-sugar; a teaspoonful every five or fifteen minutes, according to age or case. Later on a tablespoonful of boiled milk may be added. The same may be mixed with mutton-broth, which, with the white of egg, is better than beef-soup or beef-tea in convalescence. In vomiting, abstinence is mostly superior to ice; the latter may sometimes quiet the stomach and feel pleasant momentarily, but it stimulates peristalsis. Beef-tea, in its customary preparation, ought to be avoided. In convalescence, when given at all, it ought to be mixed with barley- or rice-water. Towards the end of the disease, or when the discharges are numerous and copious, the blood becomes inspissated, the circulation slow, and thromboses (hydroencephaloid) arise in the smallest veins of distant organs. Then it becomes necessary to introduce liquid into the circulation by admin-

istering water through the mouth or, if it tolerates it, the rectum; in desperate cases the infusion of a sterile salt-water solution (6 to 1000) into the subcutaneous tissue, once or repeatedly, may save life. Never are the common sense and tact of the intelligent practitioner more thoroughly taxed. In regard to that there can be no law. No printed rule ever supplies or substitutes brains.

In chronic cases boiled milk must form but a small part of the food. The white of eggs in water, or in barley- or rice-water, is superior. Still, there are exceptional cases in which even they are not tolerated. Then the cereal and farinaceous preparations, with or without mutton-broth, are preferable. In rare cases one of the better artificial foods is quite successful. Acorn coffee, acorn cocoa, answer well when given once or twice daily. The meals must be small, and may be more numerous, but a fair regularity must be kept up.

CONSTIPATION may have many causes. The intestinal mucus may be deficient or too viscid. Such is the case in febrile conditions, now and then in chronic intestinal hyperæmia, and also when there is too much perspiration and secretion of urine. Or the food may be inappropriate, as when it contains a superabundance of casein, particularly in cow's milk, or of starch, or too few salts, or of sugar.

Peristalsis may be incomplete through rhachitic debility of the muscular layer or the muscular weakness dependent upon sedentary habits, chronic peritonitis, intestinal atrophy, and hydrocephalus.

There is also, besides mechanical obstruction by cystic tumors, intussusceptions, volvulus, and imperforations, an apparent constipation which ought not to be mistaken for any of the above varieties. Now and then a child will appear to be constipated, have a movement every two or three days, and at the same time the amount of fæces discharged is very small. This apparent constipation is seen in very young infants rather than in those of more advanced age. Such children are emaciated, sometimes atrophic. They appear to be constipated because of lack of food, and not infrequently this apparent constipation is soon relieved by a sufficient amount of nutriment. Constipation resulting from a superabundance of starch in the food is easily cured by the withdrawal of the injurious substance.

Constipation produced by too much casein in the food will be relieved by diminishing its quantity. The proportion of casein in the food of infants should never be more than one per cent. Besides, this amount of casein ought to be copiously mixed with a glutinous decoction (oatmeal) as long as constipation lasts.

Infants that have been fed on starchy food, or even such cereals as barley, should have oatmeal substituted for it.

Constipation depending on lack of sugar is very often speedily relieved by increasing the quantity of sugar in the food. This is the case not only in artificial feeding, but also when the children are fed normally on breast-milk. Such mother's milk as is white and dense, and contains a large amount of casein, is made more digestible and will produce better evacuations when a piece of loaf-sugar dissolved in tepid water or in oatmeal-water is given previously to every nursing. Older children will take honey to advantage as long as it does not add to the abnormal gastric acids, or a teaspoonful of fresh butter, and should have a moderate dose of cream added to their food. Regular doses of cod-liver oil, given twice or three times daily, will obviate or relieve constipation, besides fulfilling other indications. But it is self-understood that it must be pure, and not adulterated by the fashionable admixture of calcium phosphate. Children of more advanced age and with good gastric digestion will be benefited by breads containing husk. Children of any age will be benefited by drinking large quantities of water.

RHACHITIS is sometimes the result of protracted intestinal disorders. Therefore proper feeding is an absolute necessity. Animal food must predominate, but meat ought to be lean. The so-called erethic rhachitis of thin, nervous children requires less meat, but more of the better class of farinaceous foods,—viz., barley and oatmeal, with boiled milk and salt. The same indications are valid for all the conditions subsumed under the head of scrofula. Coarse bread, acidulated food, and fruit not absolutely ripe should be avoided. The introduction of phosphates, in whatever shape, is a mistake, for the following reasons:

In the careful experiments of Foster, who fed infants on milk, it was found that the mineral constituents were absorbed least (still less than fat). Of the ashes of milk, in general, there were in the fæces 36.5 per cent.; of the calcium, in particular, seventy-five per cent. In spite of that the baby throve and increased in weight in one week one hundred and seventy grammes. Thus there appears to be but very little need of salts on the part of the growing baby. The infant of two and a half years receives in one day 1.25 grammes of calcium, of which there is an elimination of 0.92 gramme in the fæces and 0.03 in the urine. There is then a balance of 0.3 gramme in a day, of 2.1 in a week, of a kilogramme, or two pounds of calcium, in a year. This is all that is utilized.

Almost the entire quantity of calcium in the body is deposited in

the bones, which contain eleven per cent. of calcium in the adult and in the infant and child somewhat less.

There are some very important practical points connected with the results of these observations.

So long as the food contains plenty of calcium and phosphoric acid there is certainly no indication for the introduction of the same in the form of medicine, or as an addition to food, for the purpose of improving nutrition. Thus the combination of cod-liver oil with phosphate of lime, which has become so fashionable, is based upon an illusion concerning its alleged efficiency. Besides, the empirical observation has been made also, at a very early time, that immediately after the administration of preparations of calcium there was increased elimination through both the fæces and the urine.

Thus, as there is no actual absence of calcium phosphate in the food, the organism should be spared useless labor. In occasional cases, where the effect appears to be favorable, this very effect is different from what was intended. When rhachitical or anæmic infants are supplied with phosphate of lime, iron, bismuth, etc., they are generally patients who are suffering from primary or secondary catarrh of the stomach, with superabundance of acid in its secretion. In these cases the calcium phosphate acts as an antacid, inasmuch as phosphoric acid becomes free and the lime neutralizes the acids of the digestive organs.

Fever consumes nitrogen (eliminates urea), carbon, water, and also salts. These losses must be repaired, but with great care. For fever diminishes at the same time the secretion of saliva and of gastric juice, probably also that of the pancreatic secretion. Besides, it renders the stomach hyperæsthetic (nausea, vomiting) and impairs the absorbing power of all the mucous membranes. In the capillary bronchitis of the nursling, cow's milk is not digested satisfactorily. Still, nurslings will digest fairly sometimes, and lose less flesh in many of their febrile ailments than older children. A small amount of peptones is absorbed both in the stomach and rectum. In moderate fevers some sugar is absorbed, also albumin; fat in but small quantities, because of its tendency to become acid; starch finds its saliva more or less diminished; thus its amount must be carefully estimated.

Food, when given in undue quantity, may act injuriously by causing a mechanical irritation and by giving rise to fermentation. Can it thus increase the fever? Undoubtedly. We frequently see children sick with pain and fever who recover rapidly through the effect of a purgative which brings away large masses of fæces.

Others have what appears to be a second relapse of typhoid fever, and often is but the result of intestinal autoinfection, with a renewal of splenic tumefaction. All the symptoms vanish speedily, in many instances, when the bowels are thoroughly emptied of large offensive stools.

In ordinary fevers the food must be liquid and rather cool, in vomiting cold, in respiratory diseases warm, in collapse hot. The best feeding-time is the remission; in intermittent fevers nothing must be given during the attack except water or acidulated water, now and then with an alcoholic stimulant; in septic fevers nothing during a chill, except either cold or hot water, according to the wishes of the patient, with an alcoholic stimulant. Common ephemeral catarrhal fevers may do without food (except water) for a reasonable time. Sleep must not be disturbed, except in conditions of sepsis and depressed brain action. In both there is no sound sleep, but sopor, which should be interrupted. In sepsis (diphtheria and other) this rousing from sopor is an absolute necessity. Unless they are roused frequently to be fed sufficiently and stimulated freely the patients will die. Besides, in most of the cases the temperatures are not high and there is no contraindication to feeding on that account.

Chronic inflammatory fevers bear and require feeding as generous as it must be careful. Altogether, however, it requires the good judgment of a well-informed physician to take into account the possible influences of individual habits and energies, of ages and sexes, of constitutions, and of climate and season.

TYPHOID FEVER is of long duration; its temperature is sometimes quite high in children, when of more advanced age. The lower part of the small intestines is affected principally. Thus, not only is, after the first few days, a fair amount of food required, but it must be so chosen as to be digestible in the upper part of the alimentary canal; its proper selection is the more important the more the latter organ is impaired by high temperatures. Besides plenty of water or acidulated water (hydrochloric, no organic, acid), albuminoids are indicated. Milk and cereals (in decoctions, which must be strained) are the proper foods. The administration of stimulants, both as to quantity and to time, depends on the character of the individual case and the power of resistance on the part of the patient, besides on the condition of the heart. When the latter becomes feeble at an early period, besides heart stimulants (digitalis, sparteine, caffeine, camphor), alcoholic stimulants are required. Diarrhœa demands (besides opium, naphtalin) albumin, rice-water, arrow-root, mutton-broth.

Hemorrhage, which fortunately is very rare in children, forbids food in any shape for a time, the duration of which depends on the general condition of the patient. At no time during the disease and during the first ten days of fully established convalescence should the food be solid. No purging vegetables must be allowed until three weeks have elapsed since the beginning of apyrexia. When milk and cereal food become distasteful, a change in their preparation, as described above, is indicated. During most of the time broths of mutton, beef, or chicken may also be given, or beef-juice or peptones diluted in water or in broths. The large majority of relapses are due to a dereliction in the strict rules of feeding.

The diet in other chronic or acute diseases is regulated by the general rules which have been laid down before. Thus, a few words may suffice.

HEREDITARY SYPHILIS contraindicates the employment of a wet-nurse. The infant's own mother may nurse it if she can.

CEREBRAL DISEASES contraindicate alcohol, coffee, hot soups, and solid foods. Cerebro-spinal meningitis results in speedy loss of weight and strength, particularly through severe and protracted vomiting and the greatly impaired appetite. In these cases feeding must be insisted upon. The feeding-cup and feeding through the nose (usually no tube into the œsophagus when there is much vomiting) must be resorted to.

RESPIRATORY DISEASES require liquid food. Jürgensen's recommendation of roasts, and of bread with butter (particularly the first), is objectionable in every acute inflammatory case. Food and drink must not be too cold. Sugar and sweets in general are permissible in small quantities only. Farinaceous foods are the most reliable ones. In the beginning no alcoholic stimulants. They will be required when debility and collapse set in at an early time or in protracted cases. Capillary bronchitis is often complicated with gastro-enteritis, and then no milk should be allowed; sometimes even breast-milk is not digested.

ACUTE RENAL DISEASES contraindicate alcohol in any shape, particularly beer; also spices, coffee, and tea. CHRONIC RENAL DISEASES require generous feeding, because of the copious loss of albumin. But—contrary to Oertel and Loewenmayer—no eggs or meats ought to be given in any quantity or at an early period. Milk and farinacea must take their places. Alcohol, as a stimulant, is permissible in urgent cases only. Salt must be avoided except when the secretion of urine is to be fostered. It ought not to be forgotten that appetite and digestion may be suffering from the fact that the

tissue of the stomach is œdematous, like all the rest of the organs. This is another reason why eggs and meats ought to be avoided. If required in the later stages, peptones may take their place, but in small quantities only. Albumoses, such as somatose, are a good addition to the food, easily borne and readily absorbed. Milk in any shape and preparation is the main article of diet. It has no such nuclein as favors the formation of uric acid, and no extractive matters which contraindicate the use of dark meats in diseases of the kidneys. Unfortunately, it does not contain a sufficient quantity of iron to correct the loss of hæmoglobin. That is why an exclusive milk diet is not borne a long time, and should be corrected by cereals and fruit. The old practice of administering chloride of iron finds its explanation therein. In renal dropsy water should not be withheld. In cardiac and hepatic dropsies it may be refused, but its absence in renal disease may cause anæmia and death.

ACUTE RHEUMATISM requires milk (also farinaceous) diet and vegetable acids (lemonade), the latter as long and at such times as they do not interfere with the milk food.

RECTAL ALIMENTATION.

The colon absorbs very readily both medicines (effective mostly in the same doses that are administered by the mouth) and foods, though more slowly. The cæcum and rectum have this faculty more than the intermediate colon. Absorption may be increased by the greater pressure of large quantities (not always practicable in the living patient) or by local irritants, such as sodium sulphate. It is understood, however, that the colon cannot forever take the place of the upper part of the alimentary tract. A dog of Barbiani (*Policlinico*, 1901) died of starvation in sixteen days, with a loss of two thousand five hundred grammes; one with nutrient enemata without stimulation of the colon in twenty-six days, with a loss of two thousand nine hundred and sixty grammes; a third one with chemical stimulation preceding his nutrient enemata in forty-three days, with a loss of three thousand grammes.

The rectum absorbs carbohydrates, flour, wine, sodium chloride, sugar, egg (very slowly), but it does not digest. Whatever, therefore, is to enter the circulation through the lower end of the alimentary canal must be dissolved before being injected. Suspension alone does not usually suffice. Water can be introduced in quantities of from twenty-five to one hundred grammes (one to three ounces) every one, two, or three hours, and may thus save life by adding to the

contents of the thirsty lymph-ducts and empty blood-vessels. Salts in a mild solution, with cane-sugar, which is transformed into grape-sugar, and emulsionized fat, will thus be absorbed. Food must be more or less peptonized before being injected. Albumoses (for instance, "somatose") are readily absorbed in the rectum, so are also the peptones mentioned above when fairly diluted. When too thick they are not absorbed, become putrid, and a source of irritation. Milk ought to be peptonized. The white of one egg becomes absorbable through the addition of one gramme of sodium chloride. If nutritive enemata are given at regular intervals, the quantity of albuminoids in each should not exceed twenty-five or thirty grammes (one ounce). Otherwise, putrefaction with its consequences will set in, both locally in the intestine and generally in its effect on the condition of the blood. Kussmaul beats two or three eggs with water, keeps the mixture for twelve hours, and injects it with some starch decoction. The latter is partly changed into dextrin. Fat, when mixed with alcohol, is apt to be partly absorbed. Andrew H. Smith recommends the injection of blood. Its soluble albumin, salts, and water are readily absorbed; more we ought not to expect. Still, he has observed that the evacuations of the next day contained none of the injected blood. Whatever we do, however, and be the rectum ever so tolerant, not more than one-fourth part of the nutriment required for sustaining life can be obtained by rectal injections, and inanition will follow, though it be greatly delayed, and though the sensation of hunger be tolerable, particularly after one or two days have passed by. Finally, children are not so favorably situated in regard to nutritious enemata as adults. In these the lengthening of the nozzle of the syringe by means of an elastic catheter permits of the introduction of a large quantity of liquid; indeed, a pint and more may be injected and will be retained. But the great normal length of the sigmoid flexure in the infant and child, which results in its being bent upon itself, prevents the introduction of an instrument to a considerable height. It will bend upon itself; besides, a large amount will not be retained by the feeble or resisting young patient. Moreover, the rectum is straight, the sacrum not very concave, and the sphincter feeble in the very young. The amount can be somewhat increased by raising the baby by his feet, while the chest and abdomen are supported by a soft pillow, and by injecting quite slowly or, rather, allowing the liquid to flow in from above downward. While the procedure is going on the abdomen should be gently manipulated. When a long, solid instrument is used it is apt to be felt high up in the abdomen. This is the result of a large portion

of the intestine being pushed upward with the tube, and gives rise to mistakes as to the efficiency of your treatment.

The ingenuity of the practitioner will sometimes be severely taxed in regard to the choice of the mixture to be injected. Boas recommends for an adult two hundred and fifty cubic centimetres (eight ounces) of milk, the yolks of two eggs, a gramme of table salt, a tablespoonful of claret, and a tablespoonful of diastased farinaceous food; Dujardin-Beaumetz, one glass of milk, the yolk of one egg, two or three tablespoonfuls of liquid peptone, five drops of laudanum, and one gramme of sodium bicarbonate. The injections ought not to be too watery, and of the temperature of the body. When the rectum is very sensitive, the addition of a mild opiate is advisable at all events; sugar, alcohol, and whatever is apt to irritate the rectum should not be given in large quantities. Straining and abdominal pressure generally may be overcome by supporting the perineum and compressing the sphincter. (See also p. 66.)

FORCIBLE FEEDING.

When children or infants refuse or are unable to take food, forcible feeding should be resorted to. A proper amount of liquid food, from one-quarter of a pint to a pint or more, according to age or to circumstances, should be introduced into the stomach several times a day by means of a sound of proper size. The procedure need not last longer than a few minutes, and the tube should be drawn out quickly so as not to irritate the pharynx.

Nasal feeding is best accomplished through a small funnel which, to avoid pain, terminates in a short piece of India-rubber tubing. This is introduced into the larger nostril, the patient is held firmly on his back, and just enough food is poured in to allow the child to swallow. A small syringe from which the piston has been withdrawn may take the place of the funnel.

II

General Therapeutics

THERAPEUTICS of infants and children has had its stages between the era of dull and ignorant prescribing and that of impotent and conceited nihilism and of churlish pessimism. But neither a deluge nor an absence of drugs makes a physician, nor do they contribute, when alone, to the welfare of a single individual or of the community.

The first indication in therapeutics is a correct diagnosis. The most efficient treatment is local, and the cause, seat, and essence of a morbid process should be known, or at least sought for. Many a diagnosis at the present time is still simply symptomatic, though less so than in bygone times. Half a century ago, or less, symptoms like paralysis, convulsion, dropsy, or jaundice were considered full-fledged and sufficiently scientific diagnoses; to-day even chlorosis, pernicious anæmia, diabetes, epilepsy, and many others require etiological differentiation to be understood and appropriately treated. The most promising therapy of the future—serotherapy—owes its origin and importance to nothing but an accurate bacteriological diagnosis.

Much has been said of the difficulty of a diagnosis in the diseases of infancy and childhood, and the consequent difficulty experienced in treating them. I do not believe that the diagnosis in the case of an adult is much easier; in many instances it is more difficult. The latter will often mislead you intentionally, or because he is carried away by prejudices and preconceived notions; the former may conceal by not being able to talk, but will certainly not tell an untruth. Besides, the ailments of children are rarely complicated, and usually a single diagnosis tells the whole story. If it be not made, it is perhaps best for the practitioner not to attempt much doctoring, beyond the relief of the most urgent symptoms, and for the patient to be let alone. For, happily, most diseases have a tendency to get well, either completely or partially, and many will run a more favorable course when not meddled with.

This does not mean, however, that I discourage treatment even in such ailments as run a typical course extending over a number of days or weeks. On the contrary, I am opposed to the practice—much too common—of those who do not, for instance, wish to inter-

fere with a whooping-cough because it finds its natural termination after several months. This is true, but many of the children also find their natural termination during these months. Every day of whooping-cough is a positive danger. A lobular pneumonia which occurs in the second or third month of the disease, and proves fatal or terminates in tuberculosis, would have been prevented if the original affection had been removed or relieved by treatment. A physician advising no treatment in such cases as terminate unfavorably in this manner ought to be held responsible for his neglect. Nor do I approve of the practice of "meeting symptoms when they turn up." My responsibility is not lessened by my busying myself with subcutaneous injections of brandy when a collapse has set in which I ought to have foreseen and prevented, or with giving digitalis when on the fifth or sixth day of a pneumonia the pulse is flying up to 160 or 200. Anybody can perform that sort of perfunctory expectant treatment extending from the first call to the writing of a death certificate. What I expect of a physician is to know beforehand whether or not that individual heart will carry its owner through an inflammatory or infectious disease without requiring stimulation. Many a case might be saved by a few grains of digitalis or another cardiac tonic or a few efficient doses of camphor or musk, if administered in time.*

Altogether, it has always appeared to me most satisfactory to treat children, and particularly infants. They are truthful, unsophisticated; they are what they appear, and they appear what they are. In their pathology and therapeutics there is no mysticism, no faith-cure, no spiritism, nor any other diabolism. Their diseases are seldom influenced by mental impressions and emotions, and for that reason "suggestion," hypnotism, or any other confidence game has no power over them, certainly not to the same degree as over adults. But older children may be influenced to a certain extent. Neurasthenia, neuralgias, and hysteria are not unknown among them; like strong irritations of the senses, the incautious causation of emotions and the awakening of autosuggestions may become dangers to psychical life and lead to somnambulism, hysteria, and intellectual and moral per-

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* "Our platform should be: In order to obtain indications for treatment make a diagnosis. That art is becoming both more accessible and, through honest and hard work, more easy with the aid of modern methods. Remember that most diseases have, indeed, a tendency to spontaneous recovery, but also that recovery is not always complete and that invalidism should not be invited through neglect of treatment." (*Trans. of the Med. Soc. of the State of N. Y.*, 1901.)

versities of all kinds. Imitation, or emotional contagion, in a schoolroom leads to chorea, in a dormitory to enuresis. Children's nature and that of their ailments are simple enough, but you must know how to understand them. Unfortunately, however, for incompetent practitioners, children are no mere miniature editions of adults, and their ills and whims and peculiarities must be known, patiently studied, and, together with the ignorance and the prejudice and caprices of the parents, endured.

Though pediatrics is no specialty like, for instance, ophthalmology, and the practice prevailing in Europe, mainly in Germany, on the part of those who are in the market for business and reputation, of advertising themselves as children's specialists ("Kinderarzt"), both ludicrous and reprehensible, there is enough in the physiology and pathology of infancy and early childhood to justify the most careful attention to their peculiarities, mainly on the part of those who have laid a solid foundation of general medical study. This is essential. That is why pediatrics should form the most important branch of the very last year—the fourth with us—of a medical curriculum. In the contemplation of the healthy and of the morbid condition of the young the first consideration is the imperfection of the tissues. Cell-growth is still or is apt to remain embryonal. That is why hemorrhages are so frequent soon after birth and why most tumors encountered in later life have a fœtal origin. Voluntary and involuntary muscular action at that age is insufficient. Circulation is different from what it is to be, the heart is comparatively large and strong, the arteries in part larger (carotids, renal) compared with the size of the organs they supply, and compared with their own size as attained in later years. Digestion is not competent compared with that in adults. Its muscular action is defective, and the gastro-intestinal secretions not equal to those of advancing growth; still, it should be known that the differences are not so great as prejudice or the obstinacy of often refuted impressions will have it. For to this very day there are innumerable men who will simply not submit to what has often been and may easily be proven to be a fact, that the newly-born has a diastatic amylum-digesting ferment in his salivary glands. The nervous system of the newly-born is but little receptive, is still less apt to exhibit reflex action than later on; in the young infant the inhibitory function is scantily developed. The most characteristic feature of the young is his growth; developmental diseases are very frequent. To this class belong those of the locomotor system, osteitis and epiphysitis of every kind, including spondylitis, rhachitis, and scoliosis; of the nervous system, such as meningitis and encephalitis; of the lymphatic

system, such as adenoids, hypertrophies of the tonsils, adenitis, periadenitis, and polypi of the rectum. In close connection with his disorders is the congenital condition of mucous membranes. On the combination of the imperfect or morbid condition of those two rests the condition we call scrofula. The respiratory organs have their own peculiarities; their inflammations have a peculiar type in early years, and the narrowness of the larynx explains many of the imminent dangers connected with even a thin diphtheritic exudation. Infectious fevers generally can be best studied in infancy and childhood. These are only a few instances proving that a large part of general and special nosology can be studied in infants and children only, and that both hygienic and drug therapeutics cannot be complete by far without the information drawn from the morbid conditions of infancy and early childhood.

The period of puberty requires particular attention on the part of the therapeutist. There are sudden changes. The heart grows suddenly, the blood-vessels, formerly wide, are relatively narrower; the body grows, with it the head; metabolism is very active, the muscles gain strength, the sexual organs develop and send to, and derive from, the central nervous system new sensations and impulses. Hereditary taints show themselves at that period, epilepsy and insanity reveal the neurotic taints of parents or grandparents; so marked are such outbreaks of developmental origin that, when intermitting, they may return during the climacteric period. Growth may stop, however, at that time; small stature, deformity of the genitals (with or without hernia), absence of beard may explain and detect the previous criminal. In milder cases there are general feebleness, neurosis, headaches, chlorosis, menstrual irregularities, changes of character, with or without onanism, or the onset of constitutional diseases. No new diseases need appear about this period, but the impressibility and vulnerability of the nervous system, the tendency to anæmia occasioned by the sudden growth, and the frequent lack of harmony in the development of the different organs are able to start hidden diseases and tendencies, and require the most painstaking care of the judicious practitioner in regard to diet, hygiene, and medicinal therapeutics.

There is one all-important principle in treating infants and children which cannot be repeated too often. They are very liable to become anæmic, to submit to general inanition, and to suffer from failure of the heart in spite of its anatomical and physiological vigor. These facts render it urgent that the physician never lose sight of the general condition of the patient while attending to a local disorder.

Good treatment is always preventive; it should save strength, if

any be left, and provide at once for such comfort as will facilitate physiological functions. Do not insist, at the cost of a patient's life, upon having a very accurate local diagnosis when a pleuritic baby with a pulse of 180 and agony imprinted on its pinched, flushed face appeals for mercy. It may die while and because you are satisfying your "scientific" interest. Or when a patient, old or young, gets into a hospital ward after a tedious ambulance trip that exhausted whatever vitality was left, let there be no routine bathing and no close examination until the patient has been resting and a stimulant and probably food have been administered. To act differently may kill him.

Then, attention must be paid to the way the sick are placed or kept in bed. As long as they are conscious they will aid the doctor in determining their posture; but grave infectious fevers, such as meningitis, influenza, typhoid, etc., impair consciousness and the self-protection it affords. A patient must not be allowed to rest on the same side always. Hypostatic congestion of a lung may be prevented or even cured by proper alternation. Gangrene may thus be prevented. Other suggestions which should force themselves on the attentive physician, and might be multiplied, are as follows.

Congestion of the cranial cavity and meningitis require a rather erect or at least semi-recumbent posture. Convulsions thus originating may be relieved by changing the horizontal position into one more vertical. Care should be taken, however, not to raise the head alone and thus interfere with the circulation of the neck. The trunk must be raised with the head at the same time. Be also sure that no feather pillow or mattress add to the internal heat. Anæmia of the brain requires a horizontal or nearly horizontal position; temporary syncope, a temporary lowering of the head and upper part of the trunk even below the horizontal level.

Spondylitis requires absolute rest on a mattress, no matter whether tuberculous or traumatic; the former is more frequent, and in its incipient stage may heal with rest and general proper treatment. The latter will, however, never suffice without the former. Marked rhachitis requires rest. Bending limbs should be discouraged from walking, softened cranial spots protected by a hollow air or hair pillow, and bending ribs and spine demand carrying in a well-lined brace (pasteboard, leather, wood, felt, wire) until after months the bones are sufficiently hardened. A rhachitic child should never be carried on the arm before the bones are hardened, and surely not persistently on the same (right) arm. Scoliosis is the invariable result.

Children suffering from retropharyngeal abscess, pharyngeal phlegmon, or laryngeal obstruction bend their heads back to facilitate respiration. Until fully relieved, their heads should be supported in the position voluntarily assumed. In incipient pleurisy they will try to lie on the healthy side; when effusion has taken place, however, on that of the effusion, to give fairer play to the healthy side. In local pneumonia, mainly of the upper lobe, a rather erect position is preferred; in a total pneumonia of a whole side or an extensive lower lobe affection most patients prefer a nearly horizontal position, with slightly raised head only, to permit extensive excursion of the diaphragm and the co-operation of abdominal respiration. Heart diseases with dilatation and hypertrophy and pericardial effusion require semi-recumbent position in bed or erect posture out of bed. Dilatation of a bronchus and abscess or gangrene of a lung demand posture on the healthy side; thus expectoration of the putrefying or putrid mass is facilitated. Moreover, in that position the inhalation of disinfectants is rendered easier. During pulmonary hemorrhage the patient should, if possible, lie on the affected side to prevent to some extent the blood from running into the healthy lung.

Proper feeding and nursing of the infant prevent the numerous gastric and intestinal diseases of the earliest period, which either destroy life at once or lay the foundation of continued ill health. For that reason a rather large part of my literary labors has been dedicated to the questions of diet and hygiene. These and medication belong together. That is why the first chapter of this work necessarily contained some remarks on medication, and this one, dedicated to therapeutics, cannot abstain from referring to diet. Those who still object to drug medication on the "principle" of ignorance, or worse, are requested to kindly determine the boundary line between medicinal and hygienic agents or products. Attention to respiration and circulation and to the functions of the skin are of similar moment. Their requirements will be discussed in special chapters. The subjects of climate, massage, electricity, orthopædics, and gymnastics will find their places with the diseases of the lungs, muscles, nerves, joints, etc. Bathing, cold washing, exercise, and sufficiently long interruptions of school hours to avoid exhaustion are subjects of vital importance. Physicians and humanitarians have declaimed against premature schooling, too long hours, too short recesses, and objected to the overcrowding of the curriculum and to the vanity of incompetent school-masters and mistresses who utilize the poor victims in behalf of exhibitions; mostly in vain thus far. A child of seven or nine years should not have more than two or three hours daily, one of which

should be spared for intermediate recesses; from nine to twelve years the school hours should be three or four, after that age not more than five hours, with frequent and ample recesses. If the mentally slow were taught separately, bodies and minds of all classes of children would be benefited beyond the possibilities of a hot-house instruction. The best exercise of the child is play in open air. Compulsory gymnastics in badly ventilated localities cannot take its place successfully, and may add to exhaustion and ill health. It is an unfortunate fact that when the claims of physical development were urged upon school authorities, gymnastics were added to the overcrowded curriculum as a matter of business necessity, or of conviction, not always willingly or intelligently. The summer vacations of public school children ought to be four weeks longer than they are. The public schools ought to be closed about the middle of June and reopened in October. Many years ago the Harlem Medical Association and the Medical Society of the County of New York requested the Board of Education of the city to open the public schools on the third, in place of the first, Monday in September. The soundness of the principle was appreciated, and the necessity for such a change was acknowledged by the authorities, and *therefore* (!) the second Monday of September was selected for the beginning of the school season, so as to afford the children an extra week's broiling in the city sun and an opportunity to lose, as they did formerly, the benefit derived from the summer vacation. The sanitary reason for this loss of a beneficent opportunity was said to be the virtuous anachronism of an eighteenth-century school superintendent, still in office in this twentieth century until a few months ago, who said he preferred the influence of the schoolroom to that of the New York streets for the New York boy. The good effects of the excursions of the St. John's Guild and the air funds and of the Sanitaria of the Guild and the Children's Aid Society, and many other sensible charities, are steps in the right direction.

The beneficent influence of fresh air is enhanced by that of light. Rooms situated toward the north exhibit a musty odor compared with those directed toward the south. Sunlight oxidizes organic substances and destroys bacteria. Light without warmth has been recommended against bacilli, syphilis, furunculosis, and lupus. Others recommend against the latter light and warmth, as also against rheumatism where it is said to cause perspiration without urea, and against neuralgias; the same is recommended for the increase of erythrocytes and hæmoglobin. Old clinicians and physiologists appreciated the influence of light. Winslow charged insufficient light in the houses with being

the cause of retarded mental and physical development and of rhachitis. Moleschott knew the slowness of metabolism in children when not exposed to light. In light the elimination of carbonic acid and the assimilation of oxygen are increased. In open air the temperature of the body is higher by 0.5° C. than in dwellings. It is true, however, there is the additional influence of air (and exercise?).

The subject of *bathing*, or rather of *hydrotherapeutics* in general, deserves some preliminary remarks in connection with a future discussion on "bathing." There is hardly a topic which deservedly has attracted the attention of the profession (and of the public) in the last decade or two to a greater degree than that of water and of its uses as a remedy. As I am writing no history, I mention but two (modern) names that merit most credit in outlining both the indications and the methods of its uses, Winternitz, in Europe, and S. Baruch, in America. Cold water was long believed to have an antipyretic action only. Now the indication to reduce the temperature of the body arises when an excessive frequency of the pulse, degeneration of the tissues of the heart and other muscles, of the kidneys and of the brain, dryness of the mucous membranes, and impairment of absorption appear to result from it, but from it alone. Cerebral symptoms, such as delirium and convulsions, are then not uncommon. Particularly is that so in the onset of a disease, while the same temperature may be readily endured at a later stage. That is why the elevation of temperature alone, without the above dangers either present or feared, should yield no indication for antipyretic treatment; indeed, many a child bears easily a temperature which carries danger to another; and there are high temperatures in some diseases, such as many forms of typhoid fever or of intestinal autoinfection, which do not seem to interfere much, for a while at least, with the ease and comfort of the patient. Unfortunately, however, the thermometer, ranging 103° F. or more, is often permitted to establish indications, and the reduction of temperatures appears to become a fad and the only acknowledged duty of many practitioners.

To reduce temperatures we have drugs and water. Of the former, quinine should not be relied on except in malaria, also in some septic fevers, when it may be used by itself or in combinations during remissions. The coal-tar preparations, antipyrin, salopyrin, lactophenin, phenacetin, etc., will all reduce temperatures, and have their occasional indications, but are known to depress, one more the other less, the action of the nervous system and the functions of the heart, and even to destroy blood-corpuscles. Acetanilid has the latter effect more than any of the rest and should be discarded altogether. Their

administration requires the utmost care, and frequently demands the combination with stimulants to guard against detrimental effects.

The temperature of the young body is easily influenced by apparently slight causes; it may rise and fall almost suddenly. A sudden rise and a continuous heat may prove dangerous; remissions and intermissions are loopholes for escape from dangers. These dangers are not so much the direct result of a high temperature as of the toxic effect of circulating microbes or their products. A moderate degree of temperature is well tolerated and should not be interfered with. In many cases it should be looked upon as a reaction of the organism only and in others should be considered welcome by its effect on the destruction of microbes and toxins and its favoring the formation of antitoxins in the infected blood and cells. Not infrequently the very worst and most unmanageable cases of sepsis, diphtheritic, scarlatinous, or puerperal, run their bad or fatal course with low temperatures, while those with high temperatures will recover.

Water, when properly employed, lowers the temperature, but has none of the depressing effects of the coal-tar antipyretics. On the contrary, it stimulates the nerves of the skin and by reflex those of the whole system, particularly of the heart; it increases heart and arterial pressure, thereby aids oxidation of tissues and diuresis, and appears even to increase the amount of hæmoglobin and of red cells. In this respect there can be no longer a difference of opinion; but in regard to the use of cold washing, with or without friction or affusion, of packing, of ice applications, of hot, warm, or cold baths, of the duration of an application or of a bath, and of the degree of temperature requiring or permitting their employment in an individual case, no iron-clad rule will ever hold good.

A cold bath (from 60° to 75° F.) is seldom, if ever, appropriate for a baby of less than eight months or a year, and never in congenital heart disease. If given at all, it ought to be interrupted when the child begins to shiver or the lips become bluish; it cannot be expected to have a good effect unless the feet share immediately in the reaction which should take place after the bath. A cold bath should, according to circumstances, sometimes be preceded or followed by the administration of a stimulant, and usually not be extended beyond four or five minutes and be accompanied by friction of the surface, mainly of the extremities. A warm bath (from 85° to 98° F.) differs so much from the temperature of a feverish child (from 101° to 107° F.) that a reduction will also be readily accomplished by it. Besides, the patient submits to it more readily. The

temperature of the bath decreases from minute to minute, or, if necessary, may be lowered by adding cold water. A warm bath, when given for the purpose of reducing *temperatures,* should last longer,—from five to fifteen minutes,—and may be given a number of times daily. After a cold bath the child should be covered warmly, particularly the feet, at least until the cutaneous circulation is fully restored; after a warm bath the covers should not be too heavy, in order not to lose the benefit of copious radiation from the surface. Packs of cold water, iced or not, need not, in most cases ought not to cover the whole body of the child; arms, feet, and legs should be left out. A single thickness of a common towel or napkin is wrapped around the body, exclusive of the arms, either the chest alone, or the abdomen alone, or both, and the thighs, according to the more local or more general effect which is to be attained; and a layer of oil-silk or rubber cloth, and over it a flannel sheet or blanket should cover the pack. More minute instruction on this point will be found in Chapter III. To reduce local congestion or inflammation (conjunctivitis, peritonitis, arthritis, meningitis) cold water, ice-water, or ice-bags may be used. *Small children do not tolerate ice applications to the head for any length of time, collapse resulting the more readily the thinner the skull.* Applications should not be too wet; small pieces of cloth cooled on a lump of ice should be frequently changed in cases of conjunctivitis. Extensive meningitis requires at least two ice-bags, the effect of which should be carefully watched.

Cold applications, well wrung out and covered with flannel and oil-silk, to small or large surfaces, and allowed to remain from twenty to fifty minutes until the skin is hot, are efficient stimulants. Hot baths (from 96° to 105° F.) act as stimulants, but should be given sparingly and be of short duration, as too exciting or exhausting, when lasting long, for most patients. The head must be cooled while the body is immersed. Short hot baths, with or without mustard and with or without cold applications to the head, dilate the superficial blood-vessels, and will be found useful in an occasional case of pneumonia, in collapse, or to favor the cutaneous eruptions of scarlatina and of measles. After removal from the bath, the patient should be covered with hot blankets, and a hot drink, such as water, an aromatic tea, or milk, should be given freely to promote perspiration.

When bathing is resorted to as a means to lower or to increase blood-pressure, the effect of medicines given at the same time should be taken into consideration. Morphine lowers it, digitalis increases it; a bath to counteract the effect of morphine should have a lower temperature; to relieve that of a dose of digitalis, a higher tempera-

ture.* That is why the dose of a bath—that means its temperature and its duration—should be adapted to the normal and the morbid conditions of the individual patient.

Because of its grave importance, I repeat here that milk and drinking-water are safest when boiled. It is to be hoped that, whenever fresh and fairly sterile milk cannot be obtained, the method of sterilizing milk devised by Soxhlet, of Munich, and introduced in New York by Caillé, and systematically employed by Rotch, of Boston, and his followers, will prove successful. Mental and physical labor ought to be easy and pleasant. Factory work for children is an abomination, and not only a cruelty committed against the individual helpless child, but a danger to the future of the republic, which cannot be expected to thrive while the physical and intellectual development of the future citizen is crippled by the greed of the manufacturer and the recklessness or the partiality of legislatures.

It is evident, therefore, that *preventive medicine* is coming to the front as the main reliance of the future, in which the public-spirited and well-informed general practitioner will again be recognized as superior in breadth of horizon and good citizenship to the merely dexterous specialist. Besides preventive medicine, drug therapeutics has not been left behind in the evolution of practical medicine. Since the times of Magendie, who supplied us with the first alkaloids, the laboratories of the pharmacologists, both in professional chairs and in factories, have added to our exact knowledge of drugs and their effects. At the same time physical therapeutics has developed simultaneously with drug therapeutics. The claim of some of the most modern writers, however, that physical therapeutics, such as hydrotherapy, electricity and galvanism, and the study of climate, is an accomplishment of the last few years, is not justified by the history of therapeutics. Only the books get bigger and sometimes out of proportion to our increased knowledge. Physical therapeutics has been extolled as "merely aids to natural processes," and "not medicines in the usual meaning" of the word. On that score superiority has been claimed for it. What that expression means I am at a loss to explain. I do not take a medicine to be a bullet that kills a disease from afar, nor a rope that strangles it. The enthusiasm of "physical therapeutists" has sometimes grown into fanaticism. Does physical therapeutics militate against drugs? make them unnecessary, useless, or injurious? If water and massage and electricity are "natural" aids, are iron, digitalis, mercury, arsenic, alcoholics, or acids "unnatural"?

* Karl Lewin, Phys.-Diät. Therapie, Wiener Klinik, No. 8, 1901.

The narrowness of some minds cannot be better demonstrated than by the angry shopkeeper rivalry of doctrines or teachings or therapeutical aids meant to work for the same legitimate and humane ends.

In the *administration* of medicines excitement on the part of the patient must be avoided; the nervous system of infants and children loses its equilibrium very easily. Fear, pain, screaming, and struggling lead to disturbances of the circulation and to waste of strength. Preparations for local treatment or for the administration of a drug must be made out of sight, and the latter ought not to have an unnecessarily offensive taste. Naphtalin, iodoform, beta-naphtol, rhubarb, and such like should be shunned. The absence of proper attention to this requirement has been one of the principal commendations of "homœopathy," whatever that may have been the last twenty or thirty years. Still, the final termination of the case and the welfare of the patient are the main objects in view, and the choice between a badly tasting medicine and a fine-looking funeral ought not to be difficult. In every case the digestive organs must be treated with proper respect; inanition is easily produced, and vomiting and diarrhœa must be avoided, unless there be a strict and urgent indication for either an emetic or a purgative. The most correct indications and most appropriate medicines fail when they disturb digestion; it is useless to lose the patient while his disease is being cured.

The administration of a medicament is not always easily accomplished. Indeed, it is a difficult task sometimes, but one in which the tact or clumsiness of the attendants has ample opportunity to become manifest. For "when two do the same thing, it is by no means the same thing." Always teach a nurse that a child cannot swallow as long as the spoon is between the teeth; that it is advisable to depress the tongue for a moment and withdraw the spoon at once, and that now and then a momentary compression of the nose is a good adjuvant. That it is necessary to improve the taste as much as possible need not be repeated. Syrups turn sour in warm weather, glycerin and saccharin keep; the taste of quinine is corrected by coffee (infusion or syrup), chocolate, and "elixir adjuvans," a teaspoonful of which, when mixed each time before use, suffices to disguise one decigramme = one and a half grains of quinine sulphate. Powders must be thoroughly moistened; unless they be so, their adherence to the fauces is apt to produce vomiting. On the other hand, their prescription and preparation require care; for instance, many powders absorb moisture, such as acid phosphates,

sodium bromide, calcium chloride, piperazin, lysidin, chloral hydrate, dry vegetable extracts, extracts of animal organs, citrate of iron and ammonium; others form a fluid when in combination, for instance, antipyrin; others, like iodides, resorcin, and aristol, change their color. Air-tight bottles or the addition of licorice powder correct some of these changes. Capsules and wafers are out of the question because of their size; pills, when gelatin-coated or otherwise pleasant and small, are taken by many. The rectum and the nose may be utilized for the purpose of administering medicines in cases of trismus, cicatricial contraction, or obstreperousness. Both of these ways it may become necessary to resort to for weeks in succession.

The rule not to prescribe incompatible medicines is valid at every period of life. For the treatment of children the following facts should be remembered. Corrosive sublimate should be dissolved in alcohol or in distilled water with the addition of sodium chloride. Calomel and iodides should not be given together or in close succession; calomel cannot be mixed with calcined magnesia; potassium permanganate not with syrup, or with tannin, sulphur, glycerin, alcohol, or sweet spirit of nitre; potassium chlorate not with carbon or with sulphur; alkalies not with alkaloids; gallic acid not with alkaloids or albumin.

The *effect* of a medicine depends on its dose and the readiness with which absorption and elimination take place. Medication, when its effect is wanted speedily, should be continued during the night; mainly in such patients as have healthy kidneys. In infants and children sodium salicylate, for instance, is readily eliminated, much more rapidly than in advanced age. Both absorption and elimination are very active in infancy and childhood; but they vary. Curare, for instance, is eliminated speedily, and must be repeated quite frequently; potassium iodide soon after its administration, but there are traces in the urine after some days; phosphate of lime appears in the urine and fæces directly; potassium chlorate is excreted through the kidneys within a few hours; silver and mercury may take a long time in exceptional cases. Absorption takes place the more readily the more the solution in which the medicinal substance is held is diluted; but it depends greatly on the condition of the surface or tissue which is selected for the introduction of the drug. A horny skin absorbs but little; inunctions require a clean surface, and are best made where the epidermis is thin and the net of lymph-ducts very extensive, on the inner aspect of the forearm and the thigh. A congested stomach, a catarrhal or ulcerated rectum, are more or less indolent and disap-

point our expectations quite frequently. High temperatures of the body exert their influence on mucous membranes and their secretions and absorbing powers, so that absorption and efficacy are diminished or annihilated. That the doses must be adapted to the ages of the patients is self-understood; but to establish fixed rules is more than merely difficult. To give as many twentieths of the dose of an adult as the child has years is a fair average; but this rule suffers from very numerous exceptions, like all the other rules that have been decided upon not at the bedside but at the writing-table. Like foods which are tolerated by the adult, but are not tolerated by the young, though the amounts be diminished in proportion to their years, so there are medicines which are not borne by the infant. Nor are the doses the same for every adult. As healthy persons thrive on different quantities of food, so there is a variableness in the amount of medicines required for full effect. Besides, there are idiosyncrasies which in some forbid the use of a medicine apparently indicated and borne with success by others. There are those who respond quickly, and sometimes too quickly, to very small doses of opium; others in whom a minute trifle of mercury produces salivation. It is this class of cases which gives rise to much disappointment and requires all the tact and foresight of a good physician. In some the system gets used to a drug after a short time. Babies, after having taken opiates for some time, demand larger, and sometimes quite large, doses to yield a sufficient effect. Excessive doses continued a long time have produced morphinism in children as in adults. Some drugs are required in proportionately large doses. Febrifuges and cardiac tonics, such as quinine, antipyrin, digitalis, strophanthus, sparteine, and convallaria, are tolerated and demanded by infants and children in larger doses than the ages of the patients would appear to justify. Potassium iodide may be given in doses of one or two drachms (four or eight grammes) daily in meningeal affections, while in the same one of the heart tonics, caffeine, must be shunned because of its—under these circumstances—exciting and irritating effects. The same may be said of alcohol, which must not be administered in cerebral congestions unless they be of septic origin. Mercurials affect the gums very much less in the young than in advanced age. Corrosive sublimate, in watery solutions of one to eight or twelve thousand, may be given to a baby of two years with membranous croup in doses of a fiftieth of a grain every hour or two hours for five or six days in succession, with rarely as much as the most trifling irritation of the gums or of the stomach and intestines. In urgent cases of hereditary syphilis it can and should be administered on a

similar plan for weeks, and, somewhat modified, for many months, to be resumed after an interruption of weeks, and later on of months.

If it be the object of medication to accomplish an end and to fulfil an indication with the least expense to the organic economy, and within the briefest possible time, we do not score a success in very many instances. Indeed, not every aim is reached directly and not all indications can be fulfilled at a moment's notice. As the object of eating and drinking is the reproduction and the growth of the body, as many a meal is required to produce a lasting and visible effect, and as every one of the meals is necessary for the sum total of the final results, so the administration of numerous small doses of medicines extending over weeks, months, and even years may be demanded for a certain purpose. Particularly is this so when chronic ailments of the blood, the nervous system, or tissue anomalies are concerned. To affect rhachitis, phosphorus requires weeks. The faulty sanguification of chlorosis is mended by iron, if at all, after weeks or months. Pernicious anæmia, sarcomatosis, even chorea require the persistent and protracted use of gradually increasing doses of arsenic. Syphilis and chronic conditions of hyperplasia require mercury or the iodides, or both, to accomplish the desired end, through months and even years. The organotherapy of myxœdema or of cretinism has to be continued for months and years and resumed after interruptions. Even the effect of digitalis, as a heart stimulant and, by its effect on the smallest blood-vessels of the heart muscle, a nutrient of the heart itself, is obtained solely through the persevering administration of small doses in many chronic cases.

The dose of a medicine depends no less on the *mode* and *locality* of its administration. Modern therapeutics favors as much as possible local medication, like modern pathology, which requires local diagnoses. Subcutaneous administration demands smaller doses, the rectum sometimes a slight increase. There are some medicines which are absorbed and act as well in the rectum as through the mouth; this is a subject, however, to which we shall return. The manner of application results also in different effects. The inunction of the official ointment of potassium iodide is well-nigh inert; its effect is almost exclusively that of massage, for iodine makes its appearance in the urine after days only. Potassium iodide in glycerin, rubbed into the skin a number of times, may eliminate iodine after a day, in lanolin after a very few hours.

At this place it is well to remember the great additions to our therapeutical possibilities, though in a few words only. Our materia

medica has been enriched with alkaloids and enabled us to give invariable and exact doses and to render medicines palatable,—advantages much greater than those derived from electrotherapy, Röntgentherapy, or even hydrotherapy. The gigantic strides of chemistry have furnished a large number of synthetic drugs, many of them of great efficacy for good or (and) evil, and some very creditable to both the learning and enterprise of manufacturers. Serotherapy and the medication supplied by the thorough study of the ductless glands are in part due to them. But, after all, the weapons our ancestors had in the shape of mercury, iodine, opium, digitalis, and others have not become dull; indeed, modernized medicine has nothing like them, just as not one of the later or latest modern means of diagnosis excels or equals percussion and auscultation as taught eighty years ago.

Of serotherapy I shall speak again; *organotherapy* may be mentioned here. It was introduced to meet the dangers of the absence of "internal secretion." This is a term extensively employed, at first in regard to the adrenals (*Brit. Med. Journ.*, August 10, 1895), by Schaefer and Oliver, and generally admitted to be descriptive and telling. It is applied to some of the processes, partly physiological and partly chemical, of the formation and disintegration of material in different parts of the organism. Saliva, gastric and pancreatic juice, and bile are external secretions, and carried off by efferent ducts. Internal secretion, however, requires no efferent ducts, indeed, no glandular stricture, for it occurs also in muscle and in brain substance. Internal secretion is carried off into the lymph and blood directly. Liver and pancreas appear to have both external and internal secretions; but the thyroid, thymus, spleen, and adrenals appear to have internal secretion only. Their absence or removal or destruction by disease causes death with the symptoms of a chronic infection. This may result from one of two sources, or from both. Either those organs have the function of forming certain materials required in the organic economy, or that of destroying poisonous effete results of metamorphosis. Thus the absence or destruction or extirpation of the thyroid causes cachexia, that of the pancreas diabetes, that of the adrenals often Addison's disease. In regard to the thyroid, we are now certain that myxœdema and some forms of cretinism are favorably influenced, or even cured, by the administration of the thyroid gland of animals. More particulars will be found under the headings of myxœdema, cretinism, exophthalmic goitre, and others.

At best, organotherapy requires patience and time. Some of its effects cannot be obtained except by administering the substitute for the absent or defective organ persistently. Myxœdema and semi-

cretinism are liable to relapse when medication ceases or is unduly interrupted. This will not be corrected, it is to be feared, until a normal organ is implanted into the suffering organism and made to perform its physiological functions. Thus far surgery has not succeeded in yielding the coveted results.

The *rectum* of the infant and child has been rising in the estimation of the practitioner since the times of thermometry; for it is certainly the safest and easiest place to take the temperature. For therapeutical measures it is also invaluable. Its importance for the purposes of alimentation has been detailed in a former chapter. (See p. 47.)

The rectum of the young is straight, the sacrum but little concave, the sphincter ani feeble, and self-control is attained only gradually. Thus a rectal injection is easily either allowed to flow out or vehemently expelled. Therefore one which is expected to be retained must not irritate. The blandest and mildest is a solution of six or seven parts of sodium chloride in a thousand parts of water ("saline solution"). This may be made to serve as a vehicle of medicine, unless incompatible with the latter, which it will be but rarely. A medicated enema which is to be retained should be tepid and small in quantity, half an ounce or little more or less, and carried up well into the rectum, for the immediate contact with the sphincter may cause its expulsion. Care must be taken to exclude air from the syringe, which, for small quantities, must be a well-fitting piston syringe of hard rubber, with a long nozzle. This must be well oiled, and introduced, not straight, but with a gentle turn, so as to avoid folds in the anal mucous membrane (in the same way a thermometer *ought* to be introduced). The nozzle must not be too thin, as it is liable to be caught; the smallest nozzles of fountain syringes are therefore in most cases improper; the larger size is more appropriate for any age. The injection must be made while the patient is lying on his side, not on his belly over the lap of the nurse, for in this position the space inside the narrow infantile pelvis is reduced to almost nothing.

When medicines are to be injected, the rectum ought to be empty, as in infants it mostly is. When it is not, an evacuating injection ought to precede the medicinal one by half an hour. It ought to be of the mildest possible nature, for any irritation of the rectum, from the local effect of an enema to a catarrhal or dysenteric process, reduces its faculty of absorption. The medicinal solution must not be saturated; indeed, very soluble medicaments only are to be selected

for medicinal enemata. Nor must they be acid or contain anything irritating. Alcoholic tinctures require relatively large quantities of water; quinine salts must not be selected unless very soluble, such as the muriate, the bromide, the carbamide (bimuriate with urea), or the bisulphate. The addition of a small amount of antipyrin renders quinine very soluble. No acids must be used for the purpose of keeping it in solution. Sodium salicylate, also antipyrin, exhibit their full power through the rectum, and permit of full doses. Frequently, however, the rectal doses are a little larger than those given by the mouth.

Larger enemata are not retained, and are therefore utilized for the purpose of emptying the bowels. This effect is easily obtained in infants and children, for their fæces are soft and movable, with the exception of those cases in which improper medicines (large and continued doses of calcium salts and bismuth or astringents), or badly selected food (casein and starch in undue quantities), or an excess of the normal great length of the colon descendens and sigmoid flexure have given rise to large accumulations of hardened fæces. Small quantities are seldom sufficient for the purpose of relieving the bowels, unless they act as irritants; in this manner glycerin, pure or with equal parts of water, may produce an evacuation readily. Irritants, however, should not often be used, for obvious reasons. An evacuant injection may weigh from a fluidounce to a quart, in some. It ought to be given while the child is lying down; the liquid must not enter the bowels quickly or vehemently, the fountain syringe not hang more than ten or twelve inches above the anus. If that precaution be observed, occasional pain or faintness or vomiting can be avoided. If water, or water with two-thirds of one per cent. of salt, be insufficient now and then, more salt or soap may be added for the purpose of enforcing the evacuation. Half a tablespoonful of oil of turpentine, with a pint of soap and water, often acts charmingly; so does the addition of a few drachms of tincture of assafœtida, in conditions of constipation, flatulency, and nervous excitability, also in convulsions; or glycerin in obstinate constipation. A few ounces of olive oil is often preferable, as an evacuant, to anything else.

Large injections will have other indications besides that of evacuation of the bowels. In many cases of intense intestinal catarrh large and hot (from 104° to 108° F.) enemata will relieve the irritability of the bowels and contribute to recovery. They should be repeated several times daily. When such evacuations contain a great deal of sticky, viscid mucus, the addition of one per cent. of sodium carbonate will liquefy the tough secretion. When there are many stools, and

these complicated with tenesmus, an injection, tepid or hot, must or may be made after every defecation, and will speedily relieve the tenesmus. In such cases flaxseed tea or thin mucilage may be substituted for water.

When the bowels are in a state of chronic catarrh or ulceration, the injections ought to be particularly large and contain astringent or alterant medicines. Though they be expelled immediately, enough of the dissolved or suspended remedy will remain upon the mucous membrane. Zinc sulphate, alum, lead acetate, tannic acid, silver nitrate, salicylic acid, carbolic acid, and creosote have been used in such medicated injections. One-per-cent. solutions will suffice. Salicylic and carbolic acids may prove uncomfortable or dangerous because of their effect on the kidneys, and ought to be dispensed with. Silver nitrate requires some precaution. From half a grain to five grains or more in an ounce of distilled water may safely be injected; but this enema must be preceded by an evacuant consisting of water only, and followed by one containing some sodium chloride for the purpose of neutralizing the nitrate and protecting the anus and external parts from local irritation. It will also be found advantageous to wash the anus and perineum with salt water before injecting the silver solution. In many cases where one of the above-mentioned agents appeared to be tolerated badly or proved inefficient, bismuth (or subcarbonate) subnitrate, mixed with water or with gum-acacia water in different proportions, proved very acceptable and healthful.

Suppositories are useful both for evacuating and medicinal purposes. Soap is utilized for the former purpose by the public at large, and the same material differently mixed, with or without medicinal additions, such as atropine, by the irregular trade. Local medicinal applications to the rectum are best made by means of injections, but a general effect is also obtained through a suppository. Opiates, and narcotics generally, exhibit their full power when the suppository is retained. Extract of hyoscyamus, from half a grain to a grain in a suppository, to be repeated from two to five times daily, shows its effect in relieving vesical spasm nearly as well as when taken internally. Quinine is gradually dissolved and absorbed. Extract of nux, both in ointments and in suppositories, acts well in prolapse of the rectum and debility of the sphincter.

Subcutaneous injections of remedial agents ought to be made more frequently than appears to be customary. The extremities, particularly their lower halves, should be avoided, for their constant motion and the relative absence of fat in their subcutaneous tissues are liable

to give rise to local irritation, swelling, or suppuration. The abdominal wall or the lumbar region is preferable. The recommendation to use the interscapular space was made by famous men who worked in the laboratory and did not know what inconvenience there may be in a back, punctured and often sensitive, on which a patient is to seek his rest. A sharp and aseptic needle and gentle friction of the injected part are all that is required. The solutions used must be clear and without any solid ingredients. When they have been preserved for some time they ought to be filtered before being used, particularly when fungous growths have begun to make their appearance in the liquid. The latter may be preserved best by adding a small quantity of alcohol, salicylic acid, or hydrocyanic acid. The doses must be as small as possible, and the medicine diluted more than in the case of adults. This is mainly required when a caustic effect is to be feared. While, for instance, Lewin advised for adults a solution of four grains of hydrargyrum bichloride in an ounce of water, one or one and a half grains give a more appropriate solution for infants. One or two daily doses of eight or ten drops continued for weeks will prove very useful in those urgent cases of hereditary syphilis which are characterized by pemphigus on the soles of the feet and the palms of the hands in the first days after birth. Brandy and ether may be used undiluted as in adults, but the latter is particularly painful and the greatest care must be taken as to the locality injected. The subcutaneous tissue must be reached and the cutis penetrated by inserting the needle at a nearly right angle from the surface. Chloral hydrate dissolves readily in two parts of water, but a solution of one in four or six is better tolerated. For the ready symptomatic treatment of convulsions it renders good service. Antipyrin is well borne in solutions of one in six or eight parts of water, camphor in from four to six parts of sweet almond oil. The fluid extracts of digitalis and ergot are very apt to give rise to indurations and, perhaps, abscesses. As a rule, the most convenient medicaments for hypodermic administration are the very soluble alkaloids. One or three drops of Magendie's solution of morphine or the corresponding solution of morphine muriate are vastly preferable to the internal use of narcotics for bad pain in pleuritis or pleuropneumonia, or in peritonitis of advanced childhood. It may be mixed with atropine sulphate for the reasons regulating its use in the adult. The latter by itself has been found quite effective in the case of an epileptic boy, who had taken the same drug internally without any success. If possible, it ought to be injected during the aura; if not, twice a day. Apomorphine muriate is a ready emetic in doses of a thirtieth or a fifteenth of a grain. Pilocarpine

muriate can be injected in doses of from one-twentieth to one-eighth of a grain. Its reckless use, both hypodermically and internally, has led to occasional mishaps, but the drug is a powerful agent for good when carefully applied, and has saved for me several cases of meningeal hyperæmia and cerebral œdema, mostly of nephritic origin. Strychnine sulphate, while in the same affections it has mostly proved inefficient when taken internally, has rendered efficient services in enuresis depending on paralysis or weakness of the sphincter of the bladder and in prolapse of the rectum and fecal incontinence resulting from paralysis of the anus which depended either on disease or congenital incompetency. In these cases a daily dose of a fortieth or a twenty-fifth of a grain—according to the age of the patient or the severity of the case—is sufficient. More frequent doses, however, are required in the diphtheritic paralysis of the respiratory muscles, which is dangerous and apt to become fatal unless speedily relieved. A daily dose will also yield fair results, when long continued, in the later stages of spinal or cerebral paralysis, where its internal administration is entirely or well-nigh useless. Quinine salts must be neutral when injected; I prefer the bromide, the muriate, or the carbamide. They, particularly the last, are among the most soluble. The carbamide dissolves readily in from four to six parts of warm water; the latter temperature ought to be preferred in every case of subcutaneous injections. Quite saturated solutions ought to be avoided, because it has happened to me that the water of the solution was speedily absorbed, and the quinine remained as a foreign body in the subcutaneous tissue. Caffeine, in combination with sodium and salicylic or benzoic acid, is an excellent heart stimulant, and has rendered splendid service in urgent cases of heart-failure or pulmonary œdema depending on cardiac disease. Sodio-caffeine salicylate and benzoate are soluble in two parts of water, and are readily absorbed. Both should be avoided in those cases which are complicated with cerebral irritation or sleeplessness. Fowler's solution, carefully filtered and diluted with at least twice its quantity of distilled water, may be injected into healthy or morbid tissues without often risking irritation and abscess. Still, I have seen a splenic abscess after such an injection in a case of sarcoma of the spleen. Undoubtedly, the continued use of arsenic renders very efficient services in sarcoma; but as it has to be used quite a long time, it is almost impossible, except in hospital practice, to resort to hypodermic medication. There is no harm in this, however; for a slow, gradual increase of the drug is tolerated by the stomach to such an extent that very large doses (amounting to half a drachm = two cubic centimetres) of Fowler's

solution daily, well diluted, may finally be administered after meals to children of six or eight years.

Subcutaneous injections have reached an extensive field of usefulness in *serotherapy*. After it was proved that animals could be immunized against certain virulent bacteria, it was found that the blood-serums of previously immunized animals * could be utilized as powerful remedies in infectious diseases of man. In the article on diphtheria more will be said of the effect of its antitoxin, the preparation and knowledge of which is due to Aronson, Roux, and Behring. Tetanus and diphtheria are certainly influenced by their proper antitoxins to a remarkable degree. Asiatic cholera is likely to be the next great scourge of mankind to be stripped by its antitoxin (Haffkin) of part of its fury. Neither Marmorek nor others, however, have thus far succeeded in producing an antitoxin which is as effective as those of (tetanus and of) diphtheria in such infectious diseases as appear to be connected with, or dependent on, streptococci (puerperal diseases, erysipelas, scarlatina, and some forms of abscesses, of angina, and of mixed diphtheria). Nor are the claims of Coley, who, with antitoxin procured from the coccus of erysipelas and from bacillus prodigiosus, exhibits interesting results in sarcomatosis (not in carcinosis), generally accepted by all. In many more diseases antitoxins have been recommended; prematurely it appears, for neither croupous pneumonia nor typhoid fever nor syphilis has been benefited thus far. Nor have the attempts at obtaining an antitoxin to take the place of calf vaccinia in the immunization against variola been successful. Not infrequently the lymph usually employed is mixed with bacteria and other impurities. The cases of tetanus appearing after vaccination should not shake the faith in vaccination nor relax the efforts to make vaccination compulsory, but should be a warning against careless preparation of vaccine. Thus far, however, a sterile blood-serum of the vaccinated calf cannot be obtained in sufficient condensation and efficacy.

In organotherapeutics the hypodermic method is no longer employed extensively, since the internal administration of the different

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* Not to be mistaken for the congenital protection afforded by the presence of "alexins" in the blood-serum of the newly-born.

Certain infectious diseases leave in the circulation an immunizing substance which protects its bearer against relapses. This, at least, is the only possible explanation of their protection. This fact suggested the possibility of a successful treatment of measles, pneumonia, and scarlatina with the blood-serum of such persons as had just passed through one of those maladies. Good results are reported. Personal experience I have none.

tissues, or their extracts, or other modes of preparations is both efficient and (mostly) palatable. Many of the secretions and tissues of the body of man and beast were used in olden times under the reign of crude empiricism or bestiality,—blood, bile, urine, fæces, hair, bones, etc. Of the modern organ extracts, cerebrin, hepatin, lienin, renin, pulmonin, oophorin, spermin, didymin, the reports on which are not all dictated by an unpolluted scientific spirit, not much can be said as yet. Those which have been proven to be valuable, particularly to children, will be discussed later.

The subcutaneous injections of cocaine, according to Schleich's method of "anæsthesia by infiltration," will prove a great gain to the practitioner, inasmuch as, with or without the previous use of ethyl chloride, it will facilitate many operations. Maybe its principal advantage will lie in this, that many abscesses and furuncles will be dealt with before they are permitted to get larger. Their anti-neuralgic action will not be required frequently, because of the relative scarcity of neuralgias in childhood. In almost every case the solution is to consist of cocaine muriate 0.1, morphine sulphate 0.02, sodium chloride 0.2, distilled water 100.0 (5 to 1 to 10 to 5000).

Inhalation is resorted to in two different ways. Either the air of the room or of a tent is impregnated with the substances to be introduced into the air-passages, or these substances are introduced through sprays or atomizers of different shapes and patterns. Some of the latter have always appeared to me very faulty and not to the purpose at all. Tubes introduced into the mouth, through which substances are to be carried down, will land them in the mouth; it takes all the self-control and intelligence of an adult patient to allow the object in view to be accomplished. The oral cavity of the infant or child is small, the tongue is coiled up, and the faucial muscles will not relax. Nose and mouth must co-operate to allow inhalations to enter the larynx, or the former alone must be relied on. A spray calculated to reach the larynx of infants or children is always best introduced into and through the nose. In this way, at all events, the posterior part of the pharynx and the respiratory tract are reached to best advantage. The manner in which the spray is employed in diseases of the nose and pharynx is quite often too perfunctory, with no other result but to make the patients wakeful and restive; and it should not be forgotten that no access to the trachea and bronchi is possible except during a deep inspiration. The difficulty of accomplishing that in children is obvious.

Real inhalation, however, means filling the lungs with a gas or

vapor. Warm steam will do good service in bronchitis and pneumonia, when the bronchial secretion is viscid and expectoration difficult, and in diphtheria, for the purpose of softening membranes and increasing the secretion of a thin and normal mucus. Cases of fibrinous bronchitis I have seen getting well in bath-rooms, the hot water being turned on for days in succession and the air thick with steam. An excellent inhalation in the inflammatory conditions of the respiratory organs is that of ammonium muriate. Every hour, or at longer intervals, a gramme or more of the salt—the quantity depending in part on the size of the room—is burned on the stove or over a live coal or an alcohol-lamp. The heavy white cloud fills the room, is easily borne by both sick and well, and improves expectoration. Oil of turpentine can be utilized in a similar way. Its action is both expectorant and disinfectant. In the latter stages of pneumonia, when the bronchial secretion is thick, viscid, or deficient, and expectoration and cough are wanting, the room may be filled with turpentine vapor. This can be accomplished in different ways. A large soft sponge may be soaked with turpentine, with or without the addition of some oil of sassafras, and suspended at the bedside. Or a kettle of water may be kept boiling day and night on the fireplace or over an alcohol-lamp (this is preferable to a gas-stove, which consumes too much oxygen), and a tablespoonful of turpentine, more or less, poured on the boiling water every hour or two hours. The same may be done to advantage in diphtheria, with or without a teaspoonful of carbolic acid in addition to the turpentine, and in gangrene of the lungs. The inhalation of benzine, cresolin, and similar substances, and of the coal-gas of gas-works, has often been recommended in whooping-cough. In its worst forms, particularly when it is complicated with convulsions, the frequent inhalation of chloroform is sometimes life-saving. A baby of six months, with hourly attacks of convulsions, I kept alive by putting him under the influence of chloroform at the beginning of every attack, and continuing that treatment for several days. Asthmatic attacks will do well sometimes with inhalations of chloroform, ether, and spirits of turpentine in different proportions, mostly 1 to 2 to 4. Chloroform is well tolerated by the young, but should be avoided in the cases of lymphatic patients. Sudden deaths may be (and appear to have been) encountered in them, and may occur after weeks as a result of the parenchymatous changes in the heart caused or increased by the drug. Amyl nitrite also will influence them favorably; as a preventive of epileptic attacks I have experienced occasional success with its administration. But in collapse, with paralysis of peripheral blood-

vessels, it certainly renders good service. With the inhalation of oxygen for the purpose of bridging over the most dangerous period of a suffocating pneumonia and of improving tissue-change in general anæmia and ill-nutrition, the profession is well acquainted. It is no use to deny that effect on theoretical grounds afforded by the alleged law of the diffusion of gases. If those who write books for practitioners would but study disease at the bedside! With the inhalation of ether as an antidote to poisoning with santonin I have no personal experience. Ozone inhalations have been highly recommended in anæmia, whooping-cough, and septic fevers. We shall have to learn more of its effects, and particularly in regard to a ready and reliable method of its preparation. A. Caillé, while regretting the clumsiness and expensiveness of apparatuses, uses it in chlorosis, secondary anæmia, and whooping-cough. A personal communication of his speaks also of a case of tuberculosis in an adult successfully treated with ozone inhalations extending over several years.

In pulmonary tuberculosis the inhalation of disinfectant vapors is employed less than the necessity of the cases would appear to indicate. Carbolic acid, turpentine, eucalyptol have been utilized for that purpose. The object is to supply the lungs with those substances in thin dilutions constantly. Prudden has proved that carbolic acid in twelve hundred parts of water stops the emigration of leucocytes in inflammatory disorders. Thus high dilutions, though they be hardly perceptible to the senses, and certainly not to a disagreeable extent, may be amply sufficient. It is for this reason that Feldbausch invented small apparatuses filled with a disinfectant substance to be persistently worn in a nostril.

The inhalation of chloroform, which is, on account of the average vigor and healthiness of their hearts, preferable to ether for the purpose of producing anæsthesia in the cases of infants and children, is rather unsatisfactory at the earliest age because of the superficial character of respiration. So is that of ether, which, moreover, may become contraindicated in every period of life because of its detrimental effect on the kidneys and on the respiratory organs. It frequently begets nephritis, which anyway is frequent in infancy and childhood, bronchitis, and pneumonia. The effect of the anæsthetic is very temporary, and the administration must be repeated and closely watched during a convulsion or an operation. The difficulty in obtaining a complete narcosis is particularly great in the newly-born. The stage of excitement is brief, the pulse becomes frequent, and the pupils contract. After a short time, however, the pulse becomes slow and the pupils dilate. The after-effects are not so inconvenient as they

often prove in the adult; infants and young children vomit less frequently and less profusely, and certainly with greater facility and ease than adults. They are liable to remain under the influence of the anæsthetic a long time after an operation has been completed. After tracheotomies, which I never performed without chloroform unless the children were asphyxiated by carbonic acid poisoning, the patients are apt to sleep long and undisturbed. Thus they require ceaseless watching until the effect has surely passed away. Through the opened trachea the children will get under the influence of chloroform very easily. Five or six drops on a sponge or on some absorbent cotton, held in the mouth of the tube by means of a pair of pincers, have an almost instantaneous effect, and came near destroying—when I undertook to change the tracheal tube on the third day—a successful case of mine forty years ago, before I had the experience detailed in the previous remark. Further care is also required in regard to patients in ill health. Chronic pulmonary and heart diseases do not tolerate chloroform very well, but the diagnosis of these conditions is more readily and quickly made in children than in adults. Adipose children are liable to faint. The usual operations in the mouth, such as resection of tonsils, incision of abscesses, and evulsion of adenoids, it is best to perform without an anæsthetic, for the amount required to overcome the resistance of the masseter and buccinator is so large, generally, as to possibly endanger the life of the patients, besides the impossibility of obviating successfully the entrance of blood into the digestive organs, where it is inconvenient, or into the respiratory organs, where it is a positive danger.

Of the two anæsthetics, ether and chloroform, the latter should, as a rule, be preferred in infancy and childhood, except in a case complicated with heart disease. It is the heart that runs its risk during the use of chloroform. The average vigorous young heart is less exposed to its dangers, but still its power of resistance should not be relied on too long. For several reasons operations should be performed quickly, though children are anæsthetized more readily than adults. For, after all, chloroform and ether are not indifferent agents, and may prove destructive; the loss of a few ounces of blood is a serious matter, so long as a baby of thirty pounds has not over one and a half pounds at best; and blood-pressure is diminished so long as the operation requires the uncovering of a large part of the surface. For every operation requiring an anæsthetic a saline solution should be kept ready for subcutaneous injection. Among the disinfectants carbolic acid should not be used at all; even iodoform has occasionally proved dangerous.

Gargles of any description require a certain degree of training and self-control, and are therefore rarely available for children of less than seven or eight years. The liquids thus employed do not reach any farther than to the uvula, the pillars of the soft palate, and the anterior part of the tonsils. Whatever succeeds in passing them is swallowed. Thus the alleged efficacy of gargles is greatly overestimated. Astringents, however, have a certain influence in reaching beyond the area of contact, but through their secondary effect on contiguous tissue only. When a thorough effect is aimed at, it is better to rely on sprays, which may affect the whole pharyngeal cavity, or on insufflations of powders; this latter plan is rather unpleasant, and should be followed in children in exceptional cases only. As, however, in most cases where a local effect on the pharynx is desirable the local affection spreads over the posterior nares as well, spraying or (much better) irrigating the nose is preferable. The liquids thus employed reach the pharynx, and are either swallowed—which is often an indifferent matter—or expelled through the mouth. When these methods are undesirable,—for instance, when the liquids injected enter the Eustachian tube,—they may be poured into the nasal cavities from a teaspoon or a pipette. A common medicine-dropper will seldom suffice; one of the nasal cups for sale everywhere will do better. There is many a case of diphtheria in which the very gentlest method of cleansing and disinfecting the surface of the naso-pharyngeal cavity ought to be selected. More on this subject will be said in another part of this book (Chapter V.).

When no liquids are tolerated, medicated ointments may be introduced into the nostrils by means of a camel's-hair brush, or poured in. Ointments prepared with vaseline, glycerin, or cold cream are good vehicles for that purpose. Sponges and brushes ought to be avoided whenever the young patient objects to them strenuously. No violence must be used for several reasons. The child's strength must not be exhausted by his attempts at self-defence, and most local affections of the throat get worse by any injury done to the epithelia. Even galvano-cauterization can and must be applied without much violence. Persuasion, patience, and cocaine will render its employment possible in many instances.

The *skin* in infancy and childhood participates in the anatomical structure of all the tissues at that early period, inasmuch as it contains more water than in advanced age. Besides, it is thinner, and its lymphatics are more numerous, larger, and more superficial. This explains some peculiarities in regard to the effects of many medica-

ments. Hot air in apparatuses, as used by Tallerman and others, of 140° C. and more, should be watched, and lower temperatures tried first. It is employed more in chronic than in acute ailments, arthritis of all forms, deformans and gonorrhœal included, muscular and other chronic rheumatisms, and the intense chronic muscular spasm of talipes valgus (very rare in children), also the progressive ossifying myositis, and chronic osteitis and periostitis. Electricity in all its forms is sometimes efficient, and a relatively mild current may suffice. This fact is of particular importance, as, moreover, the bones also are thinner and more succulent. To act upon the brain, very mild currents only must be used. The spinal cord is less accessible, and appears to require rather large doses from large electrodes. The galvano-caustic effect resembles very much that obtained in the adult. In most cases it should be closely watched while being employed; thus, for instance, in the operation on angiomata, or diseases of the tonsils or nose, it readily destroys more than was intended.

Sinapisms, when not mixed with flour, must not be permitted to remain more than a few minutes. As soon as the skin begins to be discolored they should be removed. When that is done, they may be repeated every few hours, and they are active derivants in many cases of deep-seated congestive processes. The same remark is due in reference to the use of *mustard-baths.* A hot mustard-bath renders good services in suppressed or insufficient cutaneous eruptions of an acute character, internal hemorrhages, meningitis, and pneumonia; but it must not be continued beyond reddening the skin; if so managed it may be repeated.

Vesicatories have lost much of the esteem in which they were held in former times. I remember the time when many a case of pleurisy, articular inflammation, herpes zoster, was not permitted to get well without a Spanish-fly blister. Nor am I of the opinion to-day that it will do no good in some such cases, provided it be not used during the feverish stages. But their drawbacks are many. A plaster will not stick to an emaciated and uneven surface, and is even apt to give rise to gangrene when the surface circulation is very defective. In these cases the wound will heal badly. The skin of the infant being very vulnerable, eczema and impetigo will easily arise on ever so slight a provocation. The local pain of the application produces irritation, nervousness, and sleeplessness. This is particularly so if the application be made on the extremities or on the posterior surface of the body. The kidneys are frequently affected by cantharides, dysuria being the result in many cases, which then require energetic camphor treatment for the relief of the torturing symptoms.

There are some absolute contraindications to the external use of cantharides: the presence of diphtheria in any shape or manner, and such diseases as are liable, during the prevalence of an epidemic, to become complicated with diphtheria. Therefore, no vesicatory must be used during nasal, pharyngeal, or laryngeal diphtheria (croup), or in the different forms of pharyngitis, or in laryngeal catarrh, or in erysipelas, or in diabetes.

When a plaster cannot be expected to remain on the surface and to have its full effect, cantharidal collodion may take its place. The application will prove more effective when the surface is first washed with vinegar or irritated by a sinapism, which, however, is allowed to remain a few minutes only. Then a flaxseed poultice or warm-water applications may be applied over the vesicatory to diminish the pain and accelerate the effect. Very young infants ought not to carry a vesicatory more than an hour, at least not on the same spot. That is why to them the cantharidal collodion is less adapted. The plaster may be shifted from place to place.

After the epidermis has been raised, the serum must be allowed to escape through small punctures, but not so as to moisten the adjoining parts, for the cantharidin contained in the serum may exert a disagreeable local effect. The epidermis ought not to be removed, and no irritating ointment used to keep up a secretion. To cover the sore surface, vaseline or cold cream is preferable to common fats, which may be, or become, rancid. The best final dressing is borated cotton and a bandage. Vaseline ointments with opium, lead, or zinc, and powders of zinc, bismuth subgallate, iodoform and amylum in equal parts, or salicylic acid one part, with from thirty-five to fifty of starch, will find their occasional indications.

In many affections of the skin powders, solutions, liniments, ointments, and baths are employed. The skin is thin and irritable. Erythema will follow the contact with water quite often; thus many forms of dermatitis contraindicate its frequent use. Acute and chronic eczema get on better without than with it. Therefore astringent solutions are less advisable than astringent ointments. For superficial effect these must be prepared with vaseline or cold cream, either of which may readily be combined with lead, tannin, zinc, bismuth, salicylic acid, or iodoform. In not a few cases, on a very sore surface, denuded of its epithelium and oozing, the powders alone, or combined with starch or talcum in different proportions, will prove very effective. Oleates ought to be avoided; they irritate the skin and produce eruptions.

As the skin is thin and succulent, and the lymph-ducts of the young

quite superficial, large, and numerous, substances will penetrate the skin quite readily. Ointments with that object in view must be prepared with animal fats, particularly with adeps lanæ hydrosus of the United States Pharmacopœia (lanolin), to the latter of which, when rather dry, ten per cent. of water may be added. Still, much friction may by itself irritate the surface and give rise to suffering.

In the very young, *ice* and *ice-water* applications are not tolerated a long time. Ice to the cranium, the bones of which are but thin, is liable to produce collapse; about the neck and occiput it is better borne and often beneficial. Warm *fomentations* and hot poultices are very beneficial in many morbid conditions of the trunk and extremities, but dangerous when applied to the head and not carefully watched. General *baths* are frequently required, local baths but seldom; foot-baths may be given while the patient is lying down, but hot fomentations are more readily made, and do not require the same amount of watching, nor are they equally objectionable to the young patient.

Depletions were frequently resorted to scores of years ago. Modern practice has learned how to do without them, though we should be willing to assume that they were more frequently indicated than many of us believe at present. At all events, it ought to be taken into consideration that there is but a single pound of blood in a baby of twenty pounds, and that a patient rapidly reduced by sickness is least able to stand a loss of blood ever so small. Thus a venesection will hardly ever be thought of in the case of a baby; at all events, I hope never to repeat the opening of a jugular vein, practised by me on an infant taken with convulsions depending on, and adding to, cerebral congestion, forty years ago. But there are cases of older children that bear, or rather demand, a venesection. Its indications are over-extension and insufficiency of the (mostly the right) heart with impeded pulmonary circulation, with intense dyspnœa and cyanosis, in which the largest doses of digitalis have been given in vain. In one of his cases Baginsky opened the radial artery when he did not succeed in getting blood from a vein. Such cases are occasionally pulmonary œdema during the incipiency of the crisis in a croupous pneumonia, or, principally, old mitral incompetencies with immense dilatation and failing compensation. The objects to be accomplished are the relief of the feeble heart muscle and the restoration of its contractility. A further indication for a venesection may be afforded in occasional cases of uræmia or eclampsia, similarly to its employment in the adult. Local depletions were once more frequent, though the liability of the skin to inflammation and furuncle was well understood,

and the excitement of the little patient was such, now and then, as to lead to an increase of the symptoms and even to convulsions. Among the occasional drawbacks was also the possible loss of blood after the leeches had fallen off. In such a case the local use of tannic acid, alum, perchloride or subsulphate of iron, digital pressure, or in bad cases the ligature underneath a harelip needle, which was inserted through the wound, were resorted to. A solution of from twenty to fifty per cent. of antipyrin in water, which may be immediately followed by a solution of tannic acid (mostly not required), is a powerful styptic. The indications for depletion were bad and painful cases of pleurisy and peritonitis, and cerebral inflammatory diseases. In the two former, the indication to relieve pain is more readily fulfilled by ice or the subcutaneous use of morphine or cocaine. In the latter, the mastoid process and the septum narium are the points on which the leech or leeches ought to be applied. It is the latter spot which I prefer, when I have the choice, in those rare cases of brain diseases of infants and children in which I still feel justified in recommending a depletion. Altogether, however, many of the olden-times indications for bloodletting have proved deceptive. It does not serve as an antiphlogistic in all sorts of fevers and inflammations, or as an evacuant of an alleged plethora, or as a sedative and anæsthetic, but it certainly may be employed to divert a local stasis, even in cases in which apoplexy is feared. In toxic conditions, particularly in intense sepsis, it should be carefully avoided, though acute poisoning may be relieved by it. Uræmia, or carbon oxide poisoning, may, as I said, be benefited by a venesection, and the diminished circulating medium replaced by a saline solution administered either subcutaneously or injected in the rectum or directly into a vein.

III

Treatment of the Newly-Born

1. *Asphyxia.*

The prognosis of asphyxia and of its treatment is a very doubtful one in many cases. It depends not only on the knowledge and skill of the physician, but on the causes of the abnormal condition. A moderate or serious compression of the head, compression or prolapse of the cord, intra-uterine respiration and aspiration of foreign bodies (amniotic liquor, meconium), apoplexy, anæmia of the fœtus, accumulation of carbonic acid in the blood, poisoning by morphine or chloral, taken by the mother, or by her excessive temperature, congenital diseases, and malformations, each of them, or several combined, influence both the prognosis of the individual case and the result of therapeutic procedures.

When the long duration of labor, the prolapse of the cord, the protracted compression of the head, the early loss of amniotic liquor, placenta prævia, or a high temperature of the mother endangers the life of the fœtus, the best *preventive* of asphyxia is the artificial termination of parturition. The respiratory organs of the fœtus passing out of the vagina should be protected from contact with copious discharges of liquor amnii and other foreign material accumulated in the bed, and the face be raised so that aspiration, mostly through the nose, cannot take place. The mouth of the newly-born, unless it cries lustily, must be cleansed immediately, but very gently, by a moistened piece of cloth wrapped round the finger, the tongue drawn forward, and the baby placed on its side before attention is paid to anything else. Beating the nates, tickling of the fauces by means of the feather of a hen or a goose, and the momentary inhalation of ammonia can be resorted to before the baby is separated from the placenta. Most practitioners, indeed, will, under the usual circumstances, prefer to prolong the connection with the maternal organ until the pulsation of the cord begins to flag. The separation of the baby must take place immediately when there is no pulsation in the cord or when asphyxia is well pronounced. When the baby is strong and cyanosis marked, Grenser recommended to allow the cord to bleed before the application of the ligature. When bleeding was scanty,

he increased it by placing the baby in a warm bath. This procedure I have imitated several times with advantage.

When the ligature has been applied and the baby removed, the mouth of the asphyctic infant ought to be cleansed again as above, quickly but gently. For amniotic liquor, meconium, and vaginal secretion, when aspirated, will, though the asphyctic condition may be relieved, give rise to bronchitis and pneumonia after two or four days. Many babies die in this way.

Insufflation into the lungs for the purpose of establishing respiration was practised by Smellie as early as 1762. It is done from mouth to mouth, from mouth to nose, or through a catheter introduced into the larynx. The first method is not reliable, for the tongue is liable to close both pharynx and larynx; the second is often successful, but may inflate the stomach as well as the lungs. By inflating the former the chances for a normal action of the lungs become less. After every insufflation which fills the lungs, the chest ought to be compressed by two hands over the lower latero-anterior region of the chest-walls to facilitate expiration.

The direct insufflation of the lungs may become detrimental for several reasons. H. Reich relates the case of a consumptive midwife who was reported to have infected twelve infants with acute tuberculosis in thirteen months. In the practice of another midwife, who was healthy, in the same town, no such case occurred. During nine previous years there were but two cases of tubercular meningitis, and but one in the year following the death of the consumptive woman. Moreover, the act of insufflation may prove dangerous by the impossibility of limiting the force of the entering volume of gas. Rupture of pulmonary tissue and emphysema and pneumothorax have been observed. The same accident may occur when a catheter is used for the same purpose. It has, however, the advantage of permitting the sucking out of the aspirated material before air is blown into the lungs. Ribemont's and other metal catheters cannot be carried much below the vocal cords. An elastic catheter, guided by a wire which allows any degree of bending and may be withdrawn when the vocal cords have been passed, is better adapted both for aspiration and inflation.

The asphyctic baby ought to be plunged into a warm bath (100° F.) immediately and gently rubbed. The other methods may be continued during that time,—beating, tickling, electricity. When it is thin, pale, and collapsed, a hot injection into the bowels (from 104° to 115° F.) will render good service. The quick and repeated alternation between the warm bath of a minute and a cold one of one or

two seconds, or the pouring of cold water on chest or neck while the body is in the warm bath, restores many; but great care must be taken lest the latter be too hot. It may produce clonic or tonic convulsions, and has been reported as giving rise to tetanus. Before and after the bath, indeed at any time, the vigorous swinging of the baby on the arms of the medical man is a good adjuvant.

Among all the mechanical methods of artificial respiration (Marshall Hall, Silvester, Howard, B. Schultze, Pacini, Woihler, Bani, Schüller, Dew, and others) those of Silvester and Schultze render the best services in the asphyxia of the newly-born. Both are very simple, and either of them is effective. A. Brothers prefers the former ("Infantile Mortality during Childbirth and its Prevention," Philadelphia, 1896).

Silvester places the patient on his back, a small pillow (piece of clothing, towel, sheet) between the shoulders, the tongue drawn forward. The two arms are caught above the elbow and while being everted are slowly carried upward. Thus the chest is expanded. Then they are carried downward and pressed against the sides of the chest, a little anteriorly to the axillary line. Thus the lungs are compressed. This combined action may be repeated fifteen or twenty times in a minute, and a hot bath given afterwards. Then the procedure is renewed.

B. Schultze places his index-fingers in the axillæ, the three other fingers gently against the sides of the chest, the thumbs covering the shoulder from behind. The infant is then swung forward. The lower extremities bend on the abdomen, the abdomen presses against the diaphragm, and the lungs are compressed,—expiration. The parts then return slowly downward and swing back, thus expanding the chest,—inspiration. This action may also be repeated fifteen or twenty times in a minute. After each minute's swinging the baby is placed in a warm bath. There is but one (occasional) contraindication to the employment of this method,—viz., the insufficient development of the fœtal bones. When the newly-born is too premature and the ribs too soft and flexible, it is useless. It is also contraindicated in the plethoric, congestive variety of asphyxia. That proper caution should be exercised is self-understood. In a case published in the London *Lancet* of May 8, 1897, the infraspinatus and teres minor muscles were injured so as to cause rotation and adduction of one arm.

During all this time, whenever feasible, the surface of the infant must be kept warm artificially by hot blankets, stones, bottles, and a few drops of brandy, whiskey, camphor-water, or tincture of musk,

or a drop of tincture of belladonna may be given in some hot water if deglutition is possible, or a larger quantity (some ounces) of hot water (from 104° to 115° F.) injected into the rectum. When the main difficulty appears to be, after a while, in the excessive debility of the heart, with absence of the radial pulse, a five-hundredth part of a grain of nitroglycerin, repeated after fifteen and thirty minutes, may render good and speedy service through its ready absorbability on every mucous membrane. I have no experience with it in the asphyxia of the newly-born, but its rapid action in failing heart and collapse and shock from other causes encourages me to recommend it for a fair trial of its powers.

Laborde was very successful by drawing the tongue of the asphyctic baby forward in rhythmical alternations. That procedure is to be repeated ten or fifteen times a minute. It does not seem to be promising unless the reflex irritability (small in the normal new-born) of the medulla oblongata is rather intact.

Electricity was recommended in cases of asphyxia as early as 1793 by Hufeland. But the first case in which the rhythmical faradization of the phrenic nerve and its associates was resorted to (Ziemssen) for the purpose of producing artificial respiration was that of an asphyctic girl poisoned by carbon oxide. The phrenic nerve acts on the diaphragm. Its aids are the cervical plexus, which controls the trapezius, levator scapulæ, and middle scalenus muscles, and the brachial plexus. The ramifications of the latter are the anterior thoracic nerve for the pectoralis major and minor; the posterior thoracic for the middle scalenus, posterior superior serratus, and the rhomboid muscles; and the lateral thoracic for the serratus anticus major.

In many cases since, such as poisoning by chloroform, coal-gas, opium, diphtheria, hydrogen sulphide, and pernicious intermittent fever, also in those of apoplexy, drowning, and hanging, electricity has been employed to advantage. Its effect is often rapid and powerful.

In asphyxia of the newly-born, the systematic faradization of the phrenic nerve was first employed by Lauth and Pernice.

The point of application selected by most authors is near the sterno-cleido-mastoid muscle, over the phrenic nerve. The other pole is applied either to the neck or to the diaphragmatic region or any other part of the surface. The localization of the effect to the phrenic nerve alone, which was insisted upon by many, is certainly an illusion. The current will surely strike the pneumogastric, phrenic, sympathetic, and many sensitive and motory nerves at the same time. As this

cannot be avoided, as indeed it is better that it should be exactly so, it is best to use large sponge electrodes and moisten them thoroughly with salt water. The head, arms, and shoulders should be slightly raised, and a small pillow placed between the shoulders for the asphyctic baby to rest on. One of the electrodes must be kept stationary, the other brought into contact with the surface a single moment only. A deep inspiration will then take place, the lungs will expand, and lateral pressure on the lower part of the chest should be resorted to for the purpose of emptying the lungs afterwards. Another application is then made with the same result, and must be followed by the same manipulation. This has to be continued for some time until the baby cries, and until it appears safe to discontinue the application. Whenever a cough or a coughing movement is noticed, it should be omitted temporarily. The favorable result, however, is not always permanent. The causes of the asphyctic conditions are still active, and the infant will require resuscitation again, and perhaps many times. Thus close attention must be paid, sometimes for hours.

Great care should be taken in regard to the duration of the application. Continued or too frequent irritation by the current causes over-irritation and paralysis. Not infrequently the immediate effect is a favorable one, inspiration becoming deep and the heart active, but after a short time the former grows more superficial, the pulse feeble, and the cyanotic hue returns to the lips and finger-nails. Then it is time to stop for a while, and resort temporarily to other means of resuscitation. Thus the practice of Lauth, who applied the current persistently for two or three minutes, is decidedly improper and dangerous.

In some cases, where the interrupted current is inefficient, the galvanic (continuous) current, with occasional reversions, has been known to yield better results. In my own cases I have never had an opportunity or been under the necessity of employing it.

The application of large sponge electrodes may not always be convenient. In those cases no harm is done by using the metal poles instead. Though the irritability of the brain (and nerves) is low in the newly-born, the pain produced by the interrupted current thus applied is very intense, and the effect on the contraction of the diaphragm quite marked. Thus it is not necessary to lose time in preparing, if it be not on hand, the more complicated apparatus. Still, exhaustion is more readily obtained through resuscitating by pain and muscular action combined than by muscular contraction alone. In most cases, however, I was satisfied with not losing even a fraction of a minute, particularly in those early times, when

the most convenient apparatus was the old-fashioned rotating machine.

How long is the asphyctic baby to be watched and the attempts at resuscitation to be renewed? At all events, they must not be given up so long as the heart-beats are audible, though ever so feebly. Nor is a single scream sufficient to permit watchfulness to be relaxed. The deep recession, during inspiration, of the diaphragmatic region (the "peripulmonary groove" of Trousseau) should have ceased, the cry be vigorous, the eyes wide awake, and the extremities in lively motion. Before this is accomplished there is danger of a relapse, partly from impaired innervation and the continuation of some of the causes of asphyxia, and partly from obstruction through mucus, which may be coming up constantly and gather in the pharynx and posterior nares.

Some cases of asphyxia are particularly troublesome: those in which it is due to prematurity of the newly-born or to an actual anatomical change (hemorrhage, compression of the brain or medulla) which requires time to get well or will terminate fatally; also those which are due to congenital anomalies of the organs of circulation or respiration (syphilis of the lungs, effusion into the pleural or the peritoneal cavity, thoracic tumors, etc.).

There is no more trying hour in the life of the practitioner than that spent on resuscitating an asphyctic newly-born. Every moment tells. For it is on the immediate restoration to full life that will depend the narrow border line between a physically and intellectually normal human being and an epileptic, paralytic, or idiotic invalid. That is why I placed asphyxia at the head of this chapter and emphasized its many dangers and possible sources of relief.

2. *Postnatal Asphyxia and Atelectasis.*

Atelectasis may be congenital or acquired. The lungs may never have expanded to their normal degree, or after expansion had taken place, they may have collapsed or contracted again. The causes of this condition may also be either congenital or acquired. There may be malformations and intra-uterine diseases of the organs of respiration or circulation, such as defective development of the lungs, hernia of the diaphragm, hypertrophy of the thyroid gland, pleural effusions, syphiloma of the lungs, acquired bronchial catarrh, bronchitis, and pneumonia. Or anomalies of the nervous system may exist, such as hemorrhage or some other injury of the respiratory centre, and cerebral pressure from effusion, besides intra-uterine malformations. Or,

finally, the baby may be premature, with feeble muscles and soft bones.

The treatment resembles much, or is identical with, that of genuine asphyxia. Respiration must be insisted upon. Warm and cold baths, cold affusions in the warm bath, swinging, beating, and electricity each come in for their share in the treatment. The baby must be made to cry, or it will perish. This indication is particularly urgent in the acquired cases of atelectasis which result from bronchitis. There the small bronchial tubes are filled with a viscid sticky mucus, which must be removed. This is a condition not peculiar to the quite young only; it is as well met with in older babies suffering from bronchitis, particularly when in a condition of ill-nutrition and general debility. In them, the closing of the nose and mouth for from four to eight seconds will so saturate the respiratory centre with carbonic acid as to elicit deep and forcible inspiration through irritation of the medulla. It is an effective method, and not cruel because it is successful.

The babies should be fed conscientiously. (See Chapter I.) As many are suffering from inanition, this requires close attention. They should have plenty of water, warm or hot, with from one to four drachms of brandy through the twenty-four hours, aqua camphoræ, a few drachms; perhaps, as suggested above, nitroglycerin. Hot injections of saline solution into the rectum will stimulate the nerves and fill the blood-vessels. The infant must be carried about, its position in bed changed from time to time, and its skin kept warm according to the methods detailed above. Even the most desperate-looking cases, with shallow respiration and cyanosis of the skin and mucous membranes, may recover when the attendants are as persistent as the morbid condition is dangerous.

3. *Immaturity and Prematurity.*

Immature (born before the twenty-eighth week) and premature babies (born between the twenty-eighth and thirty-eighth weeks) require a great deal of care, the more so as their condition may be connected with a low state of the mother's nutrition or with an inherited illness (syphilis). Those which are not really diseased, but merely undeveloped, with low weight, wrinkled, covered with lanugo, cyanotic, sometimes exhibiting sclerema, demand the most scrupulous hygiene and diet. It is in this condition that Credé's, Winckel's, and Tarnier's apparatuses (*couveuse*) have triumphed over great difficulties. The apparatus of Dr. L. Emmett Holt is simple, practical, and inexpensive. A large metal incubator, devised by Mr. John P. Putnam and Dr.

Rotch, of Boston, in which the baby lies upon a water-bath and is heated by graduation from all sides, was described by Dr. H. D. Chapin in *Archives of Pediatrics,* May, 1897. Still, any box or bed, with hot bottles and stones, or a box with double walls filled in with hot sand, or a bed with hot flannel or cotton, or carefully exposed to the hot register, or anything the good-will and ingenuity of the practitioner may supply, will answer the purpose. At the same time the air admitted to the lungs should be moderate (70° F.) and pure, the ventilation of the room should be indirect, there must be no draught, the washing—with warm water, no bathing—should be done quickly, and the skin dried with the softest of materials. Any carelessness may lead to asphyxia, atelectasis, and sepsis. This may enter through any sore on the integument or through the umbilicus; for in this condition the cord is more liable to rot than to mummify. Besides, there is usually a large quantity of uric acid infarction, with the tendency to retention of urine and uræmia. That is why as large a quantity of water is required as can safely be introduced. Altogether, feeding is difficult, no sucking is possible, the teaspoon or a medicine-dropper should be employed at short intervals. Besides peptonized milk and water (1 to 8 or 10), sugar-water, moderate stimulants, a few drops of whiskey in water hourly, and warm saline enemata should be given. Gradual changes will suggest themselves to the medical attendant.

In this way, of babies weighing from one thousand to fifteen hundred grammes fifty per cent., of those weighing from fifteen hundred to twenty-five hundred grammes from seventy to ninety per cent. have been saved. D'Outrepont saved a newly-born of thirteen inches in length and one and a half pounds in weight, Kopp one of eleven inches and two pounds, Redman one of thirteen inches and a pound and three and a half ounces, Ahlfeld one that was born in the twenty-ninth week of utero-gestation, measured fifteen inches (thirty-nine and a half centimetres), and learned how to suck after a few weeks; and another one of the same size and a weight of forty-eight ounces (fourteen hundred and fifty grammes) when five weeks old. It also took the breast afterwards. Several infants of less than three pounds at birth I have saved myself, nor are similar cases very rare in the literature of the subject.

J. H. Moore published in the Philadelphia *Reporter* of April 17, 1880, the case of a fœtus born before the end of the sixth month of utero-gestation—length nine inches, weight one and a half pounds—that cried after thirty minutes, but did not move. Fifteen months afterwards the same "fœtus" is said to have commenced to walk, and to have weighed nineteen pounds.

4. *Kephalhæmatoma.*

The hemorrhage between (mostly) the parietal, rarely the occipital, and still more rarely the frontal bone and its pericranium is usually the result of pressure by the lower segment of the uterus, not always during protracted labor, or by the forceps, for occasionally kephalhæmatoma is observed after breech presentation also. Predisposition is caused by the deficient development of the external layer of the cranial bones and the shallowness of the indentations in which the blood-vessels are running, the thinness of the vessels, and the mobility of the integument, caused by the loose and vascular structure of the connective tissue of the pericranium. It is circumscribed, does not spread beyond a suture, fluctuates, and begins, after a few days, to be surrounded by an osseous ring, the result of the formation of new bone from the raised periosteum. It grows in size for some days, then remains stationary, and is absorbed within from six to twenty weeks. After this time the bone is thickened, but absorption of the newly formed osseous tissue will take place in most instances. In exceptional cases only a permanent thickening will be noticed in later life.

In some cases there is an internal kephalhæmatoma as well. It consists in bleeding between dura mater and cranium, and may lead to all the consequences of intracranial hemorrhage (apoplexy of the newly-born),—viz., convulsions, paralysis, death, or meningitis, cystic degeneration, etc. There may be no contiguity between the external and the internal hæmatoma. Still, many cases of the external form will extend directly into the cranial cavity through a congenital (traumatic) fissure in the bone.

The treatment is forestalled by what has been said of the spontaneous absorption of the extravasation. No treatment is required. The swelling must be left alone. The bony thickening will also get well in the course of time. It is important to insist upon this expectant treatment, because the attendants will often not appreciate the absolutely benign nature of the large tumor.

Meddlesome practitioners have tried compression. If there be any communication with the cranial cavity, this procedure may become dangerous by blood being forced into the interior. Ointments have been recommended "to make believe," for the purpose of quieting the anxiety of the family. Puncture has been resorted to. If made at an early period, it will facilitate new bleeding; in many a case it has been known to produce suppuration, though the operation was believed to have been aseptic. Incision is still more reprehensible.

It is not permissible except in those cases which have terminated in suppuration through previous maltreatment or septic infection. Then a large incision and thorough disinfection are indicated, and will be followed by relief from pain, redness, and fever. Puncture, aspiration, or incision may perhaps be necessary, even without suppuration, in one of two conditions: first, the tumor may be so large as not to undergo absorption for many weeks, and to endanger the bone, which may become necrotic; still, I have not seen such a case these twenty years; secondly, in a case of complication with apoplexy, aspiration may be capable of allowing some of the internal extravasation to escape.

Other indications for the treatment of this internal kephalhæmatoma are suggested by asphyxia or other symptoms which depend on disturbed innervation. The antiphlogistic treatment will be confined to cold or cool applications only. The consecutive paralysis demands an appropriate treatment, the results of which will be mostly questionable, and depend upon the amount of extravasated blood, of tissue destroyed or compressed, and consecutive changes in the nerve-centres. Surgical interference, particularly when there is depression of bone, was recommended by Jenkins, who reported a successful case. When there are positive symptoms of compression of the brain, it is safe to presume that the internal hæmatoma corresponds in its location with the external one. A fatal prognosis would justify surgical interference.

5. *Hæmatoma of the Sterno-Cleido-Mastoid Muscle.*

The fragility of the fœtal blood-vessels and an injury experienced by the muscle during parturition give rise to a hemorrhage about or above, seldom below, the middle part of the long muscle. When observed, the tumor has the size of a hazel-nut or larger; it is spherical, circumscribed, and rather hard. The latter condition is due to the secondary inflammation of the torn muscular fibres. This occurrence is not very uncommon. Even in older children, mainly in kite-flying boys, who suddenly strain either of their sterno-cleido-mastoid muscles, the same hæmatoma and myositis are observed.

When observed at an early period the local application of ice may reduce the bleeding, though the blood of the newly-born is not coagulable like that of more advanced age. For a week, after ceasing the employment of ice, small pieces of cloth moistened with cold water will check the secondary inflammation to a certain extent. Very gentle massage should be employed after the disappearance of the severe pain of acute inflammation. During all this time the head

must be kept immovable,—best perhaps by carrying the baby on a hair pillow large enough to support the whole body, head included. When the tumor has time to become hard, it may last for years; when it is large, it may give rise to torticollis. Then gentle stretching and massage, the application of a mild galvanic current, and the inunction of an absorbable ointment of potassium iodide may be tried to advantage (iodid. potass., aq., āā 1; adep., 2; adep. lanæ hydros., 6 to 8). If torticollis ensue in later life, surgical treatment will be required (not necessarily the knife).

6. *Sclerema.*

The induration of the connective tissue of the newly-born known by that name consists of a serous infiltration of, and under, the skin, also of the muscles, begins generally in the lower extremities, and spreads over the whole body with (mostly) the exception of the chest. The surface is apt to be slightly hyperæmic in the beginning, and then turns yellowish and quite pale. Respiration is shallow, nursing feeble, secretion of meconium and urine scanty, sensibility diminished, the pulse slow (60 to 75), accelerated only towards the fatal end, and temperature reduced much below the normal, even to 90° F. and less. Recovery very rarely takes place. Even those who suffer from a slight attack only are liable to perish of pneumonia or of nephritis after two or three weeks. Many of the infants are prematurely born, exhibit defective innervation, possibly resulting from fœtal brain disease, or suffer from some cardiac affection, myocarditis or other. No infectious invasion can be traced as yet. The fat of the newly-born contains only 43.3 per cent. of oleic acid compared with that of the end of the first year and later, when it has sixty-five per cent. The badly nourished infant has still less oleic acid than mentioned, and in them the peculiar stiffness of the body, mostly beginning in the calves of the legs (there is more oleic acid in the fat round the os calcis), depends on that condition of their fat.

The patient must be fed from a spoon or dropper and by the rectum. Feeding is, however, very difficult. Food should be warm, rectal injections hot. Alcoholic stimulants may be given in the shape of brandy or whiskey, four or six drops every half-hour; also a drop of tincture of digitalis every hour or two hours, and aqua camphoræ, ten drops every hour. Massage with oil or lanolin, commencing at the periphery, gentle but persistent with the thoroughly warmed hand or through a warmed cloth, will improve circulation and probably, to a certain extent, absorption. Maybe, also, passive movements, practised gently but persistently, and extensive (general) galvaniza-

tion of the surface will serve the same purpose. The infant must be kept warm near a stove or furnace register, provided the head can be kept away from it and the air-supply for the lungs be kept up at a moderate temperature. Otherwise hot stones, hot sand, hot bottles must be distributed, well covered, through the bed at a safe distance. Frequent bathing in salt water of at least 100° F., with constant friction and massage in the bath, will prove as beneficial as the bad or very doubtful prognosis will permit.

7. *Bathing.*

The first bath of the newly-born, and bathing of infants in general, demand great caution; for the temperature of the young has its peculiarities. After having been higher in the fœtus while in the uterus than that of the mother, it is apt to lose a degree (F.) or more, immediately after birth, in consequence of defective circulation and respiration and of the great difference in the baby's surroundings before and after birth. A feeble new-born requires more time before its temperature rises again to a normal standard. That is particularly so in regard to the skin. Thus it is that the thermometric measurements when made in the axilla are as deceptive in the feeble young as they are apt to be in adipose adults, with their insufficient superficial circulation.

To a certain degree the cool air of the room has a tendency to reduce the surface temperature of the newly-born. When moderate, the sudden change acts favorably by inciting reflex action, but a considerable and continued reduction of temperature must have a dangerous influence at a time when the functions of the body are not yet regulated.

In Lassar's experiments,* when an animal, after recovering from albuminuria, was exposed to a cold temperature, the same condition returned. Rabbits thus exposed, without or after depilation, suffered from interstitial inflammations of the liver, the lungs, the heart, and the neuroglia. The blood-vessels of the liver and the lungs became enormously dilated, the arteries filled with thrombotic masses, and leucocyte emigration was marked round the smallest veins. When

* Virchow's Arch., vol. lxxix. A large amount of literature on the same subject has been since collected by Reineboth in vol. lxii. of Deutsche Archiv f. klin. Med., 1898. By sudden cooling he caused suggillations of the pleura, also disintegration of the blood (hæmoglobinuria), thereby irritation of the vasomotor centre, with bursting of the finest pleural and pulmonary blood-vessels, though there was no reason to assume a greater fragility on the part of the blood-vessel walls.

the animal was pregnant, even the liver and other organs of the fœtus were found to be inflamed. This is exactly what clinical experience has taught every observer of every generation, in spite of modern contradiction. Thus I have observed a sudden return of the morbid symptoms in a number of persistent and protracted cases of hæmoglobinuria after every exposure to cold, and particularly to cold and moist air.

Therefore the newly-born babe should not remain uncovered for any length of time. The nurses who spend—with more pedantry, emphasis, and self-consciousness than intelligence—much unnecessary time in oiling and soaping and washing and bathing, turning this and that way, drying the surface, wrapping the navel, applying the bandage, and dressing the newly-born in fineries, in which it finally returns to its mother's bed or to its crib shivering with a cold nose and blue feet, are not infrequently the causes of ill health or death. In a case recently seen, the pneumonia of the newly-born was undoubtedly due to the fact that the baby was neglected while both physician and nurse were engaged about the fainting mother. Craig must have seen many such cases, for with him "no baby is ever washed, dressed, fed, tied up, the cord is not wrapped up, but the infant is anointed with fat and wrapped in flannel the first twenty-four or thirty-six hours." Similar advice has been given repeatedly.

The bath of the newly-born must not be hot. A single midwife in Elbing lost ninety-nine babies out of three hundred and eighty, of trismus. Through all her life she had estimated the temperature of the bath by trying it with her uncovered arm. She lost her temperature sense after a while, as was found by a judicial investigation, and the babies their lives. Still, the bath ought not to be less than 90° F., nor ought it to be much cooler through a number of months, in spite of a French author's opinion, who says that the epidermis becomes macerated by warm baths; that babies who are bathed grow "pale, soft, and flabby and eczematous," and proves the correctness of his position by his zoological discovery that "no other mammalia take a warm bath regularly." *

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* To the general rule implied in the above remarks on the necessity of bathing in warm water only, according to which the body of the newly-born infant is to be kept warm, the head forms an exception. Artificial heat and feather pillows ought to be avoided. A soft hair pillow is preferable, or a quilt lined with a layer of cotton. Whenever it is necessary to employ a soft head-rest, a feather pillow may be covered by a bed-sheet folded to the size of the pillow and fastened to its corners by safety-pins. Air-cushions ought to be in more common use than they are.

The proportion of the surface to the cubic mass of the human body is larger in an infant than in an adult, and the number of peripheral nerve-ends and capillaries relatively larger. Thus, there is a greater liability to reflex symptoms depending on exposure, in spite of the low degree of nervous irritability in the newly-born during the first few weeks. That is why a protracted cold bath is not well tolerated even by older infants; but, also, why tepid or cold bathing or packing exhibits a very much more rapid effect in the young than in the old. For both the reduction of temperature and the reflex effect do not depend on the weight of the body, but on the *extent* of the conducting and radiating surface.

While the cord is drying, and until it has fallen off, it is better not to bathe the newly-born again after its first bath. Washing may take its place, for it is best not to interfere with the normal drying process.

When the baby is six months old, particularly during the summer months, the warm bath is to be succeeded by washing and friction with tepid and, later on, with cold water. When washing is substituted for bathing, water may be selected of a lower temperature, inasmuch as but a part of the surface is exposed to its influence at one time. When the bath, in the course of time, is gradually made cooler, friction of the skin during bathing stimulates its action. In pathological conditions, when cool or cold bathing is resorted to for the purpose of reducing an abnormal temperature, this aim is always and easily reached so far as the surface is concerned; but, to accomplish the same end for the whole body, it is necessary that the skin should retain its vitality and lively circulation. Unless that be so, the internal temperature may remain unchanged or even rise while the surface is cool. In such a case, which must be ascertained by taking the rectal temperature, the cold bath ought to be followed immediately by a hot one for the purpose of restoring the surface circulation. In this way the reduction of temperature aimed at by the administration of a cold bath may finally be accomplished by hot water. In less urgent cases the warming of the extremities and of the general surface by dry heat may suffice to restore the warmth of the surface. At all events, a cool or cold bath, after which the feet do not become warm at once, is dangerous.

8. *Mamma. Mastitis. Perimastitis. Angioma.*

Since the time of Menard, Scanzoni, and Guillot, the secretion of the mammary gland of the newly-born has been the subject of fre-

quent investigations by clinicians, chemists, and physiologists.* It is mostly found towards the end of the first week, and resembles very much the milk of the mature woman in the mammæ both of the male and female infant. The superficial milk-ducts are obstructed with epithelium; the interior ones are dilated in many places and filled with a cuboid epithelium and a liquid which resembles colostrum. This secretion may be absent, but it is frequently found in premature or still-births, though the mammæ be but rudimentary. The dilatations will increase in size for weeks, and begin a retrograde development as late as the middle of the first year of life.

The tendency to epithelial elimination, which is a peculiar feature in the newly-born, and which is so commonly observed on its skin, mucous membranes, and in sebaceous follicles and kidneys, appears to be very marked in the mamma of the newly-born. This discovery of Epstein renders the subject of our discussion very much clearer from an etiological point of view.

The swelling and secretion of the gland may last a week or two when undisturbed. After it has been squeezed out ever so gently, a new secretion will follow and continue five or six weeks. Thus pressure of any kind should be avoided. It is barely possible that it is not always injurious, and that a gentle inunction of warm oil, which is so commonly used, may do no harm. But, as a rule, every sort of pressure occasions an attack of inflammation and, maybe, suppuration. Though an abscess be ever so small, it is sufficient to destroy forever all or a part of the mamma,—a serious misfortune in a female. A swelled mamma must be left alone. Applications of cool or warm water, the cloth being well pressed out and covered with oil-silk and cotton or flannel, or of a mild lead wash, will answer well. Also applications of potassium iodide dissolved in glycerin, one part of the former in two or five of the latter, which are repeated every few hours. Extract of belladonna may be added to advantage. When suppuration cannot be avoided, the incision must not be delayed. It ought to be made at the greatest possible distance from the nipple, directed towards the nipple, so as not to cut the main milk-ducts, and treated antiseptically. Indurations remaining behind require frequent and gentle inunctions of an iodoform ointment (iodoform, 1.0; ol. bergamot., 2 drops; adep., 6.0 to 8.0), or iodoform collodium, to be applied with a brush twice every day (iodof., 1; collod., 10 to 20) in such a manner that only those scales of the application

* Jacobi, in Gerhardt's Handb. d. Kinderkrankh., 1st vol., 2d part, p. 39 of the 2d ed., 1882.

which are peeling off from the skin are removed before a new layer is applied over the dried-up previous application. No collodion should be employed so long as there is the slightest secretion from the surface or from a wound. In place of the iodoform, potassium iodide may be used. A very mild galvanic current of from two to six small elements, conducted through the induration by means of soft sponge electrodes moistened with salt water, has rendered me good service in many cases.

Perimastitis, the inflammation of the surrounding connective tissue, may occur primarily, but is mostly the final result of traumatic mastitis. It is liable to grow dangerous, *unless* incisions be made early and treated antiseptically with great care. I have met with not a few cases in which the suppuration of the connective tissue was very extensive, spread over a large surface, undermined the skin of the chest, axilla, and back, resulted in gangrene, erysipelas, or sepsis, and terminated fatally. Antiseptic solutions (applications, injections, irrigations) must be used frequently, but ought to be mild. Carbolic acid should be avoided, for infants are easily poisoned by it.

The mamma ought to be examined for angiomata in every baby, whether there be mastitis or not. Nævi are by no means rare in this neighborhood, and ought to be destroyed at once, either by the application of fuming nitric acid when superficial or by the actual cautery (red-hot iron, galvano-cautery, or thermo-cautery) when they are deep-seated or form genuine vascular tumors, for they are liable to grow rapidly and prove dangerous to the female.

9. *Treatment of the Cord.*

The indications for the application of the ligature, and thereby the complete interruption of fœtal circulation, appear to vary in the practice and teachings of obstetricians. When the baby has cried a few times, the majority apply the ligature and cut the cord. Others insist upon waiting for the collapse of the cord produced by that of the vein, while the arteries are still pulsating, and some will wait for the disappearance of the arterial pulse. A few facts should be remembered for the purpose of guiding the practitioner in individual cases, for the amount of blood entering, or retained in, the body of the infant is by no means an indifferent matter.

If the ligature be applied after the cessation of the umbilical pulsation, there are still six ounces of blood (one hundred and ninety-two grammes, according to Zweifel) in the placenta. If the latter be compressed by Credé's procedure, that amount is reduced to three ounces (ninety-two grammes). Thus the difference between the

two procedures means a difference of three ounces of blood in the circulation of the newly-born. That is an enormous addition to the usual quantity of blood, which in the infant slightly older is but little more than five per cent. of the total weight of its body. After all, it appears that a delay of the separation of the baby, when poorly developed and pale, and the admission of more blood to its circulation, are deserving of recommendation; while, on the other hand, there may be an occasional indication for bleeding the infant.*

The admission of a large quantity of blood, however, is no unmitigated blessing. The blood-vessels of the newly-born are so thin and fragile that spontaneous hemorrhages on serous membranes and into the nerve-centres, etc., are by no means uncommon under normal circumstances. It is true that the destruction of superfluous blood-corpuscles is very rapid,—as rapid, indeed, as it is known to be after transfusion in the adult,—but some time is required to accomplish that end, and during that time hemorrhages may take place, and have been reported by Neumann and Illing and observed by me. This danger is sufficiently great to counterbalance the alleged observation of Hofmeier, according to whom babies, after deferred separation from the mother, lost less weight and commenced to increase sooner than those removed more speedily. However, Violet states that the former lost twenty ounces (six hundred and nineteen grammes), the latter but nineteen (five hundred and eighty-five grammes)—not much of a difference, though.

Nor does Porak's observation, according to which congested babies exhibit a more intense degree of jaundice, lack confirmation.

If the ligature be thin, it is liable to cut through the walls of the blood-vessels prematurely; if too thick, it may not suffice to compress them satisfactorily. It ought to be applied at a distance of from one and a half to two and a half inches from the abdominal wall (three to five centimetres); not nearer, in order to avoid the effect of the great muscular power of the umbilical arteries inside the abdominal cavity. A second ligature is placed about an inch from the first, and the cord cut between them. It is a good rule, which must surely be adhered to in every case of thick cord, to apply an additional ligature between the first and the abdominal wall, to avoid hemorrhage which may take place after the cord has commenced to shrink, from the insufficiently compressed arteries. The abdominal end of the cord is then wrapped up in a dry and soft piece of linen, lint, or borated cotton, placed on the left side of the abdomen, and

* Archives of Pediatrics, March, 1888, p. 130.

fastened, by means of a soft flannel bandage, which is wide enough to cover the larger part of the chest and all of the abdomen, so as not to slip.

In wrapping up the end of the cord no oil or fat should be used. Warmth and dryness favor mummification; moisture and exclusion of air, gangrene. This holds good also for the cord when it is separated from the living baby by an additional ligature, and in the dead. Thus, the former forensic axiom, which prevailed for decades after Meckel had demonstrated its fallacy as early as 1853, that a dry cord proved that the baby had lived, is absolutely worthless. Fatty substances and moisture of any kind must be avoided. That is why it is best to omit the daily bath. Powdered bismuth subgallate, or zinc oxide, or iodoform, or salicylic acid (one part with forty or twenty parts of starch) may be dusted round the insertion of the cord and over the stump daily. The latter application is not necessarily useless (from the point of view of antisepsis), for the separation of the cord is a gradual one, and not uniform through the whole thickness of the amnion and the three blood-vessels.

The size of the sore stump and the rapidity or slowness of cicatrization depend upon the thickness of the cord, the intensity of the line of demarcation, and the reactive inflammation. The latter are most marked in vigorous infants. As a rule, the surface is dry a few days after the falling of the cord, and cicatrization complete within twelve or fifteen days after birth. This normal process is, however, disturbed by careless handling, local irritation, and infectious influences. In these unfavorable cases there is a serous or purulent secretion, and cicatrization may be deferred for many weeks. Under these circumstances local treatment is required. Carbolic acid ought to be avoided, for the newly-born and infant are easily influenced by its poisonous properties. Solutions of lead, zinc, or alum answer quite as well as any solutions do. As I said, however, it is best to avoid water. I recommend the powders of zinc oxide, bismuth subgallate, alum with starch, salicylic acid with starch, or iodoform. Such measures will always prove helpful; to omit them in times of prevailing erysipelas or diphtheria is unpardonable. Perchloride of iron or subsulphate of iron must not be used. Under the hard coagulation formed by their application over the whole wound secretions will accumulate, cannot escape, are absorbed, and produce sepsis. I have seen babies die from applications of iron to the umbilical stump, as I know of women dying for the same reason when the hemorrhages from their uteri or from the lacerated vaginæ were maltreated in the same manner.

10. *Omphalitis.*

Inflammatory infiltration of the abdominal integuments which surround the stump, with swelling, pain, purplish discoloration, gangrene, or abscesses, and consecutive peritonitis, occurs within a few weeks after birth, and is the result of traumatic or septic influences. The dermatitis requires applications of lead wash; tendency to suppuration, moist antiseptic (or aromatic) applications, such as Thiersch's solution (salicylic acid one part, boric acid six parts, water one hundred and twenty-eight parts); the presence of pus, a large incision, with antiseptic after-treatment. Cold applications are not tolerated. Bathing is painful. Any of the antiseptics mentioned previously will render good service. Carbolic acid must be avoided; lysol, in a two-per-cent. watery solution, potassium permanganate 1 to 500 or 1000, thymol 1 to 1000, aluminum acetate two to three per cent., and when ulceration is extensive, powdered bismuth subgallate (better than in a vaseline ointment) will do much better. Erysipelas is no uncommon complication in certain epidemics; absolute alcohol, ichthyol in water or with vaseline (ten to fifty per cent.); during the time of great irritation the lead and opium wash with attention to the effect of opium, which, however, is not readily absorbed through the swelled and inflamed tissue, are indicated. Generous feeding by a wet-nurse, alcoholic stimulants (from one to two teaspoonfuls of whiskey or brandy daily), plenty of water, and evacuation of the bowels by injections are the additional aids in treatment. The main reliance is on the local treatment,—viz., large incisions and antisepsis.

11. *Umbilical Gangrene.*

This is the result of an inflammatory process, mostly in a prematurely born baby, or one that fell sick with diarrhœa. It may extend inward to the intestine and terminate in perforation. The prognosis is very bad except in the few cases in which there is a well-marked line of demarcation. The treatment consists in antisepsis and stimulation.

12. *Arteritis and Phlebitis.*

The former is very much more frequent than the latter. Arteritis is often connected with general sepsis, pneumonia, pleurisy, peritonitis, arthritis, and subcutaneous abscesses. The infection reaches the arteries from outside through the lymph circulation, begins in the connective tissue surrounding the vessels, and attacks the adven-

titia first. To discover the source of infection is sometimes very difficult; in his experiments Budin succeeded even in forcing septic material through the cord from beyond the umbilical ligature. Pus can seldom be squeezed out of the arteries, and the diagnosis is sometimes made at the autopsy only. The disease begins often before the complete separation of the cord, absorption taking place through the cord, which dries and shrinks irregularly, and admits infection through the newly formed cuts or fissures.

The treatment is indicated by the causes, which are self-infection from a putrefying surface, infection by soiled fingers, cloths, baths, applications of any kind, the contact with a septic mother, or the contact with anything septic,—for instance, the pus of ophthalmo-blennorrhœa, or the decomposing lochial discharges of a healthy woman. Thus the successful treatment is mostly preventive. The scissors, cloths, and sponges used for the newly-born must be aseptic. The baby must not be in the mother's bed, and must be attended before the mother on the days following her confinement. The hands touching the baby's body must be carefully cleaned and disinfected many times a day, the cord and umbilical wound treated as detailed above. They should be kept tied up conscientiously. There should be no possible contact between them and the fecal discharges, be these ever so normal; if there be diarrhœa the greatest caution is required, for the danger of infection is imminent. If the mother suffer from puerperal sepsis the baby may be permitted to nurse, but should, in the intervals, be kept in another room and carried into the presence of the mother for the purpose of nursing only, and contact avoided. The internal treatment is identical with that advised in omphalitis and gangrene.

The symptoms of phlebitis differ sometimes from those of arteritis in this,—that there is more peritonitis of the hepatic region from the beginning, more epigastric meteorismus, more icterus. Now and then pus may be obtained by gently squeezing along the course of the vein. The infection is either direct, through the vein, in which an ulcerous process is sometimes found half an inch or an inch above the navel, or also through the lymph-current in the surrounding connective tissue and the adventitia of the vessel. The treatment cannot differ from that of arteritis. Recovery is possible when the absorption of the poison has not been very copious, or elimination progresses with absorption at an equal rate. A female baby of less than three pounds, in my experience, exhibited no other source of septic infection than a slight erosion or ulceration of the umbilical stump, with hardly any secretion. She recovered, though the process extended to the end

of the second week, with temperature reaching sometimes 103° F. Chronic septico-pyæmia, which lasts a year and more and furnishes the usual kind of abscesses all over, may sometimes be traced directly to umbilical infection of a mild degree. Such cases may get well when the abscesses one and all are incised and treated antiseptically. To what extent an antistreptococcus serum may be found available (certainly in such cases only in which the streptococcus is the infecting agent) remains to be seen. Credé's ointment should be tried.

13. *Puerperal Sepsis. Acute Fatty Degeneration (Buhl). Epidemic Hæmoglobinuria (Winckel).*

The treatment outlined in the last chapters is to a great extent also that of the puerperal sepsis of the newly-born contracted before birth, or immediately after, from the mother (umbilical changes, fever or collapse, peritonitis, pleuritis, pneumonia, meningitis, jaundice, diarrhœa,—in fact, all the possible symptoms of septico-pyæmia). It takes more than "an ounce of prevention;" but, after all, prevention is all that can be done. Recovery is a bare possibility only, but should be hoped for; that is why internal disinfectant treatment (Credé) and attention to abscesses should not be omitted.

Acute fatty degeneration of the liver, heart, and kidneys, also of the lungs and the intestinal villi, with multiple hemorrhages, jaundice, cyanosis, vomiting, and diarrhœa, does not seem to get well. It lasts from one to two weeks. It need not necessarily be the result of some acute influence. Fatty degeneration (chronic) may be a slow process of intra-uterine malnutrition. George T. Elliot, forty years ago, presented to the New York Pathological Society a full-grown fœtus all of whose tissues were in fatty degeneration to such an extent that during the extraction of the fœtus necessitated by the existing breech presentation limbs and parts of limbs were torn off. Almost the same may be said of epidemic hæmoglobinuria (Winckel), which exhibits the same symptoms, to which is added the presence of hæmoglobin in the urine. It is of a brownish-red color and contains no blood, but renal and vesical epithelia, casts, and cocci.

Sepsis derived from the mother need not be of long duration. Indeed, the embryo appears to be better protected against the poisons of the maternal blood than the fœtus, for in the fœtus its placental villi float free and loose in the maternal blood, while in the embryo (as also in mammals) the maternal and the fœtal tissues meet like the interlaced fingers of two hands.

14. *Umbilical Hemorrhage.*

This may take place from the arteries either before or after the separation of the cord. Its treatment is either mostly preventive or the indications become so clear in every individual case that it becomes easy to fulfil them. Though the pulmonary aspiration and the great contractility of the muscular layers of the arteries render a hemorrhage difficult, even when no ligatures were applied, an insufficient development of those muscular fibres, or the presence of asphyxia, or atelectasis, or a pneumonia, may produce a disposition to bleed. That is why the ligature or ligatures should be tied accurately. In such cases of bleeding it may become necessary to apply an additional ligature. The arterial power being greatest in the abdominal cavity and near the umbilical ring, the cord must not be cut near the body. Two ligatures, as described above, are a fair preventive. Tight abdominal bandages impede circulation, and should be avoided. When the cord is cut too short or torn off, it may be impossible to secure the vessels; in such cases two long harelip needles should be run through the abdominal wall near the vessels, crosswise, and a strong ligature tied underneath them. The same procedure may be resorted to when the hemorrhage takes place after the separation of the cord, either from the blood-vessels or from the slowly healing surface, in consequence mostly of inconsiderate handling. When the hemorrhage ceases, a moderate compression of the wound, which is covered with iodoform or the salicylic acid and starch powder and borated cotton, by means of a bandage, will answer well. In obstinate cases antipyrin in a twenty- or fifty-per-cent. solution should be applied. No iron. When the surface is granulating the proliferations may be touched with the solid stick of silver nitrate.

All such cases yield a better prognosis than those resulting from hæmophilia, congenital syphilis, general sepsis, or acute fatty degeneration. In these conditions the blood coagulates with even greater difficulty than that of the healthy newly-born, and not infrequently all attempts at stopping the bleeding are liable to prove futile. Besides, internal hemorrhages are very frequent (stomach, intestines, lungs, kidneys). The ligation of the whole mass is often unsuccessful because the stitch-channels will also bleed; chemical styptics are too often useless; plaster of Paris has sometimes proved successful, and the actual cautery has proved advantageous in a few cases. But the majority of such cases terminate fatally. Antipyrin solution (twenty-five or fifty per cent.) should be applied, followed immediately by a few drops of a saturated solution of tannin. Feeding

and stimulants (whiskey, musk, ether, camphor) are self-understood. Gelatin may be used here as in other hemorrhages, both externally and subcutaneously (a two-per-cent. sterile solution).

If the case be one of syphilis, daily subcutaneous injections of corrosive sublimate should be tried (1 to 1000). A suggestion of Bienwald, who applied fresh coagulable blood of a healthy person to the bleeding wound of a hæmophilic patient, with the result of causing coagulation and insuring recovery, is here reported for what it may be worth. A. E. Wright claims a styptic effect of a solution of fibrin ferment and calcium chloride.

15. *Icterus.*

A certain degree of yellowish discoloration of the skin is the result of the normal changes of hæmatin deposited in the skin during the rapid transition from fœtal to postnatal circulation. When by retarded separation of the newly-born from the mother, and compression of the placenta, the amount of blood in the circulation of the infant is unduly increased, this form of hæmatogene jaundice is rather more developed. Besides, the disintegration of many blood-cells causes directly an increase of bilirubin. The simplest form of hepatogene icterus is produced by the sudden diminution of the blood circulating in the vessels of the liver, which encourages the exosmotic transition of bile from the bile-ducts into the adjoining blood-vessels. That is why babies who rapidly lose weight (and blood) are very liable to exhibit intense degrees of jaundice. Another cause of jaundice of the newly-born is the immediate absorption of bilirubin into the circulation; for meconium having accumulated bilirubin since the third month of utero-gestation, and peristalsis being, as a rule, slow, absorption becomes easy through the open ductus venosus Arantii, which remains patent at least a week in the large majority (Quincke, seventy-seven per cent.) of cases, and through the hemorrhoidal plexus (v. hemorrh. media). If peristalsis be very slow, jaundice may begin in the second week. That is why premature babies in whom the ductus venosus is large are apt to be much jaundiced; and why Elsaesser found no jaundice in three cases that exhibited a closed ductus; and why, finally, many a liver of newly-born icteric babies does not participate in the icteric process.* All of these forms of jaundice, while mild, require no treatment. Duodenal catarrh will produce, in rather rare cases, icterus in the newly-

* Cases like those of Hayem, in which the blood contained bile while the urine had none, are rare indeed.

born, as it does in advanced age. That is why the feeding and the digestion of the baby must be carefully watched and the air pure. The routine administration of syrup of rhubarb is a mistake on the part of the female busybodies which should be discouraged. Maybe, also, some of them can be taught that acid cow's milk and indiscriminate feeding in general, and exposure, tight bandaging, and cold feet, can do still more harm than even their medicines. Icterus resulting from congenital obliteration of the large biliary ducts, or from congenital cirrhosis, or from acute fatty degeneration, or from epidemic hæmoglobinuria is incurable. Icterus during septic infection is a bad symptom, and rarely terminates otherwise than in death. Icterus depending on congenital syphilis of the liver is grave, but I have met with several cases that recovered. A thorough and energetic antisyphilitic treatment is the only safeguard in such cases. It may prove unsuccessful, however, because the syphilitic process of the connective tissue is not confined to the liver, but extends to the rest of the organs. Mercury must be administered for a long time, a twentieth or a twelfth of a grain of calomel three times a day; careful inunction of a scruple of blue ointment daily; or one-thirtieth of a grain of corrosive sublimate in a one-fifth of a per cent. solution of distilled water for subcutaneous injection daily. In the beginning of the treatment two of these medicaments may be combined, or one of them, together with the internal administration of from three to five grains of potassium iodide daily, in three doses, which are given after meals. The internal administration of mercuric bichloride is also well tolerated; one-one-hundredth of a grain may be given in a teaspoonful of water every two or four hours, and continued many weeks.

16. *Melæna Neonatorum.*

Hemorrhage from the bowels (more frequent than from the stomach) occurs on the second or third day of life, very rarely before, but sometimes later within the first week. Syphilis, acute fatty degeneration, epidemic hæmoglobinuria, and sepsis of other varieties—also asphyxia and atelectasis, together with the normal incompetency of fœtal tissue—cause a predisposition; also pulmonary obstructions, cardiac disease, and a widely open ductus Botalli with consecutive intense congestion. Leopold Fischer (*Münch. med. Woch.*, 1897, No. 19) suggests as one of the causes the delayed cutting of the cord. A baby of three thousand grammes contains about one hundred and sixty of blood. When eighty or one hundred grammes more are pressed into its circulation from the placenta, the blood-pressure

may become too high. But is all of this amount really entering when no pressure is exerted? A thrombus emanating from the latter, or one coming from the ductus venosus Arantii (Landau), may cause an embolic ulceration of the stomach or duodenum. The blood is fluid or coagulated, rather black, like that of hæmatemesis in advanced age. It is, however, mixed with the food and rather reddish when it was swallowed while nursing. A mistake in diagnosis may happen when blood is swallowed during an operation on the lip or cheek or during an epistaxis resulting from an injury. A single observation of the latter kind was published lately, and generalized as *the* cause of melæna. Bleedings of this kind do not exhibit the pallor, cyanosis, and collapse of the genuine affection, provided such an epistaxis is really traumatic. In most cases, however, a congenital epistaxis is itself the result of septic infection (or syphilis).

The quantity of blood evacuated from the bowels is sometimes enormous, particularly in view of the fact that the weight of the blood in the body of the newly-born amounts to little more than five per cent. of the weight of the baby. The cases complicated with vomiting are the worst. These result mostly from the presence of ulcerations in the stomach and duodenum. Hemorrhage into the peritoneal cavity is exceptional only. Competent respiration and an aseptic umbilical wound are the best preventives. Babies should cry from time to time to stimulate and strengthen both circulation and respiration. The treatment consists in applications of ice to the epigastrium, while the limbs are kept thoroughly warm by artificial means. Tincture of chloride of iron may be given in drop doses. Food is to be given at a low temperature. Rectal alimentation is mostly useless because of the frequency of discharges. In a desperate case of anæmia and collapse the subcutaneous injection of a sterilized salt-water solution may prove helpful. I could not convince myself of the usefulness of subcutaneous injections of ergot; but gelatin in sterilized solutions (two per cent.) may be used subcutaneously. In a case lately reported a solution of from three to five per cent. was given internally, two tablespoonfuls every two hours, and two hundred and fifty cubic centimetres (eight ounces) of a three-per-cent. solution were injected twice daily into the rectum. As the baby carried these large quantities, the case looks like a favorable one, prognostically.* Altogether, about three cases of melæna out of five have recovered.

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* Ernst Levy and Hugo Bruns (Mittheil. Grenzgeb., vol. x., 1902) report that gelatin, which was used by the Chinese in the third century A.D., may cause thromboses not only on the bleeding surface but in undesirable places

17. *Trismus and Tetanus.*

Its prognosis is not quite so bad as it was believed to be formerly. Now and then recoveries have been reported, and I have seen them myself, though the cases observed by me have not been very numerous. The prognosis is better when trismus appears at a later period after the separation of the cord than usual, and when its course is protracted. Cases lasting more than five or six days are rather promising. Such as set in early and exhibit a high temperature (from 106° to 111° F.)., with disturbances of respiration and great inanition, are bad. As a preventive, it has been proposed to remove women, for the time of their confinement and recovery, from districts where trismus is endemic. At all events, the greatest care should be taken of the umbilical wound, through which most of the invasion of the specific bacillus takes place. Towels and clothing must not have lain on the floor, dust must be carefully excluded. Some of the cases are mild,—that is, not fatal. Maybe they are those only which are due to excess of temperature, high or low, —there are those of "rheumatic" origin,—or to lesions of the brain or medulla oblongata. Food must be introduced through the rectum or the nose, and as much water as possible. For days after no food could be swallowed when introduced into the mouth, the patients were sometimes able to swallow whatever was thrown into their pharynx. By means of a medicine-dropper or a small teaspoon fluids may be poured down. Medicines must be administered subcutaneously, atropine sulphate in doses of one-one-thousandth or one-six-hundredth of a grain a number of times daily; curare, one-twelfth to one-third; it paralyzes the muscles and works well when given in such doses as will counteract the reflex irritation of the muscles without paralyzing them (Scharlau in Festschrift); extract of calabar, one-half of a grain. A few of my cases got well with chloral, mostly per rectum, in doses of from one to five grains from six to ten times (!) a day, and occasional inhalations of chloroform. High

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also, and, unfortunately, tetanus, the bacilli of which are quite frequently found in the gelatin of the market. The tetanus bacilli require at least forty minutes' heating at 100° C.; that degree of heat cannot be obtained by mere boiling, the less so because colloid solutions of two or ten per cent. gelatin require more heat than water. Perfect safety cannot be attained except in moving steam.

Paul Krause (Berl. kl. Woch., July 21, 1902) advises the sterilization of the gelatin solution on five successive days, one-half hour each time, in vapor of 100° C., and also that there should be a place (a hospital) at which practitioners could at any time procure such a sterilized solution.

temperatures may be influenced by antipyrin or phenacetin, combined with whiskey or brandy. Bathing is contraindicated because the baby bears no handling. Even applications of cold water for the purpose of reducing high temperatures, if used at all, should be local only, and made without turning or tossing the patient.

All this medication is not rendered superfluous by the subcutaneous administration of the antitoxin, first introduced by Tizzoni and Cattani. One case out of four of Escherich recovered under the use of three doses of three decigrammes (five grains) each injected in the course of two days. The chemical poison ("tetanin") evolved out of the invading bacilli is not absorbed at once; the invasion is more or less persistent and should be stopped in the admitting wound (mostly the umbilicus) by the actual cautery, or by applications of tincture of iodine, or of a one- or two-per-cent. solution of iodine trichloride, or a one-half-per-cent. solution of potassium hydrate, or a one-twentieth-per-cent. dilution of hydrochloric acid, or a one-per-cent. dilution of cresol (Sahli, *Deutsche med. Zeit.*, No. 11, 1896). Similar rules are given by the Health Department of New York. Of the antitoxin, twenty cubic centimetres are a dose for an adult; accordingly, one cubic centimetre seems to be appropriate for the newly-born (*Archives of Pediatrics*, July 1, 1897). Perhaps the best method of introducing the antitoxin in doses of from one to three cubic centimetres is the lumbar puncture in as large a quantity as that of the cerebro-spinal liquor which was first withdrawn. To facilitate the operation, the opisthotonos should first be relieved by chloroform or chloral or morphine.

18. *Blennorrhœa.*

Blennorrhœic conjunctivitis may be prevented by repeated disinfectant injections into the vagina of the woman in labor. For that purpose a solution of three parts of carbolic acid in one hundred of water, or one of mercuric bichloride in one or two thousand of water, is sufficient. After the newly-born has been bathed, a few drops of a two-per-cent. solution of silver nitrate (or a one-twentieth-per-cent. solution of mercuric bichloride) are applied to the cornea. When the disease is established, both eyes are affected in most cases. When but one, the healthy eye should be covered with a disinfecting lotion and borated cotton, and its infection by sponges, towels, water, and fingers guarded against with the greatest care. The diseased eye must be kept scrupulously clean by pouring tepid water over the cornea, or (and) removing the pus by means of small pellets of borated cotton. To succeed in this the upper and lower

eyelids must be turned out. This is not always easy, and is never satisfactory unless the cornea becomes perfectly visible during the manipulation. Once a day the application of a mitigated stick of silver nitrate (nit. arg., 1; nit. sod., 2) is useful. It may be substituted by a two-per-cent. solution of silver nitrate in water. In both cases the diseased surface should be washed with a mild solution of table salt afterwards, and ice-cloths, small and as well pressed out as possible, applied every ten minutes or oftener. When the cornea is ulcerated, a few drops of a solution of atropine sulphate (1 to 200) may be instilled several times daily.

Lately G. Schallern experimented on the eyes of nine hundred and seventeen new-born in the obstetrical clinic of Göttingen. Not more than two babies became affected, and on the eighth day only; all were saved. The slight irritation following (in some cases) the application of the two-per-cent. solution of silver nitrate subsided without any injury. When that irritation is observed, no new application should be made in the next twenty-four or thirty-six hours (*Archiv f. Gynäk.*, 1897, p. 86). Of nineteen hundred and seventeen cases reported by Runge, not one was affected after the treatment with silver nitrate solution; of that number, nine hundred and twenty-eight had a one-per-cent. solution only to avoid the local irritation sometimes encountered with a stronger solution. The application should be made within an hour after birth.

19. *Umbilical Fungus (Granuloma). Adenoma. Cysts.*

The umbilical stump requires frequent inspection. Unless it cicatrizes speedily, granulations will spring up from its surface and form into small tumors. They are either sessile or pedunculated, and are apt to grow very fast. They are not sensitive, but apt to bleed. In some cases they are discovered on very close examination only, and may remain many years, even to advanced age. Exceptionally such a fungus is not, or but partly, the result of granulation, but consists mainly of the remnants of the omphalo-mesenteric duct (with unstriped muscular fibres, tubulated glands, and cylindrical cells) or of the allantois. Once it was found by Virchow to be a sarcoma. Waldeyer met with some that were adeno-sarcomata.

Usually it requires no excision, but only cauterization or astringent and antiseptic applications. Silver nitrate may be used, but must immediately be neutralized by sodium chloride. Other applications are: a drop of liquor subsulphatis ferri once or twice daily; bismuth subgallate; iodoform; one part of salicylic acid with five parts of starch. If the granuloma is large, or when it returns, it

should be removed with the scissors and the stump scraped off. Dry antiseptic treatment is to follow (bismuth subgallate, aristol, nosophen). The persistent omphalo-mesenteric duct, which presents itself as a small tumor after the cord has fallen off, should not be taken for a granuloma. This anomaly is observed in different degrees. In the milder forms, even those in which a fine sound entered the intestinal tract, the actual (thermo- or electro-) cautery would destroy the tumor and cause the fistula to close, Körte's assertion to the contrary (*Deutsche med. Woch.*, 1898, No. 7) notwithstanding; but when the fistula is so large as to admit a prolapse of the intestine into it, nothing short of a careful aseptic operation will answer. The incision must surround the tumor, and be carried far enough to permit the diverticulum to be drawn out. It has then to be separated from the jejunum, the intestinal wound is closed with sutures, and the bowel returned to the peritoneal cavity. Several such operations have proved successful.

Umbilical cysts may owe their origin to remnants of the omphalo-mesenteric duct or of the urachus. A few were due to atheroma, or were echinococci, or dermoids, or due to a strangulated umbilical sac. Possibly a strangulated peritonitic exudation dating from early fœtal life may also be credited with the same result, exactly like some of the hydroceles of the spermatic cord.

20. *Umbilical Hernia (Omphalocele).*

Congenital umbilical hernia (exomphalos) is called a fissure of the median line of the abdominal wall; it is the result of an arrest of development. When the fissure is small and the sac contains intestine only, the condition is considered incurable. There is no reason why an operation on these cases, in which the abdominal defect is small, should not be at least as successful as those on more pronounced ones; for when the sac is large, containing at least a portion of the liver, together with intestine, the contents may be reduced and the cases cured. Twenty-four such cases have been collected by Kocher.* C. Brenz reported the case of a girl weighing two thousand seven hundred grammes at birth. When the hernial contents had been reduced, which was accomplished with difficulty, he caught the edges of the sac by means of a pair of pincers, removed it with scissors, applied three percutaneous ligatures, removed the clamp, applied the actual cautery to the stump, and covered it with

* A. Jacobi, The Intestinal Diseases of Infancy and Childhood, Detroit, 1887, p. 267.

antiseptic dressings. Both these and the ligatures were removed on the eighth day. The operation proved successful, though there was peritonitis as early as twenty-four hours after birth. D'Arcy Power reports an unsuccessful one ("Surg. Dis. Child.," 1895). Hallet (*Rev. de Gynéc. et de Chir. Abdom.*, 1900) collected fifty-eight operations performed within thirty-six hours after birth, of which fifteen cases died; seven performed between the thirty-sixth and forty-eighth hours, of which three died; two on the third day, of which one died; four after the third day, all of which died. The operation is contraindicated when omphalocele is complicated with other congenital anomalies.

Acquired umbilical hernia, which contains small intestine and peritoneum, and is produced by the large size of the cord, by leanness and insufficient development of the baby, by the muscular insufficiency and abdominal flabbiness of rhachitis, and by screaming, coughing, and the straining consequent upon diarrhœa, constipation, phimosis, or anal fissure, demands the treatment indicated by these causes, and reduction, which is almost always quite easy, and retention, which is by no means so easy, within the abdominal cavity. The ordinary trusses are unavailable, or even injurious. Whatever appliance is used should be larger than the aperture and not too hard. Linen or lint compresses, plates of cork covered with linen or lint, may be held in position by means of a bandage, to which they can be fastened by stitches or pins. Knitted bandages are more useful than those of linen, cotton, or flannel cloth. Adhesive plasters are used frequently, but are generally too irritating to the sensitive surface of the infant.

Incarceration and strangulation of an umbilical hernia are very rare, but there is on record a fair number of cases in which herniotomy was performed successfully on infants of a slightly advanced age.

Inguinal hernia is a curable disease. When the short and straight inguinal canal of the newly-born becomes more oblique and the adjacent fat increases in the course of a few years, the rupture will disappear, provided a proper truss has been retained for a long time. During that period the intestines must not be allowed to protrude at all. The truss must be worn day and night, with the exception of such times when the infant is sleeping quietly. A good fit does not mean undue pressure. The testicle must be closely watched. It is found high up in the scrotum, behind the hernia. Sometimes it has not descended into the scrotum, and is then mostly discovered in the inguinal canal. By gently pressing it downward and applying the truss above, we not only protect it but facilitate a complete descensus. Mr. William Coates's (1848) appliance "consists simply

of a skein of lamb's wool; for infants Berlin wool is preferable. This encircles the pelvis, one end being passed through the other at a point corresponding with the inguinal ring; the free end is carried between the thighs, and is fastened behind to that portion which forms the cincture. This simple and cheap contrivance can be worn during the morning and evening ablutions, and then changed for a dry one. No attention is required on the part of the nurse, except at the moment of changing." (D'Arcy Power, "The Surgical Diseases of Children," Philadelphia, 1895, p. 414.)

For such cases as prove too obstinate a radical operation becomes advisable; in some it is inevitable. (D'Arcy Power and the special works on surgery. See also Digestive Organs.)

21. *Congenital Constipation.*

Malformations of the intestinal tract, such as strictures or complete interruptions, will either terminate fatally (when inaccessible) or require surgical treatment. The latter class includes imperforate anus and rectum. In these cases, the obstruction being complete, we cannot speak of constipation. This latter condition may, however, be found to depend on an anatomical peculiarity which is quite frequent, and may give rise to mistakes in diagnosis and treatment. The colon descendens of the newly-born is quite long. The sigmoid flexure, which I have found to measure as many as thirty centimetres (twelve inches), is bent upon itself several times in the narrow pelvis. Thus the convolutions of the intestine will press upon and compress one another * to such an extent as to result in obstinate constipation. In some extreme cases the babies died without or with colotomy, which was performed on the strength of a mistaken diagnosis. The treatment of that congenital form of constipation must be adapted to the anatomical condition which gives rise to it. Rectal injections alone, non-irritating (tepid water or saline solutions), in large quantities, are rational. They must be made daily, at least once a day, and continued up to the completion of the fifth or sixth or even seventh year. At that period the normal relations of the several parts of the intestine are established, the pelvis becomes larger, and evacuations of the bowels easier. No purgative medicines must be resorted to, inasmuch as the obstacle is mechanical only. There is, however, a single indication for their administration,—viz., those symptoms depending upon constipation, which point to the absorp-

* A. Jacobi, The Intestinal Diseases of Infancy and Childhood, Detroit, 1887, p. 184.

tion of intestinal toxins above the obstruction. Septic fever, high temperatures, and serious reflex symptoms—such as convulsions—may require the speedy evacuation of the bowels by means of mild purgatives. Powerful medicines are rarely demanded; in most cases a teaspoonful of honey or of sweet butter will suffice. Further advice will be found in the discussion of constipation. Though such occurrences be rare, they should be looked for. (See "Non Nocere" in *Trans. Eleventh Internat. Med. Congress,* or *N. Y. Med. Record,* May 19, 1894.) Very bad cases may lead to early dilatation of the colon, an anomaly which may be congenital in rare instances. Small diverticula may occur in the sigmoid flexure (also in the appendix) with rapid dilatation as a result, followed sometimes by perforation, sometimes by inflammation in the mucous membrane and submucous tissue, peritonitis, torsion of the intestine, and adhesions. Dilatation is also apt to favor muscular hypertrophy by overaction and by intestinal colitis resulting from irritation by fæces and by toxins.

IV

Diseases of the Blood and Constitution

1. *Anæmia.*

ANÆMIA is often the result of an hereditary predisposition, or it is congenital from some accidental cause. Mothers who suffered much during their pregnancies or were delicate themselves are liable to give birth to anæmic and puny infants. Premature infants, or those afflicted with congenital diseases, such as "cyanosis" or neoplasms, or smallness of heart and arteries, are anæmic and apt to remain so. Another cause of idiopathic or primary anæmia is found in actual loss of substance by copious suppuration, excessive exudations in pneumonia and pleurisy, or by actual hemorrhages, the results of which are in some cases perceptible through a whole lifetime. They are quite frequent in the newly-born or young, in true melæna, hæmophilia, umbilical bleeding, and sometimes even in kephalhæmatoma; from harelip operations or ritual circumcision; from the prolonged losses by rectal polypi; in older children from epistaxis occasioned by coryza, heart disease, or abdominal stagnation; from ulcerations in diphtheria; from trauma. Acute anæmia thus caused requires external and internal styptics, the closure of wounds, the application of ice, and, mainly when parenchymatous bleeding is obstinate, the external use of a twenty- or even fifty-per-cent. solution of antipyrin. The subcutaneous injection of fluid extract of ergot, the internal use of lead acetate (hourly doses of two or five centigrammes (one-third or three-fourths grain), may be given ten or twelve times without fear), or of liquor ferri perchloridi (from five to ten drops amply diluted), or of calcium chloride from five to twenty grammes daily (0.3 to 1.25), stimulants internally, externally, and subcutaneously, ligature around the extremities so as to compress the veins, warming of the surface, transfusion of defibrinated blood, or of a sterilized salt solution (6 to 1000) are apt to meet the most urgent necessities.

So far as *chronic anæmia* is concerned (it is seldom "primary," but almost always secondary to some tangible or occult cause which ought to be sought out), I cannot do more than simply allude to its direct and indirect causes for the purpose of obtaining the indications for treatment. Among the former are prominent an insufficient amount or an improper composition of food and an insufficient

supply of oxygen. Poverty with its wants, its squalid and airless dwellings, and overwork in overcrowded school-rooms, are all powerful sources of widespread anæmia; they become social problems more than merely medical questions. Among the indirect causes I count every disease of more than a temporary character; all those ailments which so change the alimentary or digestive organs as to interfere with nutrition; slow hemorrhages; intestinal worms, which are sometimes borne without symptoms, sometimes irritate and annoy (oxyuris, ascaris), sometimes, however, interfere with assimilation to such an extent as to cause the gravest forms of anæmia (ascaris, tænia, bothriocephalus); diseases of the organs of respiration, circulation, and elimination (kidneys); all feverish diseases, and particularly the infectious fevers (scarlatina, malaria, least of all typhoid fevers, unless they result in chronic intestinal ulcerations); diseases of the lymph system (including what is meant by "lymphatic condition" in the writings of many modern authors), most of which are accessible to successful treatment. It is true that pseudoleukæmia, leucocythæmia, and pernicious and kindred anæmias offer the same difficulties which we meet in the adult; but the many glandular swellings—"scrofulous" or not—permit of successful treatment, both preventive and curative.

All of these affections, the number and names of which I do not care to multiply, are the more dangerous, and require the more dietetic and medicinal attention, the greater their detrimental influence during infancy and childhood,—that is, during the period of growth, in which the organism has not only to sustain itself, but to increase steadily. The latter consideration is a very important one. It includes the necessity to which I have alluded in a previous chapter, not to permit a morbid condition, either acute or chronic, to run its full course without interference. A disease shortened a day, a sleepless night less, a dozen diarrhœal movements prevented, a racking cough soothed, a convulsion interrupted, an excessive temperature relieved, are just as many prophylactic points gained and as many causes of persistent anæmia mitigated in their dangerous influences.

These considerations are the more weighty the younger the patient; for in regard to anæmia the young are in a very precarious condition indeed. The infant (and child) has less blood in proportion to its entire weight than the adult; this blood has less fibrin, less salts, less hæmoglobin (except in the newly-born), less soluble albumin, less specific gravity, particularly between the second and twelfth months of life, and usually more white blood-corpuscles. It has a specific gravity of but 1045 or 1049 compared with that of 1055 in

the adult. The total amount of blood in the young is relatively small. Its weight, compared with that of the body in the newly-born, is 1 to 19.5. The relative figures in the adult are 1 to 13.*

Hence it follows, from a practical point of view, that it is important not to permit the proportionately small amount of blood in an infant or child to be unduly diminished or diluted. That is why the subject of feeding and digestion is of such paramount weight in pediatrics.

While it is a good rule to be careful in regard to the amount of *food* to be given in the beginning of a feverish disease, a fair quantity should be allowed after a while, provided it is fluid and well selected. Unless there be a contraindication in the condition of the

* According to the researches of Ernst Schiff (Jahrb. d. Kinderheilk., vol. liv.), the specific gravity of the blood of the newly-born (male or female) is 1080 to 1070 in the first six days, in the following four days 1070 to 1060, a little higher in the day than in the night, less in the icteric after the fourth day, more in the well developed than in the weak, and more after delayed ligature of the cord.

The blood of the newly-born, the infant, and the child undergoes rapid changes. According to Monti (Wiener Med. Presse, 1894, No. 41), the specific gravity at birth is 1056 to 1066, at from two to four weeks 1056 to 1059, at from two to twelve months 1049 to 1052, at from two to ten years 1050 to 1056. Its specific gravity increases with larger body weight, with perspiration, in pneumonia (rapid fall during crisis), and in the feverish state of malaria, typhoid, and pleurisy, frequently also during cardiac diseases. It diminishes rapidly after drinking, in acute nephritis (1047 to 1038), in non-cardiac chorea, in tuberculosis, dyspepsia, and intestinal catarrh. In all forms of anæmia it may vary from 1040 to 1028. According to Max Carstanjen (Jahrb. f. Kind., vol. lii.), there are on the first day of life many polynuclear leucocytes, few lymphocytes, between the sixth and ninth days both forms are equal, on the twelfth many lymphocytes with plenty of transition iorms. Until the third day there are many nucleated red blood-cells; no increase of eosinophile cells at that time.

The leucocytes are rather more numerous in the nursling than they are in the adult; Hayem says 18,000 to 5,368,000, Alfred Japhe 13,500, with predominance of the mononuclears, and only forty-two per cent. of polynuclears. These are not increased in intestinal diseases, unless there be toxins of putrefaction or of pathogenic bacteria. There is an increase of leucocytes in most acute infectious diseases, except when the prognosis is a very bad one the first day of the illness, or in typhoid or malarial fevers, in pneumonia, and in the puerperal sepsis of the very young.

The specific gravity corresponds mostly with the number of erythrocytes and the amount of hæmoglobin. Both are high when the cutting of the cord was delayed. Hæmoglobin and iron run mostly parallel. The percentage of iron is low in the nursling, in nephritis; it grows when exclusive milk feeding is stopped and cereals, fruit, and animal foods are given. It increases very gradually; even about puberty it does not reach the percentage found in the adult.

stomach, a fair amount of albuminous nutriment (milk) should be administered, with the addition of such foods as contain more iron (animal foods, cereals). During protracted diseases the danger of inanition becomes imminent, still more in the young than in the adult. Convalescence requires generous feeding and stimulation also, with this restriction, that the meals should be small and frequent and the stomach sustained all the time. In this way many a case of secondary anæmia may be avoided. (Chapter I.)

Babies become anæmic when their mothers or nurses have too little milk, or when the supply is ample but of improper quality. Nursing during a subsequent pregnancy ought to be forbidden. It must not be continued too long, certainly not beyond the protrusion of the first group or groups of incisors. Nor must it be continued beyond the tenth month if at that time no tooth has made its appearance. Many a case of anæmia or rhachitis will be cured by a change of such faulty diet. It is better for the baby to develop teeth, bone, and muscle on barley or oatmeal and cow's milk and beef-broth than to become rotund with œdematous fat, and anæmic on its mother's powerful sympathy and powerless breast-milk. Maternal love does not improve the breast-milk of a person with a history of consumption, rickets, syphilis, nervous disorders, or intense anæmia. Sometimes even a healthy woman has a milk which is not adapted to that particular baby; then another woman or artificial food must be preferred. The addition of barley or oatmeal and beef-soup or beef-tea is always advisable when a nursling becomes anæmic without having been afflicted with a tangible disease. A small piece of beef, half an egg daily, a crust of bread, may be added about the end of the first year. The diet ought to remain simple and mostly fluid or semi-solid until the child is two years old. Prevent bad habits, such as fast eating, and enforce regular defecation (not by medication), plenty of exercise out of doors, and undisturbed and long sleep in a cool room. Avoid crowded school-rooms and protracted lessons. "We have laws to protect children from being sent to work in factories or to be employed on the stage, but none to protect them from the equally destructive, incessant schooling in close rooms, without air or exercise. There are too many books bought for Christmas and too few skates" (*Arch. of Med.*, February, 1881).

The subjects of nursing and artificial feeding and of digestive organs have been treated of elsewhere;* therefore I abstain from

* A. Jacobi, The Intestinal Diseases of Infancy and Childhood, Detroit, 1887, and in Chapter I. of this book.

discussing the matter here beyond the above fragmentary remarks. What cannot, however, be emphasized too much or too often is the necessity of resorting to animal food—soups, teas, peptones—in cases of infantile anæmia.

The medicinal treatment of anæmia must fulfil the causal indications first. That which depends upon chronic *gastric catarrh* requires, according to circumstances, alkalies or hydrochloric acid, pepsin, bismuth. Besides the well-known subcarbonate (or subnitrate), the salicylate has made many friends of late. Pepsin and dilute hydrochloric acid are best when combined; a baby of a year may take six or eight drops of the latter in six or eight ounces of water daily, or the acid may be mixed with milk, according to the formula given in a previous chapter. Disease of the kidneys has its own indications. The regulation of the heart's action—which, when abnormal, is the most frequent cause of habitual epistaxis, and of gastric catarrh and hepatic congestion—is the first indication in secondary anæmia. Many a gastric catarrh will not get well without digitalis or some other *cardiac tonic,* and persistent nose-bleeding is apt to improve immediately after the administration of digitalis, with or without iron. Thus, in a great many cases, anæmia is "cured by digitalis." In a similar manner digitalis can be utilized for the purpose of more competent oxygenation of the blood. When the heart is weak and the lungs, by virtue of old pneumonic infiltrations, offer too great a resistance to an easy circulation in the pulmonary vessels, it is again digitalis (or its equivalents) which facilitates the extensive contact of the oxygen of the atmosphere with a larger number of blood-cells.

The *insufficient innervation* of the muscular tissue of the heart, stomach, and the rest, which is one of the most serious results of anæmia, is corrected very happily by *strychnine* or other preparations of nux. An infant a year old tolerates and requires one-fortieth of a grain of strychnine, or one-third of a minim of the fluid extract of nux, daily, for a long time in succession. These preparations may easily be combined with any other medicinal administration.

Iron is looked upon as the sheet-anchor in anæmia. It is mostly indicated in cases of primary uncomplicated anæmia. A catarrhal stomach does not bear it well; when, however, the stomach is abnormal in consequence of the general anæmia, iron improves both the general condition and the stomach. In many of these cases the addition of bitter tonics is advisable; strychnine is perhaps preferable. Anæmia after malaria, dropsy from anæmia and chronic nephritis, anæmia with neuralgia, anæmia with (and from) valvular diseases

which do not result in local congestion,—mainly incompetency of the aortic valve,—are greatly benefited by iron. Anæmia after chronic diarrhœa requires great care in its use; in most cases it may or ought to be avoided. While it is very beneficial in the predisposition to hemorrhage, it should be avoided in hæmoptysis. It is contra-indicated in "inflammatory" fevers, for it increases pulse, arterial pressure, and temperature; but in the more serious infectious fevers, such as erysipelas and diphtheria, it is very efficient. It requires good digestive powers, which may be stimulated by aromatic tincture of rhubarb, tincture of cinchona, or strychnine, and, to combat anæmia only, no large doses. The total amount of iron introduced into the system in the average daily food does not exceed much a single decigramme (one and one-half grains), and that contained in the blood of the adult has a total weight of three grammes (two scruples) only. Still, it is quite possible that the iron introduced into the stomach fulfils more indications than that of supplying red blood-cells and (to a lesser degree—even that much is doubted—) hæmoglobin. Indeed, it sometimes acts as a stomachic.

Of the preparations mostly in use, either official or otherwise, I have mostly employed dialyzed iron, a few minims several times daily, the tincture of the malate (pomate), from twelve to thirty minims daily, and the same, or somewhat smaller doses, of the tincture of the chloride of iron for children from three to eight years of age. The dry preparations are the phosphate, from one-half to two grains three times a day, and the same doses of the carbonate (saccharated). The latter is aptly combined with proper doses of bismuth. The pyro-phosphate demands smaller doses. The lactate is a mild and digestible preparation which seems not to be appreciated at its full value. The citrate of iron and strychnine and that of iron and quinine are valuable preparations when the effects of the combinations are sought for. Coming with the recommendations of Schmiedeberg, ferratin in several daily doses of one or two decigrammes (one and a half or three grains) each has been awarded a fair trial; so have some other preparations,—the peptonate, the albuminate, the pepto-manganate. The obtrusive methods of advertising them do not prove their superiority over the drugs and preparations of the Pharmacopœia and of the National Formulary. The syrup of the iodide of iron is well tolerated by the youngest infants; as many drops as the baby has months may be given three times a day up to eight or ten drops a dose. It is well tolerated by the stomach, in which the iodine is freed from the iron and acts as an antifermentative. Besides, experience appears to confirm the theoretical inference that it proves

its power as an absorbent in cases of anæmia complicated with glandular enlargements. The syrup of the hypophosphites cum ferro of the Pharmacopœia may be given in larger doses; this is the preparation which I frequently select when I mean to add arsenic or nux vomica in liquid form. It is self-understood that I prefer the legitimate preparations of the Pharmacopœia to the wares of the agents and advertisers, "physicians' samples" or not.

Other (animal, like ferratin) preparations of iron are Kobert's hæmol and hæmogallol. It has been suggested, not proved, that their animal origin renders them more homogeneous.

For subcutaneous administration the pyrophosphate of iron with sodium citrate, also the albuminated iron, have been recommended; also, by Rummo, a ten-per-cent. watery solution of the ammoniated iron citrate, and by Lépine, one of a two-and-a-half-per-cent. solution subcutaneously. As anæmia is a chronic condition which requires "chronic" treatment, and the injections cause pain and indurations, it is not very probable that this mode of employing the remedy is available.

The administration of iron appears to have an indirect effect also, which is apt to do much good. As a rule, the inhalation of *oxygen* gas, continued for five or ten minutes, at intervals of from an hour to two hours, seems to improve sanguification and metamorphosis considerably. This wholesome action, it always seemed to me, was most perceptible while iron was administered. To admit oxygen red blood-corpuscles are required; it appears that the influence of iron on their organization and numbers renders the introduction of oxygen into the blood easier and more beneficial. Oxygen was often credited with being a general tonic, and its inhalation was considered at one time almost a panacea. So long as the organs of respiration and circulation are normal, the atmospheric air contains more than they require. Still, whenever they are disordered, in the orthopnœa of pneumonia, in asthma and emphysema, in pulmonary tuberculosis, in cardiac diseases (as also in poisoning with carbon oxide or when there is methæmoglobin in the circulation), and in anæmia depending on these conditions, the inhalation of oxygen is of undoubted service. It has the advantage of being readily prepared pure; that is more than we can say of ozone (p. 74).

Some of the worst forms of anæmia are greatly benefited by *arsenic*. They are those which result from long-continued inanition and slow convalescence, in which the stomach does not suffer primarily; from primary catarrh; from chronic malaria; from chronic tuberculosis of the lungs; from chronic glandular swellings of a malignant type,

either lymphoma or sarcoma or adenoma. In all of these forms it is highly useful. The doses need not be large, but may be increased slowly. One-one-hundredth of a grain of arsenous acid, or one drop, or one and a half of Fowler's solution, three times a day, after meals, the latter amply diluted, are well borne for weeks, even months, without interruption, by a child of four or five years. In malaria the remedy may be given with quinine (and iron), in exceptional cases with ergot, in other forms with strychnine (and iron); in pulmonary tuberculosis with digitalis.

The gradual increase of the doses of arsenic may be effected in the following manner. A drachm of Fowler's solution is diluted with sixty drachms of water; three doses of this mixture are given daily. If the initial dose is to be one drop, give a teaspoonful; the next dose is a teaspoonful + one drop, the third dose a teaspoonful + two drops, and so on, until the sixty-first dose consists of a teaspoonful and sixty drops. Thus the original dose is gently and slowly doubled in twenty days.

Children bear arsenic better than adults and very much better than senile patients. Still, even they must not take it when they are affected with gastric disorders; nor continue it when in the course of treatment conjunctivitis, œdema of the eyelids and face, or diarrhœa makes its appearance. A modern preparation, the cacodylate, appears to offer no advantages over any of the rest. Sometimes, when Fowler's solution (liquor potassii arsenitis) is not well tolerated, the sodium preparation of the Pharmacopœia (Pearson's solution) may be tried in tenfold doses, or arsenous acid, alone or in combinations, in doses of one milligramme (one-sixtieth of a grain) daily to a child of two years or older.

Among the important remedies in anæmia *change of place* should be mentioned,—from city to country, from lowland to altitudes and woodland. *Friction with cold water* and after a while cold bathing will improve cutaneous and general circulation and sanguification. *Mineral springs* with iron and carbonic acid, so frequent in Germany and France, enjoy a well-deserved reputation.

This dietetic and medicinal treatment, mostly so effective in simple anæmias, is also indicated in *chlorosis* when it develops in children. In them the anatomical cause giving rise to life-long chlorosis —viz., persistence of the fœtal smallness of the aorta (Virchow) with smallness of the general arterial system—cannot be wholly overcome. It is here that bitter tonics should be added from time to time to the preparations of iron and digitalis to stimulate arterial and cardiac action. Both of these require the continued use of cold water,—viz.,

daily washing or bathing with vigorous rubbing, followed by sea-bathing, and systematic exercise, gradually increased. The diminution of hæmoglobin, while the number and character of the red blood-cells are more or less normal, requires ample and cautious feeding; it is here that peptones to such an extent as can be absorbed are indicated. It should never be forgotten, however, that all the symptoms of chlorosis in a child (as in the grown woman) may be caused by undiscovered malignant tumors, or by gastric ulcerations (not so very uncommon), or by duodenal ulcerations, with slow and almost imperceptible hemorrhages. It may be complicated and increased (caused, according to some) by intestinal disorders leading to constipation and autoinfection, or by enteroptosis. These disorders have their own indications, which may be studied under the proper headings. In such cases iron and arsenic will be combined with alkalies, with mild purgatives and antifermentatives, or with proper bandaging. Nowhere more than in chlorosis should a sojourn in higher altitudes be recommended; the red blood-cells increase with rising altitudes. Christiania yields 4,970,000, Berlin (fifty metres) 4,647,000, Görbersdorf (five hundred and sixty-one metres) 5,800,000, Schöneberg (six hundred and fifty metres) 5,887,500, Reiboldsgrün (seven hundred metres) 5,970,000, and Davos (fifteen hundred and sixty metres) 6,551,000 blood-cells in the cubic millimetre.*

The tendency to dilatation and hypertrophy of the heart may be transitory only, but small doses of *digitalis* should be given a long time. The same treatment is indicated when there is a tendency to thrombosis in peripheral veins. The treatment of very bad cases may begin with absolute rest in bed and generous feeding.

Pernicious (essential) anæmia is characterized by a decrease of red blood-cells (from four or five millions in a cubic millimetre to one or even one-half of a million), which, moreover, exhibit irregular sizes and shapes (poikilo-, micro-, and megalocytes, not absolutely characteristic, however), while hæmoglobin is not reduced at the same rate. When it is caused by atrophy of the peptic glands (Kinnicutt), or prolonged icterus, prolonged gastro-intestinal disorders, protracted suppuration, infectious fevers, or syphilis, or entozoa (ascaris, tænia, bothriocephalus), the indications are clear. Many

* The number of erythrocytes is also increased, but hæmoglobin diminished, in *Anæmia montana*, mountain anæmia (mal de la puna), the result of sudden exposure to high altitudes, with palpitation, suffocation, fainting, and hemorrhages from the mouth and nose. Thus it is the exact reverse of pernicious anæmia. Its indication is clearly removal from the high altitude which caused it.

such cases get well when treated for known causes. That is why every addition to etiology is so welcome. That is why William Elder could report the case of a man of thirty-five years whom he treated successfully with eighteen injections, one every other day, of ten cubic centimetres of antistreptococcus serum, and why there is quite an array of cases getting well with anthelmintic treatment. Ewald has found atrophy of the small intestines in many cases of pernicious anæmia (indican? toxæmia?). Knud Faber published a case (*Berl. klin. Woch.*, July 26, 1897) which seems to prove its connection with a stricture of the small intestine. If a diagnosis could have been made in his case it is possible that an operation would have prevented anæmia. As other such strictures (tubercular, syphilitic), quoted by him, are also known to have been connected with intense anæmia, the suspicion is justified that an intestinal toxin caused or occasioned by them (as also by apepsia and helminthes) is the source of the rapid destruction of blood-cells and the cause of pernicious anæmia. If that be so, intestinal antisepsis, if it is ever accomplished to a sufficient degree, will cure many a case. Of the remedies mentioned above, arsenic in rising doses is quite effective; iron and small doses of quinine act as adjuvants; bone-marrow (when raw or boiled, it nauseates quickly) or its preparations (Armour's or others), the daily doses of which may vary from one-half of one to two teaspoonfuls or more, have been credited with good effect. I have seen improvement, but no cure. Weir Mitchell's rest and feeding cure, with general massage, benefited some. The capricious appetite prefers mostly a vegetable diet, the failing digestion requires stimulants (strychnine), besides pepsin with hydrochloric acid; the absence of blood-cells and the consequent inability to bind oxygen and to produce heat demand warm clothing and warm rooms; diarrhœa, its symptomatic treatment; and utter debility and collapse, infusion of salt water. In spite of the lack of erythrocytes, combined with shallow respiratory movements, the systematic inhalation of oxygen should be tried. An undoubted case of pernicious anæmia from no tangible cause in a child less than a year old I saw in Boston with Rotch and Dr. Ladd. She bore little iron and no arsenic, but got entirely well.

The prognosis of *leucocythæmia* (*leukæmia*), no matter whether lymphatic or splenic, is still worse than that of pernicious anæmia. From the latter it is diagnosticated by the increase of leucocytes (1 to 50 to 1, instead of 1 to 250 or 500) and of eosinophile cells. Acute cases have been observed after influenza and pernicious anæmia. They lasted a week only, or longer; in its usual protracted form it is known to follow malaria, influenza, syphilis, glandular, intestinal, and

blood anomalies. Klebs and others, besides a case that came under my observation, saw cases in the new-born, with ascites (leucocytes 529,000, erythrocytes 4,000,000). Complications are frequent, rare with diabetes and bone diseases; and prevention is therefore a possibility. Albuminoids in blood and tissues are rapidly destroyed; therefore albuminoids in every possible shape, peptones, albumoses, etc., should be given in absorbable quantities. Rest, massage, cold and heat, transfusions, infusions, oxygen inhalations, arsenic and iron, quinine, bone-marrow, injections of ergotin into the subcutaneous tissue, of arsenic into the spleen, electricity and galvanism, extirpation of the spleen (always fatal—should be performed early, if at all), treatment of the accompanying hemorrhage, of perspiration, of pleuritis, and of ascites,—all are in vain. I know of no authentic case, either acute or chronic, that recovered.

Pseudoleukæmia (Hodgkin's disease), though there are so many transformations of this form of anæmia into leucocythæmia as to make a common origin (infection?) and nature very probable, has in most cases its own symptomatology (painless, swelled lymph-bodies from the neck down all over the body, swelled tonsils, liver, and spleen, no leukæmic blood, merely leucocytosis). In its history rhachitis, traumata, or intestinal disorders are mentioned frequently. The swelling is not a simple hyperplasia (Dorothy M. Reed in *Johns Hopk. Hosp. Rep.*, vol. x., 1902), but a change suggesting a chronic inflammatory process, proliferation of endothelial and reticular cells, formation of lymphoid and of characteristic giant cells, gradual increase of connective tissue leading to fibrosis, and in most many eosinophiles (absent in tuberculosis, sarcoma, and lymphatic leukæmia), with occasional hemorrhages, and ascites now and then, the latter sometimes without cirrhosis of the liver. The diagnosis from general sarcomatosis, which causes inflammatory adhesions between the lymph-bodies (isolated in pseudoleukæmia), is not always easy. Arsenic is again the sheet-anchor. Piperin, from five to fifty centigrammes or more daily (one to ten grains), has been recommended. Berberin sulphate seems to deserve crédit in repeated daily doses of one-sixth of a grain (0.01); it certainly stops the troublesome constipation, but should not be given in such doses as to cause diarrhœa. It seems to improve the appetite and to reduce the size of the glands and of the large viscera.

Splenic anæmia, with its large spleen and somewhat swelled liver, no leucocytosis, but poikilocytosis, occasional megaloblasts, some diminution of hæmoglobin, and some nucleated blood-cells, does not deserve a place of its own in our nomenclature, unless the original

swelling of the spleen (with atrophy and sclerosis of the Malpighian bodies) be claimed as the cause of anæmia. It shares the therapeutical indications of its sister anæmias, which are harmless and fairly useless. But the removal of the spleen has been quite successful, so that it should always be advised and no other chances taken. But first be sure of your diagnosis. The nomenclature of hypertrophy of the spleen with cirrhosis of the liver and ascites has been unnecessarily saddled with a new name, that of Banti.

2. *Rhachitis.*

Many cases of rhachitis which depend on hereditary influences might have been prevented or modified by attending to the parents before conception or to the mother during pregnancy. I have known women to bear healthy or rhachitical children according to the condition of health or ill health during the year preceding parturition. A number of their constitutional ailments, such as anæmia, tuberculosis, and syphilis, make their appearance in the offspring with the symptoms of rhachitis. If that precaution have been neglected, the injury inflicted upon the infant cannot be completely annulled; in many cases, however, it can be greatly moderated. Thus there are a great many cases of early rhachitis which are due to the influence of mitigated syphilis in the parents. Indeed, some of the microscopical bone lesions of the two diseases, as they are met with in the newly-born, are difficult, some impossible, to distinguish from one another. Such cases can be greatly benefited by an antisyphilitic (mercurial) treatment, which should be continued through a period of many months.

Attention should be paid to general hygiene. More can be accomplished by furnishing good air than by any other means. The air of the winter is no contraindication to keeping windows open and to taking the young baby out so long as there is ample clothing and covering. Sea-air is preferable so long as there is no contraindication, for instance, in the condition of the respiratory organs.

Sojourning in the country is beneficial only when the rhachitical infant is not locked up in the house. Sea-air, together with sea-bathing, warm, cool, or cold, according to age, condition, and training, is an excellent preventive and curative measure. England commenced that practice on a large scale in 1750; Italy, France, Germany, and America twenty-five years ago. The sea-hospitals have done an immense amount of good. To eradicate rhachitis, however, the children must be kept at the shore for years. In America we are always too much in a hurry, and expect the benefits of heaven and earth in a

particle of a season. When no sea-shore is accessible, the bathing in salt water, with friction, massage, occasionally with electricity, may be done at home. When eczema is caused by it, the salt-water treatment should be discontinued.

Plenty of air by day and by night, coupled with poor food, is still safer than the best possible food with bad air. Comby's saying, that rhachitis gets access through the stomach, not through the skin or lungs, requires a good deal of modification. Still, the nature of the food is highly important. Lactation must not be continued beyond the appearance of two or four teeth. A wet-nurse should not be too young nor too old. But, after all, even an apparently proper age or condition of the mother or the wet-nurse does not always exclude the possibility of a breast-fed baby becoming rhachitic. In such a case a well-selected artificial food is preferable to breast-milk. Pure cow's milk, when given as exclusive food, no matter whether raw or boiled, is harmful. The reason for this warning has been discussed in Chapter I. In addition, I will again refer to my criticism on the excess of lactic acid (milk-sugar) in the infant's alimentary canal. Excess of lactic acid appears to have detrimental effects on the nutrition to such an extent that rickets has been explained by its chemical action. Like acetic, oxalic, and formic acids, lactic acid has been claimed as the cause of rhachitis by Ch. Heitzmann, in 1873; Tripier, in 1875; Neiss, in 1876; Siedamgrotzky and Hofmeister, in 1879, while Albarel could not verify their observations. Such differences had been noticed before. Schmidt and O. Weber long ago found lactic acid in the bones of animals fed on that material; Marchand and Gorup-Besanez in the urine; while Virchow and Lehmann found the bones and the blood alkaline. After all, however, it should be remembered that rhachitis means more than merely excessive elimination of lime by the kidneys and intestines; its pathology is not complete without the soft swelling of the peri-epiphyseal cartilage, of the epiphyses, and of the periosteum, also deformities of the bones. That is why lactic acid in the circulation should not be accused of being the cause of rhachitis. But this much is certain, that by an undue presence of lactic acid the amount of phosphate of lime in the urine and in the fæces, at least in one of them, is at once vastly increased and that the bones are deprived of part of their calcium.* Artificial foods must be well selected and watched. The absence of

* It is on account of this and its eliminative, chemical action on lime (and thereby diuretic effect), which it removes in the shape of salts, that Rumpf gives lactic acid in those cases of angina pectoris which depend on calcification

pathogenic germs from them is not the only safeguard. Even Rotch's modified milk and Gaertner's fat milk do not protect against rhachitis, though they be fairly proof against microbes. The addition at an early date of cereal decoctions, barley, oatmeal, and of animal broths renders all the known milk preparations safer and more wholesome. Too large a percentage of fat in the foods of young infants should be avoided. The addition of fat is not always a protection against rhachitis, and may easily be overdone. Diarrhœa, dyspepsia, from whatever cause, and constipation should be corrected, and the warning often expressed by me and urged by Comby should not be forgotten, that over-alimentation is at least as dangerous as under-alimentation. That the skin requires intelligent attention was suggested above. Whether a bath should be given immediately after birth and continued regularly during the first weeks ought to depend on the nature of the individual case. As a general rule, which is valid for every child, bathing—first tepid, later cooler, in salt water when there appears to be an indication for more surface stimulation, with appropriate friction—improves both the cutaneous and the general circulation.

Rhachitis due to, or connected with, *digestive disorders* demands the correction of the latter. Gastric catarrh is not frequently primary; more commonly it is the consequence of a faulty diet; but in both cases it is the cause of anæmia, and either of insufficient or of abnormal secretion of both the mucous membranes and the glands. The gastric catarrh of rhachitis is pre-eminently acid; thus, neutralization of the stomach is often required before every meal and between meals. Prepared chalk, calcined magnesia, sodium bicarbonate, and the several preparations of bismuth find their proper indications in this condition. Bismuth salicylate, animal carbon, and resorcin find their places, besides aromatic teas, in complications with fermentative processes in the intestine and excessive flatulency. When the secretions of the stomach are merely insufficient, the addition of sodium chloride in proper quantities will facilitate the formation of hydrochloric acid. When that plan does not suffice, pepsin and muriatic acid, the latter largely diluted, will take the place of the physiological gastric juice; and bitter tonics and alcoholic stimulants, also diluted, will stimulate a normal secretion. Still, the selection of a proper food forms the

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of the blood-vessels, about fifteen grammes daily for months in succession. It is self-understood that the food should be fairly free of lime. That is why the diet is as follows: 250.0 meat, 100.0 bread, 100.0 fish, 100.0 potato, 100.0 apples (or instead, green beans, peas, or cucumbers).

main part of the indications. The principles of infant feeding, both in health and disease, I have laid down in the first part of this book; to that I refer; also to my suggestions, in the same place, on the selection of animal foods so urgently required in rhachitis (p. 43).

Cod-liver oil, when tolerated, influences rhachitis favorably. As a rule, however, it is not so universally well borne in rhachitis as it is in "scrofula." I do not advise the use of its compounds, emulsions, and so on, except when it is disliked or the latter have some other indications, for instance, diarrhœa; this is sometimes produced by the oil, mainly in the hot season. In that case the remedy may have to be discontinued, or may require the temporary addition of bismuth subcarbonate or calcium phosphate. The action of cod-liver oil is considered by some hygienic only, by others remedial. The former attribute its effects to the fat, and believe the substitution of any assimilable fat an equivalent. As I said before, I do not believe its agency to be thus restricted, for three teaspoonfuls of cod-liver oil will never be replaced by three teaspoonfuls of cream or other fat. Universal experience teaches its wholesome influence in many morbid tissue-changes. Possibly the mystery of its action is best explained by attributing to it a percentage, though ever so slight, of some organic tissue juice of a nature and efficacy to be compared with that of the ductless glands. Tempted by that point of view, Heubner tried the action of thyroid gland in rhachitis, but without any tangible effect. He believes, however, that the general condition of the infants was improved by it.

Malt and "maltine" preparations have found favor both with the profession and the public. Unfortunately, the market has been swamped with all sorts of combinations and mixtures to such an extent as to shake confidence in their honest composition in the same degree as the mere object of making money by them becomes pre-eminently clear. The preparation ordered by the United States Pharmacopœia should be preferred.

Though rhachitis be a general disease, and not merely one of the osseous system, the anomalies exhibited by the *bones* are apt to attract most attention. The changes exhibited in the shape of the chest, which result from the pressure of the atmosphere on the soft rhachitical ribs, are not liable to disappear entirely. The "pigeon-breast"—that is, the prominence of the sternum and (or) the costo-cartilaginous junctures—remains for life to a greater or less degree, according to the severity of the affection or to the restoring power of the expanding lungs. It requires early medical and surgical interference and protracted gymnastic exercise. Even crying is wel-

come, and in children of two or three years trumpet-blowing, soap-bubbling, etc. The curvatures of the diaphyses of the long bones are apt to be less marked in the adult because of the extension which takes place during growth. If ever splints are to do any good they should be applied before the bones have become hard again; the eburnation following the softness of the bones after recovery resists every degree of permissible pressure. The tendency to flat-foot, acquired through the flabbiness of the ligamentous apparatus during the attempts of the child at locomotion, requires massage and sustaining by a shoe made strong enough to support the ankle and a steel spring just sufficiently strong to restore the arch of the foot; scoliosis, a Sayre's plaster-of-Paris or a felt jacket; the rhachitical groove round and above the insertion of the diaphragm, well-directed gymnastics of the chest; inflexible and ugly curvatures of the long bones, either osteoclasy (fracturing of the curved bone while leaving the periosteum intact, and resetting) or osteotomy (straightening the bone after it has undergone a cutting operation). Of these two, osteoclasy was the only operation resorted to formerly. The fracture of the bones was either manual or instrumental, mostly successful in the middle of the femur or tibia, mostly unsuccessful for genu valgum or varum, inasmuch as it often tore off the epiphysis, or fractured in an undesirable place, and was sometimes followed by septicæmia.

Osteoclasy has been mostly replaced by osteotomy. It is a simple and open operation. It is seldom required on the upper extremity, generally on the lower, not so often on the thigh as for genu valgum and varum or for the curvatures of diaphyses. The genu valgum of children results from the curvature both of the femur—usually the only one at fault in adolescents—and of the tibia. It requires the supracondylar operation of Macewen, and often a supplementary operation on the tibia. The curvature of the tibia has mostly its concavity interiorly and posteriorly, and is usually found at its lower half. The operation may be either simply linear, transverse or oblique, or cuneiform (wedge-shaped). In bad cases the latter is preferred, and not seldom a single operation is insufficient. An interval of a few weeks is ample between the several operations that may become necessary. The results of osteotomy are almost always absolutely good. Suppurations are not frequent and are controllable.

During the active rhachitical process the bones will not only bend, but are liable to be changed in their continuity. It is true that genuine fractures are not very frequent because of the softness of the bones and the succulence of the periosteum. But infractions (green-stick fractures) are quite common about the extremities and

clavicles. The periosteum never participates in the injury; the bone is more or less bent upon itself; the ends are not entirely separated and are easily readjusted, but require splinting until the rhachitical process has terminated in general recovery. Immobilization of the entire body is sometimes required when the tendency to infraction is quite extensive.

Many of the serious results of softness of the bones could be avoided or mitigated by precautionary measures. Babies in general, and those with incipient rhachitis in particular, must not be made to sit up before their vertebral columns and their dorsal muscles are able to support them. They must not be carried about in an erect posture, nor on the same arm always; the latter practice is an invariable cause of scoliosis, and frequently of genu valgum of one side and of genu varum of the other. They must be kept and carried about in a reclining posture; better on a hair pillow than on the arm until they feel strong enough to do without it. Thus scoliosis can be prevented. They must be discouraged to walk before their limbs are sufficiently strengthened; no walking baskets should be employed, no fond and proud grandparents allowed about; thus the curvatures of the diaphyses of the lower extremities, which in part result from the vertical weight of the body on the feeble limbs and the secondary deformities of the pelvis, are reduced to a minimum.

Craniotabes, the rhachitical softening of the cranial bones, is one of the earliest symptoms of the disease. The bones which commenced their postnatal ossification in a normal manner begin to soften to such an extent that the parietal and occipital bones exhibit a number of spots in which the osseous tissue has nearly or entirely disappeared. The hair falls out in that neighborhood, the scalp is perspiring copiously, the veins are dilated, the bones and meninges become hyperæmic, and meningeal effusions are quite frequent. The softness of the bones results in asymmetry of the cranium, which is flattened by the slight pressure of a soft pillow. This asymmetry is liable to disappear after recovery, except in grave cases.

The local hyperæmia and excessive occipital heat forbid the use of warm bonnets and feather pillows. A soft hair pillow must be so arranged that the head, together with the body, can be comfortably carried without any pressure. Elsaesser (1843) recommended a pillow with a central depression or perforation; a small air-cushion filled to one-third of its capacity is very acceptable. Consecutive brain symptoms require appropriate treatment. Great convulsibility demands bromides, chloral, and mild opiates, which are well tolerated in this condition. The perspiration requires cooling with water, or

water and vinegar, or powdering with one part of salicylic acid mixed with ten parts of zinc oxide and twenty-five of starch. The general treatment of rhachitis improves this local cranial symptom, which is quite serious. In former years I was in the habit of giving a good prognosis, provided the next six or eight weeks passed without fatal symptoms (convulsions, etc.). That period was generally sufficient to so change both the general nutrition and the local condition as to restore a fair average of health both in the cranium and its contents. The experience of late years has shortened this period. What I suggested in a brief paper on the use of phosphorus in the treatment of chronic and subacute diseases of the bones in the *Transactions of the Medical Society of the State of New York*, of 1880, and in a paper on anæmia in infancy and childhood read before the Medical Society of the County of New York in 1880 (*Arch. of Med.*, February, 1881), has proved a great success in other hands. For it is to Kassowitz that the credit of the introduction of phosphorus as the principal remedy in rhachitis is mainly due. When, thirty years ago, C. Wegner fractured the bones of rabbits and fed the animals on minute doses of phosphorus, he found that these bones would heal in a much shorter time than those which were not so supplied. This observation induced me to employ the drug in all cases of (mostly tuberculous) subacute and chronic osteitis, Pott's disease, and caries of the tarsus; and a great many cases led me to conclude that recovery was more readily accomplished under this treatment. Phosphorus is, by virtue of its irritating effect, when given in small doses, a tissue-builder (Kassowitz asserts that it impedes the formation of blood-vessels), when in large doses, a tissue-destroyer. In the former it in part acts through the rapid development of connective tissue, similarly to what Lannelongue expects to attain by the local injections of zinc chloride solutions near tubercular joints. Thus I became convinced of its tissue-building properties in other parts also. I may mention here, before I have an opportunity to return to the subject *in extenso*, that I have availed myself of this quality of phosphorus for other purposes. It has served me well in many ominous cases of purpura and similar processes, in which a congenital or acquired ill nutrition of the blood-vessel walls results in habitual hemorrhages.

Kassowitz's results with the use of phosphorus in rhachitis are generally good. The cases in which it has rendered me its best services are exactly those alluded to, of craniotabes. A very few weeks suffice to change the condition of the cranial bones considerably; the softened parts become smaller and harder and the consecutive

symptoms milder. It is of equal value in acute rhachitis, with its extensive acute epiphysitis, rapid pulse, diarrhœa, general feebleness, and (frequently) some symptoms of scurvy.

The dose of phosphorus in these cases is from one-third to one-half of a milligramme three times or twice a day. The oleum phosphoratum of the U. S. Pharmacopœia contains one part of phosphorus in ten parts of ether and ninety of oil. Its daily dose is from two to three minims. Concentrated oil solutions are liable to decompose. "Thomson's solution" keeps fairly well, but the best preparation is the elixir of phosphorus of the U. S. Pharmacopœia, composed of 210 parts of the spirit of phosphorus, 2 parts of oil of anise, 550 parts of glycerin, and a sufficient quantity of aromatic elixir to make 1000 parts. Of this elixir a teaspoonful contains one milligramme of phosphorus, and a dose, to be repeated three times a day, is from six to fifteen minims. No temptation ought to be strong enough to employ phosphates, which will invariably reappear both in the urine and in the fæces. It seems probable, moreover, that the phosphates when contained in nutriment are more digestible and more assimilable than when given as a medicine, but only when given in organic combination like that in which they are in human but not in cow's milk, which has much more of it, but in an insoluble and unabsorbable condition. It is probable that the preparation of cow's milk with hydrochloric acid (p. 34) will keep lime in better solution. Its place may even be taken by extra doses of sodium chloride, with its tendency to change into hydrochloric acid (p. 14). It is worth while here to refer to the observation of E. Pfeiffer, who found that the breast-milk of mothers who had rhachitic infants contained only 0.1 per cent. of chloride of lime (altogether less lime than normal), and of Zweifel, who reports that nearly all the infants in workingmen's families were rhachitic for the reason that the bread (in Saxony) is made without salt, and that on that account nursing women had less than the normal quantity of salt in their milk. Another plea for the copious use of salt! Phosphates are much inferior in effect to the hypophosphites of the Pharmacopœia with or without iron. Phosphorus given simultaneously with cod-liver oil is a good combination, but it is a doubtful practice, so long as the latter is not a uniform compound, to dissolve phosphorus in the oil. No danger need be feared from the administration of phosphorus, for the doses are small and may be continued a long time. Indeed, phosphorus poisoning is not observed in the lower oxidations and not in organic combinations. When anæmia is intense, the preparations of iron are required. Besides the above, the syrup

of the iodide of iron may be given, as many drops three times a day as the baby is months old, or from ten to twenty-five drops three times a day to children of from one to two or three years. When the spleen and also the lymph-bodies are very large, three daily doses of from one-half to one drop of Fowler's solution are beneficial. In scorbutic cases or complications, fruit-juices are required. Heubner's experience with phosphorus in bad hospital cases is negative. The famous teacher knows, however, that bad rhachitis never does well in hospitals. If it requires anything, it is air, air, and again air! To his discomfiture, however, we owe some observations which, though they be negative, are valuable. Guided by what he takes to be a fact, that all irritations and inflammations from known causes are local, and by Lanz, who finds certain relations between the thyroid and bone development, and suggests a trial of thyroid in rhachitis, he gave from one-half to one decigramme of Merck's thyroidin every other day, or every day, with a negative result so far as improvement of rhachitis was concerned; with a favorable effect, however, he believed, on the general condition of the child.

Laryngismus stridulus, the crowing inspiration of infants, is almost always connected with craniotabes, and caused by its meningeal and encephalic results. It consists of two stages, the first of which is that of paralytic apnœa, the second of a long-drawn and loud inspiration through the spastically contracted glottis. The causal treatment is that of rhachitis in general, of cranial rhachitis in particular. Before, however, it can accomplish a permanent effect the single attacks of, and the general tendency to, laryngismus require attention. For any attack may prove fatal, though the assertion of Vogel, who expresses the opinion that most cases of laryngismus are fatal, is grossly exaggerated, in my opinion, which has not changed in this respect since my utterances in 1871.* Besides phosphorus, syrup of the iodide of iron, and other treatment, constipation requires more than the usual attention, for the nerve-equilibrium is easily disturbed by a slight irregularity in any of the organic functions. To soothe its general vulnerability the regular administration of the bromides (twelve or fifteen grains daily of a mixture of potassium, sodium, and ammonium salts) or of a few grains daily of zinc valerianate is indicated. Many cases bear one-sixth of a grain of codeine in the twenty-four hours. These cases of excessive irritability are quite precarious. In them the ears require particular attention, for the slightest (external or) internal otitis is liable to produce con-

* American Journal of Obstetrics.

vulsions. In them even the lancing of gums, when there is but a suspicion of local pruritus, may become pardonable. The attack can be cut short by shaking the infant, or slapping the face with a cloth dipped in water, or using the spark of a Leyden flask (for there is no time for the administration of the interrupted current). General convulsions, which are not uncommon after an attack, require the inhalation of chloroform or the rectal injection of from four to eight grains of chloral hydrate.*

The rhachitical disorders of the *respiratory organs* owe their origin to several causes. In rhachitis the heart is of average size, but the arteries are abnormally large. Great width of arteries lowers the blood-pressure. That is why the muscles and bones suffer from insufficient nutrition, and why the circulation in the respiratory organs is slow and sluggish, with a tendency to produce congestion and catarrh. Other causes of the chronic bronchial catarrh of the rhachitic infant, which is so apt to become bronchitis and terminate in broncho-pneumonia, depend upon the smallness, particularly of the lower half, of the contracted chest, which compresses the lungs and the heart, mainly when the elliptic shape of the chest is changed into the quadrangular or triangular; and the tumefaction of tracheal, bronchial, and mediastinal *lymph-bodies,* which are in close lymph communication with the bronchial mucous membranes. There are but few thoroughly developed cases of rhachitis, when complicated with bronchitis, without them. Not infrequently some of them can be felt in the supraclavicular spaces; more commonly they can be percussed behind and to the left of the manubrium sterni, the dulness of which is in many cases but partly thymic. Sometimes they are discovered by percussion of the infraclavicular region of the (right or more frequently the) left side and often on the left side of the intrascapular region. These glandular swellings, which point to and explain the frequent relations of rhachitis, scrofula, and tuberculosis with one another, are not uncommon appearances in the autopsies of rhachitical babies who finally died of the last developments of their chronic catarrh.

This tendency to glandular swellings requires early attention. It is here that cod-liver oil and the syrup of the iodide of iron are

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* There are occasionally other causes, independent or contributing, of laryngismus which may be mentioned here,—viz., enlarged thymus, swelled bronchial glands, adenoids, and extra-cerebral nerve disturbances (inferior laryngeal), the latter two mostly depending on one or both of the first named. They have their own indications, but will hardly ever be found without rhachitis.

mainly serviceable. In many cases the addition of half a minim of Fowler's solution, administered three times a day, proves beneficial. This is the condition of things in which cold sponging, salt-water bathing, and salt air are particularly beneficial. Out-door life must be insisted upon, and there are but few reasons—mostly of a local character—which forbid such babies to enjoy fresh air at all hours of the day and night.

Subacute or acute inflammations of the respiratory organs, when they have made their appearance during the chronic rhachitic catarrh, require, besides the usual rational treatment, some additional measures. More care than in an average case of the otherwise healthy must be taken lest the faltering strength be exhausted before the acute disease has had time to run its course. The sluggish circulation, depending on general debility and the large size of the arteries, demands the administration of heart tonics—digitalis, strophanthus, sparteine, caffeine, or coffee—from the very beginning, and besides small doses of alcoholic stimulants at an early stage or the use of stimulant expectorants, such as ammonium carbonate or camphor. There is a positive contraindication to antimonials and squill; even ipecac must be avoided because of its possibly depressing effect.

Rhachitic *constipation* is mostly due to the incompetency of the muscular layers of the intestine and of the abdominal wall. Thus purgatives must be avoided in its treatment, with the exception of those cases in which the accumulation of fæces in the bowels is attended by serious consequences. In these an occasional dose of calomel will act both as a laxative and a disinfectant. When an acid gastric catarrh accompanies the intestinal weakness, calcined magnesia in doses of a grain, given on an empty stomach or before meals (never after), repeated several times daily, will neutralize the abnormal acidity of the stomach and also open the bowels. A daily enema of tepid water continued for months will mostly suffice to alleviate the troublesome symptom. Cod-liver oil, while being administered on account of the general indications, has also a beneficial local effect. Pure cow's milk is more contraindicated in this condition than in almost any other. Artificial food should contain a copious addition of salt and sugar, and oatmeal rather than barley. Gentle massage of the abdomen, and strychnine, one-two-hundredth of a grain, two or three times a day, improve the muscular strength. The syrup of the iodide of iron, in three daily doses of a few drops, and the regular administration of beef preparations, will improve constipation with the other symptoms, particularly when this treatment is com-

menced at an early period. For it is at an early period, generally in the second or third month, that this rhachitic constipation makes its first appearance. It is one of the first symptoms of protracted rhachitis, and is diagnosticated from what I have described as congenital constipation—which depends on the abnormal length of the sigmoid flexure—by the fact that the latter begins at birth.

3. *Scrofulosis* (*Scrofula*).

The discrimination between scrofula and tuberculosis is attended by no difficulty for those who claim the bacillus of Koch as the pathognomonic essence of the latter. For all others—and so it was before the period of the bacillus—the distinction may not be quite so easy; at all events, the boundary lines between scrofula and tuberculosis are not always quite marked. But it is certain that the bacillus need not be present in the former so long as it remains uncomplicated. To diagnosticate "tuberculosis" when the lymph-bodies of the neck swell from below upward, and "scrofulosis" when from above downward, is a wanton postulation, for the mucous membranes of the nose and throat are as pervious to bacilli as that of the bronchi. The skin, mucous membranes, and lymph-ducts of the very young are very pervious, and access to and through them quite easy both to bacilli and to cocci. It is particularly the lymph-apparatus that is affected by scrofula. Even in the adult the lymph-bodies, with their copious cell-formation, retain an embryonal character, the lymph-vessels are numerous and large, and the lymph-current very energetic. A fistula of the thoracic duct in a young dog furnished lymph that equalled one-tenth or one-sixth part of its body weight, in a grown-up dog one-twelfth or one-sixteenth part.

We speak of scrofula in persons who exhibit a great tendency, with no apparent, or upon the slightest, provocation, to subacute or chronic inflammation of most tissues, mainly the cutis and mucous membranes, sensory organs, glands, bones, and joints. It is characteristic of scrofula, in its incipiency, to be wide-spread; of tuberculosis, however, in the vast majority of cases, to be localized. One or more localities in which scrofulosis is noticed may become the seat of tuberculosis, for bacilli will find a resting-place in softened tissue with slow circulation. These inflammations are persistent and liable to return; they run their course with both rapid formation and disintegration of the cells, equally in the "erethic" and "torpid" forms. Of these, the former is recognized by a frail and thin form, delicate features, great intellect, blue sclerotic, and large pupils; the latter, by a coarse and expressionless face, œdematous lips and nose,

congested eyes, large abdomen, swollen glands, and frequent cutaneous eruptions.

It is the commendation of modern therapeutics to be mostly *preventive*. So is the treatment of scrofula. Many cases of the disorder would not appear if our modes of thinking and feeling, our habits and laws, were not the immediate results of individual egotism. So long as the welfare of the commonwealth, both present and future, does not supersede, in the convictions of the many, the dictates of selfishness, there will be no restriction of the marriages of the scrofulous, syphilitic, and tuberculous, and the propagation and proliferation of their dangerous ailments. If mankind of the future means to be healthy and happy, there must be found some mode of preventing hereditary influences from having full sway. We are not Spartans, who kill the unhealthy newly-born, but we are to develop into men who pity those laden by their parents with the eternal curse of illness, and citizens who feel responsible for the physical and intellectual welfare of the community. In the United States scrofula has been on the increase at a rapid pace since the immigration of the most abject specimens of the most abject peoples of the Old World has been allowed to swell our numbers by the hundreds of thousands for each of the last two dozen years.

An important preventive measure is the suppression of the attacks of acute diseases in children, mainly the eruptive fevers. It is urgent always to emphasize the necessity of medical (hygienic and pharmaceutical) treatment of most cases of sickness. Measles and scarlatina are particularly liable to interfere with the subsequent normal development,—the former through its influence on the respiratory, the latter through its effect on the digestive and lymphatic systems, and also on the bones. The modifications of a severe form into a milder form and the early restitution of the physical functions to a normal standard are gains for life.

Scrofula being frequently the direct effect of *digestive disorders,* resulting either from improper food or nutriment improperly given or insufficiently digested, the greatest care is to be bestowed on both food and the digestive organs. This is of more than the average importance in regard to the offspring of tuberculous parents. No tuberculous mother should nurse her own infant. The selection of the wet-nurse should be the most painstaking, and the period and mode of weaning must be supervised with the utmost care. Afterwards amylaceous food, particularly potatoes, should be avoided or given in small quantities only. Good milk (boiled), cereals, and meat, with the addition of fruit, ought to be the principal food of children

up to their tenth or twelfth year. Stimulants must not be given except on proper and exceptional indications; thus tea, coffee, alcohol, stimulating beverages of any kind, are forbidden articles of diet. Cocoa must take the place of chocolate. The best beverage is water. It supplies every want, and when taken in sufficient quantities is the best stimulant of tissue metamorphosis. In the very rare cases in which a sensitive stomach does not bear it well a carbonated or (and) slightly alkaline water will take its place.

Among the additional foods, *cod-liver oil* ranks high. Most children take it readily after a short time, and are anxious to have it. Thus there was no necessity for peptonizing, emulsionizing, or "hydroleinizing" from the point of view of the children or of practice. Of the reprehensibility of filling the child's digestive organs with unlimited lime I have spoken in another place. The oil can be taken through successive years. Its administration ought to be interrupted during warm days and during the summer. Still, there are those who bear it well all the time. Fat children do better without it. In disorders of the stomach, and while the appetite is bad, also during a feverish disease of any kind, also during a diarrhœa, it must not be given (p. 8).

Preparations of *malt* may be administered to advantage in small quantities several times daily. It is self-understood that the multitude of malt preparations containing medicines will be left by the intelligent practitioner on the shelves of the corner pharmacy.

Tea of walnut leaves was a universal remedy in scrofulous affections when tastes were simpler, medicines less in number, and less money was invested in expensive articles. Among the poor and in country districts it will prove an admirable adjuvant.

Among medicinal preparations those of *iron* and *iodine* have met with most praise. The indications for the administration of the former are those of anæmia. When this is marked, iron ought to be given, and continued for a long period, according to the principles and methods laid down in a previous chapter. Potassium and sodium iodides and the tincture of iodine have been used. In the "erethic" form of scrofula they may do harm, and ought to be avoided. The same warning holds good in reference to those children who suffer from frequent attacks of bronchitis, which may already be the precursor or accompaniment of pulmonary tuberculosis. A sensitive stomach will not bear iodides. They may be made more digestible by the addition of a bitter tonic, and particularly by a few drops of tincture of nux vomica, diluted, with each dose. When the iodide results in bringing on the disagreeable or dangerous symptoms

of iodism, the addition of potassium chlorate to the iodide, in doses of from ten to twenty grains daily, according to age, will prove beneficial. The potassium (or sodium) iodide may be taken in five- or six-grain doses, daily, by a child of two years, fifteen grains at ten years, for a long period. The sodium is better tolerated, as a rule. The tincture must not be administered in more than one-drop doses, three times a day. The syrup of hydriodic acid is often tolerated better than the previous preparations (from two to four cubic centimetres = one-half to one drachm daily); of iodipin, which contains ten per cent. of iodine, a teaspoonful may be given daily (= seven grains of potassium iodide). The syrup of the iodide of iron is a valuable preparation, to be given three times a day in doses varying from three to twenty drops. So is the saccharated iodide of iron in three daily doses of from two to five centigrammes (gr. ⅓ to ¾).

The indications for the use of iodine in general are also valid for that of the mineral springs containing that element, such as St. Catherine or Kreuznach. Fat children and those with œdematous swellings, glandular infiltrations, or the exudations resulting from scrofulous inflammations are mostly benefited by them.

Of *phosphorus,* as a tissue-builder in subacute and chronic inflammations of the bones, I have spoken in another connection (p. 130). Its property as a stimulant of growth in general I have often verified in many morbid conditions. Scrofulous tissues, with their rapid decay and new formation, exhibit indeed the type of subacute inflammation, with the peculiar characteristic of rapid cell-proliferation, which perishes speedily because it is not sustained by a healthy connective tissue. The latter is formed by the internal administration of minute doses of phosphorus, such as I recommended for the above indications. Thus I refer to the remarks (made previously on the subject) on the doses in which the drug is to be given, the period during which it is to be continued, and the impossibility of substituting for it any of its salts. Those who do not pin their faith on the treatment of any disease on any single remedy, but combine remedial measures with the proper regard to hygiene, will not be mistaken in their expectations of the effects of phosphorus in the treatment of scrofulous disorder. I have used arsenic for the same purposes and on the strength of the same indications, but it has appeared to me to offer less advantages in these conditions.

A very active treatment can and should be applied to the *lymph-bodies.* Their tumefaction may be prevented in most cases. They swell under the influence of an irritation in the neighborhood. An intestinal catarrh will congest the neighboring mesenteric lymph-

bodies; within a few days they become enlarged and hyperæmic. When the local catarrh continues the hyperæmia will result in hyperplasia, and no long period is required to so change the tissue as to render the induration unabsorbable. If the diarrhœa "of the second summer," or of "teething," had not been permitted to go unchecked, these "scrofulous" glands would never have existed and therefore never interfered with lymph circulation and nutrition. Or the caries of a tooth, or a nasal catarrh, or a facial eczema, or one of the scalp is allowed to continue and develop into a chronic condition, and the secondary swelling of the glands round the throat and neck is the inevitable result. *Principiis obsta.* The greatest and gravest consequences might easily be prevented by attending to their trifling causes. Keep the mucous membranes healthy and the neighboring lymph-bodies will not be infected.

When the lymph-bodies have had time to undergo induration, an attempt should be made at reducing them, though they be ever so hard or large. The frequent inunction of potassium iodide ointment made with lanolin will often carry the point; so will that of green soap. Which preparations ought to be used, and to what extent the remedy, to what the massage of the parts alone is effective, are left to the decision of the practitioner. At the same time the syrup of the iodide of iron may be administered internally.

When these measures have proved inefficient after a reasonable time, the indurated lymph-bodies should be removed. The operation is not always easy, but recovery is almost certain, and the protection afforded by it more than pays for every exertion on the part of the medical man and the temporary annoyance on that of the patient. When an abscess forms in the centre of a lymph-body, it should be enucleated. If it rupture, all the remaining parts of the lymph-body should be scraped out, disinfected, and made to heal. Sinuses should be laid open and the surface scraped off and treated with iodoform in oil or in glycerin (1 to 8 or 12) once every few days. A mild solution of dioxide may also be used a few times, or powdered zinc hyperoxide, or the same in an emulsion of ten per cent.

Diseased *bones* should be treated on similar principles. Unless a scrofulous osteitis be superficial and within easy reach, the diseased parts ought to be removed with the least possible delay. The number of cases recovering, though after a long time, and sometimes with shattered general health, without an operation, affords no excuse for those which have been permitted to develop into caries, or necrosis, or pyæmia, or leucocythæmia, or tuberculosis.

Scrofulous *conjunctivitis, keratitis, otitis, eczema,* and *arthritis*

should be treated internally and to combat the morbid disposition, besides the procedures and appliances taught in subsequent chapters.

That the scrofulous condition requires good air and ventilation may be mentioned, though it hardly appears necessary to do so. The children ought to be kept in the open air constantly. For that purpose the winters should be passed, if circumstances permit, in warmer climates. From that point of view the summer sea-sanitaria of our large cities and the similar institutions of the civilized countries of Europe have rendered valuable services.

The *skin* of a scrofulous child must be kept scrupulously clean. But water must do more than merely that: the child must get used to cold water, and thereby accustomed to changes of temperatures. At the same time its nervous system will be strengthened and its cutaneous and cardiac circulation stimulated. The principles laid down in connection with the bathing of the very young hold good here, and I refer to my remarks on the subject. Salt water is preferable to plain water, and sea-bathing to either. Only in the cases of those who suffer greatly from eczema and other scrofulous eruptions, water must be avoided as long as the surface is not relieved. Indeed, no irritation of the surface is tolerated. Thus a scrofulous skin ought to be spared adhesive plasters or vesicatories, though the indications for their use be ever so tempting.

Incidental diseases of scrofulous children require more than the usual care. The perishable character of all their tissues renders an average febrile or inflammatory disease uncommonly dangerous. Unexpected deaths are frequently met with in such cases. In them the avoidance of strong purgatives or depletions is the first commandment; in them early feeding and sufficient general stimulation are among the principal indications; in them cardiac tonics, given timely and plentifully, will save many a life that would otherwise succumb.

4. *Lymphatism.*

A number of infants and children exhibit a peculiar pallor, coupled with adiposity and rhachitical symptoms. I have alluded to this form of rhachitis repeatedly during many years. These patients, always pale and flabby, show a singular general debility. The laryngismus found in such children, with or without sudden death, like the other symptoms, glandular swellings, etc., I mostly attributed to this form of rhachitis; probably correctly, at least in many or most instances. Maybe others should be explained differently.

The so-called "lymphatic state" is a condition of pallor, adiposity, hyperæmia, but otherwise normal structure of most organs, rather

large (sometimes very large) spleen, thymus, and also thyroid, rhachitic epiphysitis, swelling (in different degrees) of the lymph-bodies of the neck, axillæ, mesentery, of the tonsils and the follicles of the naso-pharynx, and of the tongue. This condition is also complicated with hypoplasia of the (heart and) arteries (Virchow, different from actual rhachitis, in which the arteries are rather large), which explains many a case of chlorosis and also of hæmophilia, sometimes with infantilism of the sexual organs, hairless pubes, and lymphocytosis. Sudden deaths seem frequently to be due to this condition, or rather to the excessive weakness of the heart connected with it (Paltauf, Escherich, J. Ewing). The *heart being weak,* chloroform inhalation, otherwise preferable to ether in children, becomes dangerous. Escherich tried the effect of calf-thymus feeding in this complex ailment, with negative result. Besides general antirhachitic treatment, I should feel like relying mainly on phosphorus and cereal and animal foods. Lymphatic children in whom the above symptoms may be feared can be protected by moderate doses of bromides or a few daily doses of ten or fifteen drops of tincture of musk. Iron preparations should be used carefully (ferratin, the albuminate, or the peptonate).

In some cases of general *lipomatosis* of children of both sexes I was struck with the smallness of their radial and carotid arteries and their feeble heart-beats. The percussion of the heart yields very questionable results, on account of the thickness of the chest-walls. Still, these were never so thick as to prevent the percussion of the thymus behind the manubrium sterni. In several instances it was found to be large, even in patients of ten and twelve years. In every one of its varieties, lipomatosis, being general, is a serious danger in any intervening disease. All the organs, mainly the heart, being liable to be incompetent, stimulants and roborants should be given through the whole course of feverish diseases intervening in excessively adipose children. Intertrigo is very common and obstinate. Adiposity of the nurslings is not a pleasant symptom, and the increase of their weight, generally claimed as a proof of good health and of thriving, is rather deceptive. Unless it be excessive, however, it will disappear about and after the end of the first year when muscles develop more effectually. As a rule, their blood is defective in erythrocytes and in hæmoglobin. The fat babies of fat mothers should be *weaned,* or cereals and animal food should be added to breast-milk; perhaps iodide of iron given.

The *diet* should be principally albuminous, with a fair amount of fat, very little vegetable carbohydrates, and little water. General

massage, exercise, for a while sodium sulphate every morning, and iodide of iron are helpful. Thyroid may safely be given, with some caution and combined with a cardiac stimulant (strychnine), to advantage. In hydræmic anæmia also, with or without a slight enlargement of the thyroid, and in marked simple anæmias, with or without enlarged spleen, besides lipomatosis, thyroid (as recommended by N. Koplik, *Arch. of Ped.*, July, 1897) should be tried in combination with the treatment detailed above.

5. *Diseases of the Ductless Glands.*

Their "internal secretion" is required in the organic economy either as an additional element or for the purpose of destroying the toxic results of metabolism.

Pseudoplasms of the *thyroid gland* are not often observed in infancy and childhood; still, even *carcinoma* and *tuberculosis* have been noticed. *Syphilitic gummata* have been found, and would, if diagnosticated, demand specific treatment. A dermoid tumor was removed from an infant two hours old, who recovered (London *Lancet*, May 22, 1897). *Atrophy with myxœdema* has been reported in a girl of twelve years; its treatment consisted in the administration of thyroid gland. *Inflammation* has been known to follow trauma and infectious or common catarrh of the nose and naso-pharynx. The treatment should consist of local applications of ice, hydrotherapeutic measures in general, saline purgatives, irrigations (both cleansing and antiseptic) of the nares and pharynx, and perhaps iodine both internally and externally, when absorption is slow. Suppuration requires early incision. *Goitre*—struma—is mostly met with in the lateral lobes, and therefore is not liable to annoy respiration until it becomes very large; should it do so, it compresses, particularly when behind the sternum, the trachea, vessels, and nerves. The usual forms found in the adult (lymphatic, cystic, even colloid and fibrous) are observed. When congenital, it is apt to be absorbed unless it be syphilitic and in need of mercurial combined with iodine treatment; the age of puberty also predisposes to spontaneous decrease. Most cases presented were in children from seven to ten years old. An occasional pulsation is not, of itself, pathognomonic of Graves's disease. An epidemic—infectious and contagious—form of goitre has been observed in schools, but was only a temporary ailment. Tincture of iodine, strong or modified, may be applied once every few days, or potassium iodide in glycerin (1 to 2 or 8), or a potassium iodide ointment with lanolin (1 to 4 or 10) may be rubbed in several times daily. Potassium iodide may be given in doses of from five to fifteen

grains daily. Iodine, indeed, appears to have, in bacteric and in thyroid poisoning, antitoxic properties, the toxalbumin of the thyroid having a great affinity to iodine. With potassium iodide injections into the tissue of the enlarged gland I have had no experience. In simple hypertrophic goitre and diffuse colloid degeneration injections (as many as fifteen) have been made every other day or every third day, with effect beginning to show itself after the sixth or seventh, of iodoform one, ether and olive oil each seven parts, the dose to be one or two cubic centimetres (min. xv or xxx). The cystic form requires puncture with injection of Lugol's solution; if the secondary swelling be too large and annoying, ice should be applied. Or the cyst or cysts may be incised and tamponed with aseptic gauze. If extirpation be preferred, it must not be total, because of the consecutive occurrence of cachexia strumipriva, tetany, and myxœdema.

Extirpation has the same effect as that observed in cases of absence or of degeneration of the thyroid gland. This degeneration may lead to atrophy or to an apparent hypertrophy; that is why thickness of the thyroid should not be taken for normal tissue. *Myxœdema* (mainly characterized by that condition of the thyroid, by the peculiar myxomatous structure of the skin and subcutaneous tissue, and by mental failure) is seen in the young as well as in the adult. In the young it is mostly complicated with *cretinism* or semi-cretinism; in many cases the absence or degeneration of the thyroid may be its only cause, in many others it exhibits at the same time changes in the skeleton, prominent among which is the shortening of the cranial base produced by the premature ossification of the occipito-sphenoidal synchrondrosis. Thus, with the exception of the latter, the cretinism of the fœtus and of the infant and the myxœdema of the young and of the adult are results of the same anomaly.

This *cretinism* is by no means so rare among us as it has been reputed to be even by the best observers. The patients, with their thick, short neck, clumsy looking head, retracted root of nose, wide-apart eyeballs, thick lips and tongue outside the teeth, large abdomen, dwarfed stature, and indolence, seldom appear in practice. They are occasionally found in the retreats of the tenement-houses, where the general practitioner may happen to see them, though he be not consulted about them; only of late they turn up in the dispensaries.

In the therapeutics of cretinism in most of its forms the thyroid gland, in its various preparations, has worked a beneficial revolution, as it also has in that of myxœdema. This addition to our facilities for overcoming a formerly incurable ailment, at least to a certain

extent (for no perfect recovery is known as yet), is, as Meltzer has so well shown (*New York Med. Monatsschrift,* May, 1895), eminently due to biological experiment and to it only. There are but few cases that resist its efficacy. The doses, however, must be small, particularly in the beginning; from one-third of a grain to one grain of Parke, Davis & Co.'s powdered thyroid three times a day, the small dose first, the larger one afterwards, are all that ought to be given an infant or child, according to age. The treatment must be continued a long time. It cannot be expected to act so well as in the myxœdema of the adult, because the cretinism or semi-cretinism of the child is the result of an arrest of development at a very early period of intra-uterine life. It follows that the treatment ought to begin as early as the diagnosis can be made. Besides the powder of Parke, Davis & Co., I know only Armour's preparation and the tablets of Burroughs and Wellcome. They are not of equal strength, and in every case ought to be commenced in small doses; for sometimes even apparently small doses produce general and cardiac irritation, palpitation, tremor, debility, and diarrhœa. On the other hand, rather large doses may be required. In a cretin six years old, in hospital treatment, I was obliged to increase the doses from one and one-half grains (0.1) daily to thirty-six (!) grains (2.5), which were taken a number of days before the pulse became more frequent, mild perspiration and restlessness showed themselves, and the temperature rose slightly. The general improvement was rapid. Other effects of the thyroid medication are obtainable in the child as in the adult. Myxœdema, the near relative of cretinism, shows its main symptoms in the subcutaneous tissue and in the skin, which are thickened and hard, and in the nervous system. I have seen good results of the thyroid treatment in cases of excessive adiposity,—one boy of eleven years, weighing one hundred and fifty pounds, was reduced to one hundred and twenty in four months under the use of small doses,—in scleroderma, and in a case of psoriasis. Fortunately, such cases are rare. Moreover, the thyroid treatment has proved very efficient in instances of stunted growth in the child and adolescent, with or without stunted intelligence. The effect was several times quite astonishing, both the length of the body and its general condition being rapidly improved.

The attempts at isolating the active principle, either organic or probably chemical, have proved successful in a good many cases that indicated thyroid medication. The dose of *iodothyrin* is like that of the thyroid substance. Its disagreeable effects may be modified by the use of arsenic. Burroughs-Wellcome's *thyroidin,* sold in tablets

of 0.25 (four grains), may be given in similar doses. Aiodin, another thyroid preparation, is recommended in the same way. It is claimed to contain 0.4 per cent. of iodine, and is therefore warmly recommended in the treatment of scrofulous lymph-bodies. The thyro-antitoxin of Fraenkel is recommended in doses (to an adult) of one centigramme (one-sixth grain), five or six of which may be given daily.

Not infrequently I have combined arsenic or phosphorus with the thyroid, some of the cases of cretinism showing characteristic symptoms of rickets. Indeed, the condition of the base of the skull appears to be one of the manifestations of localized rhachitis which has completed its entire course before birth.

The lasting effect of thyroid administration is rather jeopardized by the necessity of persisting in the treatment in order to escape relapses. Horsley's attempts at transplanting glandular substance will have to be repeated until they are successful and place the effect of the miraculous therapy beyond any risk. Such risks exist. The effect, sometimes of small doses, may be distressing,—prurigo, perspiration, tachycardia, delirium, even tonic spasms, and undesirable loss of weight; glycosuria rarely. In all these symptoms the effects of the treatment resemble very much those of exophthalmic goitre (Graves's or Basedow's disease), in which the thyroid is enlarged and in all probability the seat of abnormal functions.

Exophthalmic goitre is not a frequent disease in childhood. Of twelve cases reported in literature until 1879, four were mine (*New York Medical Record,* July 5, 1879); they occurred in children of from nine to thirteen years. Nor are the symptoms so grave as they are liable to be in the adult; in many, not all of the three alterations (exophthalmos, goitre, and tachycardia) are found at the same time. In the treatment proper regard must be paid to diet and hygiene. No excitement, fear, work, stimulants. Prolonged or but partial rest in bed at home or in a hospital. Baths of moderate temperature. Ice to the heart and (or) to the goitre for days, or hours, in succession. Application once or twice daily of a mild galvanic current (negative pole, from one to three milliampères) from five to ten minutes over the sympathetic nerve, between the horn of the hyoid bone and the sterno-cleido-mastoid muscle. Digitalis and strophanthus act badly, and are apt to increase tachycardia; potassium iodide acts more favorably. Gowers recommends belladonna in rising doses. My most successful medicinal treatment has been with arsenous acid, from two to six milligrammes (one-thirtieth to one-tenth grain), atropine from one-third of a milligramme to one milligramme (one-one-hundred-

and-eightieth to one-sixtieth grain), and fluid extract of ergot a gramme (fifteen grains) or more daily. I lately had a child's case under observation for some time, and was favorably impressed with the effect of thyroid in that case. Possibly it acts better in children, in whom the course of the disease is mostly milder; for, so far as adults are concerned, experience does not seem to be favorable. It is quite possible that Graves's disease will be much more influenced by the administration of thymus gland. Reinbach found fresh thymus to act in cases of goitre in which thyroid treatment had proved ineffective. The direct dependence of Graves's disease on the condition of the thyroid glands appears to be proven by the result of operations (partial removal), which, according to Oppenheimer, cured eighteen and improved twenty-six out of sixty-six cases. Nine died within a day after the operation. Of late the results of operations are greatly better; Kümmell, for instance, operated on fourteen severe cases of exophthalmic goitre with partial removal of the thyroid gland; twelve were permanently cured. The report was made from two to seven years after the operation. The remaining part of the gland showed a tendency to shrink; in one case only it grew a little larger. The other two cases were cured, with the exception of the exophthalmos, which persisted at first, but gradually diminished in size (*Berl. Klinik,* June, 1897). Doyen reported two equally successful cases (*Sem. Méd.,* 1897, p. 280). Sorgo collated 174 cases of strumectomy performed on adults who had Graves's disease; recovery took place in 48, considerable improvement in 27, moderate improvement in 62, no improvement in 11, death in 24 soon after the operation. Mikulicz arrives at the following conclusions: after a partial removal of the thyroid the first symptoms to disappear are the nervous and psychic, tachycardia takes more time, exophthalmos disappears late or not at all. Resection of the sympathetic about the neck has lately been recommended (Jonnesco), total and bilateral, inclusive of the inferior cervical ganglion.

Favorable results of the thyroid treatment have been mentioned in regard to dwarf growth and psoriasis. Further mention should be made of prurigo, of acromegaly, and of hyperplastic otitis interna in young obese persons. The absence of the thyroid function certainly retards the growth of bones, while it seems to leave intact the large abdominal viscera. It has sometimes improved tetany and certainly has a very favorable effect in simple hyperplastic goitre, in which the normal structure of the gland has been destroyed.

Diseases of the *thymus* gland are not yet very amenable to treatment. Inflammations, abscesses, syphilis, tuberculosis, sarcoma,

lymphadenoma, carcinoma, hemorrhage, and sclerosis have been observed. Its physiological dignity in the fœtus and young infant is certainly great. Nearly half a century ago Friedleben proved that it is indispensable in the fœtal and infant economy. It is largest (normally) from the third to the twentieth month; about the ninth month it was found, in unusual instances, from 1.5 to two centimetres in thickness. As the distance between the manubrium sterni and the vertebral column is but two centimetres about the eighth month of life, the slightest increase of an enlarged thymus through disturbed circulation, by crying or otherwise, may prove suddenly fatal; for besides the thymus, the œsophagus, the trachea, the blood-vessels, and the sympathetic and pneumogastric nerves are located in that narrow space. Bending the head backward during tracheotomy proved fatal. Swelling of the thymus in a cold bath may be dangerous.

Another danger is the irritation of the recurrent nerve by the constant up-and-down movement of the thymus gland. In such a case death may occur. It is cardiac, for at the autopsies there was no injection of the pia mater and no suggillations in the lungs.

Koenig (1897, after Rehn, 1896) extirpated a part of the thymus of an infant of nine weeks that suffered from intense dyspnœa. The remaining part he attached to the manubrium sterni and the tendons of the sterno-cleido-mastoid muscles; recovery was complete in four weeks. Thus, local pressure or irritation by the greatly enlarged gland may prove fatal, though most cases of sudden death in laryngismus stridulus must be explained otherwise. A recent case of death from large thymus occurred nine hours after birth (Schleif).

Like the thyroid, the thymus was found enlarged in many, according to Erb in all, cases of acromegaly.

Acromegaly—enlargement of all the tissues (except the skin) of hands and feet, of both maxillæ, with alveolar processes, so that the base of the face is below (while it is above in Paget's osteitis deformans, and the shape of the face is round in myxœdema), of ears, of tongue, and thorax, now and then hereditary, multiple in families, occasionally with disorders of the pancreas, in the adult with early arteriosclerosis, with deformity of the chest and enlarged viscera, seldom with glycosuria—was attributed by Marie to hyperfunction of the hypophysis (pituitary gland), which is in part a secreting organ without a duct, so that the lymph-vessels carry off the secretion. Marie, therefore, looks upon acromegaly (and many cases of gigantic growth: several professional giants were found to be acromegalic) as a nutritive disorder connected with an anomalous hypophysis, as myxœdema is with the thyroid gland. Possibly, as the thymus ap-

pears to be affected, acromegaly is the result of the complex anomalies of several organs. The treatment with hypophysis gave no conclusive results; nor that with thymus. The latter was also employed by Macalister in pseudo-hypertrophy, and by Mikulicz in goitre and Graves's disease; in the latter it has also been used by Owen, Cunningham, Edes, and Solis Cohen. N. Mackenzie reported twenty cases treated with thymus (*Amer. Journ. Med. Sci.*, February, 1897). One died, six showed no improvement, thirteen showed some improvement, which, however, was not considered marked or conclusive.

Hypertrophic osteo-arthropathy was described by Bamberger and in 1890 by Marie as clubbing of the last phalanges and thickening of the nails of fingers and toes, enlargement of all the phalanges, and later of the bones of the forearms and legs and joints; not of the face and skull. It is connected with or dependent on suppurative lung diseases, empyema, abscess of the lung, bronchiectasis, and sarcoma of the lungs. Venous obstruction may now and then be a causal factor, but the influence of toxins formed in cavities is more probable. It is by no means so rare in children as it is reputed to be. In a small hospital service I saw two cases in one year. They are apt to improve with the improvement of the local trouble.

Addison's Disease.—The "suprarenal melasma" depends on anomalies (tuberculosis, carcinoma, induration, hemorrhage) of the adrenals. According to Otto Ramsay (*Johns Hopkins Hosp. Bull.*, vol. x., 1899, p. 24), of thirty-five cases of carcinoma whose ages were known five were between one and twenty years, of twenty-six cases of sarcoma whose ages were known eight were between six months and ten years old. Such tumors were more frequent in the male, and attended by pain and emaciation, and exceptionally only with changes in the skin. Removal was successful in two cases. In some cases the semilunar ganglia have been charged with being its cause. Great muscular weakness, debility of the heart, frequent and small pulse, irritability, later apathy, cephalalgia, cardialgia, decrease of red blood-cells, and exhaustion (together with the characteristic discoloration of the skin) are the symptoms common to a number of constitutional ailments leading to a slow death. The treatment is, therefore, to a great extent, that of the anæmias, and requires iron, arsenic, strychnine, and measures directed against incidental symptoms, such as diarrhœa. Adrenals have been given in powder or in glycerin extract, or raw or cooked. Tabloids are prepared by different manufacturers, in which, as a rule, one grain corresponds with fifteen grains of the dried extract. They mostly weigh five grains; not more than one daily would be a dose for a child. Locally the fresh watery solution (suspension)

of the powdered extract has been used extensively on account of its blood-vessel-constricting power in conjunctivitis, rhinitis (hay fever), pharyngitis, and as a hæmostatic, now and then in combination with cocaine. Parke & Davis's "adrenalin" is a solution of one in one thousand, and is to be used in drop doses (1 to 4) several times a day, ten or more in the adult. According to T. B. Aldrich (*Amer. Journ. Phys.*, vol. vii. p. 359), adrenalin is identical with the copper-sulphate-reducing body, the blood-pressure-raising substance, as found in the gland, and is therefore the active principle of the same, and not a changed or modified form as I. J. Abel contends (*Johns Hopkins Hosp. Bull.*, 1901, vol. vii.). Epinephrin appears to be a changed form of adrenalin. It does not reduce Fehling. The equivalent of two glands was administered by Osler, with varying results; he has a case (adult) that gained fifteen pounds in six weeks and felt stronger ("Princ. and Pract. of Med.," 2d ed., 1895, p. 749).

Most valuable general information on *organotherapy* we owe to Hun and (*Amer. Journ. of Med. Sc.*, July, 1897) to Kinnicutt, who gave the results of vast experience and large numbers. According to him, in accordance with other observations, the myxœdema of cretinism is readily removed by thyroid treatment. The earlier it is commenced in the young the greater is its influence on growth and mental development. In the idiot, with a lymphatic rather than a myxœdematous condition, improvement is also obtained. Hyperplastic goitre (not the cystic) is greatly improved if not cured. Exophthalmic goitre was not improved; on the contrary, many patients felt worse. Obesity is influenced rapidly, losses of from two to eleven pounds having been observed; these losses will continue for some time only. Psoriasis is influenced to a certain extent only; the thyroid treatment seems to have no better effects than others. Other skin diseases were not particularly benefited. Of forty-eight cases of Addison's disease treated by suprarenal extract, six were cured, twenty-two improved, eighteen not improved, and two aggravated. Thymus extract appears to be useless in exophthalmic, beneficial in hypoplastic goitre. Of thirty cases, there was improvement in twenty, a cure in two. Pituitary preparations were used in thirteen cases of acromegaly. Varying degrees of improvement were noticed in seven, none in five, and one became worse. In one the affected extremities decreased, in two the pain in the head and limbs diminished.*

Diseases of the *spleen* are rarely of a primary character; but

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* Thymus has been administered in adrenal disease, because the thymus gland was often found enlarged in it.

most cases of *pseudoplasm* are congenital, and not amenable to any medicinal treatment, except sarcoma, which cannot be cured, but may be favorably influenced by arsenic and by the toxin of the erysipelas coccus and the bacillus prodigiosus (Coley). It is not so rare as it is reputed to be. I am certain that I see a case annually. The majority of changes occurring in the spleen are connected with, or dependent on, constitutional ailments, and result mostly in *enlargement* of the organ. Malaria, leucocythæmia and pseudo-leucocythæmia (Hodgkin's disease), and amyloid degeneration have their own indications. Rhachitis and syphilis are liable to produce induration depending on hyperplasia of the connective tissue. Tuberculosis of the spleen is a frequent complication; sometimes, in the very young, the spleen is the first place of deposit of acute tubercular infection. The deposits are sometimes of microscopical size only. The differentiation between tubercular deposits (transparent in very acute cases only, otherwise slightly yellowish, sometimes caseous, of unequal size and irregular distribution) and the follicles of the spleen is not always easy. Heart disease may lead to *embolism, infarctions, ruptures,* and *abscesses* (the latter forming also a part of general pyæmia), typhoid fever to softening and enlargement. This condition expands the peritoneal covering and causes *perisplenitis,* though it be not always distinctly amenable to diagnosis. For, indeed, the younger the infant the less is percussion—being hampered by the frequency of tympanites—able to reveal the exact size of the spleen. Unless it can be felt below the margin of the ribs, it should not be assumed to be enlarged. There are even cases in which it can be so felt, and still there is no enlargement, for in some instances the spleen is found descended or floating ("ptosis").

Banti has described a condition in which the spleen is enlarged for years, the enlargement is then followed by ascites, and finally by cirrhosis of the liver, the reversed order of the symptoms observed in the latter condition. Hæmoglobin was found to be reduced more than would be explained by the reduction of the red blood-cells.

As *primary splenomegaly,* or *splenic anæmia,* a condition has been described which furnishes a large spleen, anæmia without leucocytosis; sometimes hemorrhages, ascites, and enlarged lymph-bodies. For this condition, as also for malarial hypertrophy, for floating kidney, and for rupture, the spleen has been extirpated, with increasing successes. In leucocythæmia it has not been successful, maybe because the operation was performed too late. Possibly other organs assume the function of the spleen after its removal; for Hodenpyl found a general (compensatory?) lymph-body hyperplasia

in a case of absence of the spleen. The same has been observed in some cases of splenectomy.

The therapeutics of the constitutional disorders above alluded to has been discussed in previous papers. Quinine, ergot, and arsenic have been shown to be efficient in some and absolutely inert in others. The combination of quinine and ergot, with or without iodides, is probably among the most powerful remedies in chronic cases. Acute instances of swelling and inflammation require ice energetically applied, purgatives, and large doses of ergot; the presence of pus demands incision and drainage. To ascertain that condition exploring punctures, carefully executed, can be made with safety. To what extent extirpation of the organ can be rendered serviceable in chronic cases remains for the future to demonstrate. Many of them that are dependent upon disorders of circulation or nutrition are more amenable to a preventive than to a curative treatment.

6. *Hemorrhagic Diathesis.*

Under this heading I propose to treat of *purpura,* the hemorrhagic disease of Werlhof, *scurvy, peliosis rheumatica,* and *hæmophilia,* because of their similarity of symptoms and their—to a certain extent —uniform anatomical cause. Among them all, the first, with its wide-spread petechiæ and subcutaneous and cutaneous hemorrhages, is most frequently mentioned. It results from all causes interfering with general nutrition, and particularly with that of the blood-vessels. Among them are poverty, uninhabitable dwellings, chronic gastro-intestinal catarrh, overdoses of turpentine, dysentery, typhoid fever, diabetes, miliary tuberculosis, pneumonia, diphtheria, scarlatina, measles, grave anæmia, leucocythæmia, hepatic and renal diseases, and severe intestinal autointoxication. Relapses are very common. The complications with hemorrhages from the mucous membranes of the nose, stomach, and intestines, from the kidneys, into the brain and retina, and often with fever, are denominated Werlhof's disease. The diagnosis of "scurvy" requires bleeding from the gums, "peliosis" complications with "rheumatic" pain and swelling of the joints, but without an affection of the heart, and hæmophilia the hereditary tendency to general or only local (kidneys, gums) bleeding of (mainly) the male transmitted through the female, on the bases (Virchow) of narrowness of the arteries and insufficient development of the thin blood-vessel walls.

The alleged defective condition of the blood does not explain the hemorrhagic tendency. No blood, though ever so thin, penetrates a healthy blood-vessel wall. Hydræmia by itself does not produce

bleeding without an impaired condition of the tissue of the blood-vessel; thus it is that the same degree of anæmia in women may result in metrorrhagia in one, in amenorrhœa in another. Infants are peculiarly liable to bleed, because in them the blood-vessel tissue is still undeveloped; the embryonic condition extends into early infant life, and frequently gives rise to hemorrhages into the brain, meninges, and other serous membranes. When morbid influences are added to this physiological predisposition, the result is easily comprehended.

These influences are unknown. Bacteriological explanations are not yet quite satisfactory, in spite of Babes and many others. Finkelstein (*Charité Ann.*, vol. xxi.) connects the hemorrhagic diathesis with the bacillus pyocyaneus, and found streptococci in the blood-vessel walls. It is possible that all these varieties of hemorrhagic diathesis, which have been subsumed by Wilhelm Koch under the common heading of "scurvy," are more or less acute infectious diseases. That suspicion appears particularly justified in regard to purpura fulminans, a few cases of which have been observed in the very young (Henoch).

The treatment is to a great extent preventive. The social condition of a large part of the population is a main cause and ought to be improved. Thus the successful treatment depends largely on the prosperity of all, and is another proof of what ought to be considered a fact, that medical and social questions and aims are frequently identical. Zymotic disorders and eruptive fevers should be treated with a view of sustaining the strength of the system and the vigor of circulation. The heart's action ought to be watched constantly, and cardiac tonics given before heart-failure sets in. The dietetic treatment of these diseases is at least as important as their medicinal management. In this way hemorrhagic diathesis is kept off, as well as exhaustion.

Medicines can accomplish a great deal, but ergot less than it is often credited with. In these conditions I have often met with its untoward influence on digestion, and but rarely with a favorable influence on the hemorrhagic deposits or processes. Perhaps hydrastis does better, stypticin in one-tenth of a grain (0.006) doses frequently, adrenal substance a few grains daily, adrenalin (Parke & Davis) in drop doses, and gelatin subcutaneously in one- or two-per-cent. sterilized saline solution. Stronger solutions may be used locally on a bleeding surface or in the rectum. The styptic effect of calcium chloride, from five to ten grains (0.3 to 0.6) daily in all forms of hemorrhage, appears to be well established. It has been

administered to pregnant women in bleeding families. Iron does not appear to yield desirable results; among its preparations the tincture of the chloride is perhaps the best; the tincture of the malate and the liquor of the albuminate are well tolerated. Digitalis has a favorable effect on the heart's action; an infant of a year may take the equivalent of from one to four grains daily for some days, two grains daily afterwards. With it strychnine may be combined; the same baby may take a fiftieth of a grain daily. As relapses are quite frequent, the invigoration of the blood-vessels is the main object in view. From one to three drops of Fowler's solution, largely diluted, may be given every day for a long time. Better still is phosphorus, the method of administration and the doses of which have been detailed in a former chapter. Lead and tannin have not satisfied me at all. Local hemorrhages, when accessible, will require the application of ice, or compression of the bleeding vessel. The solution of antipyrin (5 to 20 to 50 per cent.), with or without tannic acid, is a good styptic. The success of the preventive treatment of hæmophilia will be rather doubtful so long as individuals are not controlled by the community in regard to the demands of public health. The daughters of hæmophilic families ought to be prevented from, and protected against, contracting marriages and having children. Phosphorus, administered in small doses and continued a long time, seems to diminish the tendency to bleeding.

Infantile scurvy (*Barlow's disease*) has become very amenable to treatment, both in its early and in its advanced stages. Its main and characteristic symptoms are pain and immobility of the (mostly lower) extremities; swelling (mainly) of the diaphyses, which depends on subperiosteal hemorrhages; petechiæ, and ecchymoses over any part of the skin, particularly of the eyelids; spongy condition and purple color of the gums, no matter whether teeth have appeared or not (contrary to Barlow in Keating-Edwards's Cyclopædia, vol. v., 1899); and sometimes separation of an epiphysis. These symptoms are frequently complicated with the tumefied epiphyses and other marks of rhachitis. The prognosis is mostly good. The principal remedy is fruit-juice, that of from one to two oranges a day, or of a pineapple; it is the specific. Complications with rhachitis require, besides, the elixir of phosphorus. Sterilized milk, if the only nutriment, as in many instances it will be found to have been, should be banished. If no reliable sweet milk be accessible, it should be pasteurized and combined with cereal (barley, oatmeal) decoctions, and meat-broths or some meat-juice should be administered as a regular food. Within a few days recovery will begin.

7. *Diabetes.*

Diabetes mellitus is by no means a common disease among infants and children, but it is not so rare as some will have it,—even acute diabetes running its full course within one or two weeks, mostly from trauma of the head, has been observed,—nor so frequent as those assert who have found glucose in the urine of infants whose food was supplied with an unusual quantity of sugar. Indeed, traces of sugar are often met with in the urine of nurslings. But this is not "diabetes."

In the ten years before 1860 there were thirty-one deaths from actual diabetes in Great Britain in children under fifteen years, annually. Since that time the occurrence of the disease in every period of life appears to have become more frequent. Hereditary (Blumenbach) and family influences, such as neuropathies, epilepsy, insanity, syphilis, exert a great influence. Isenflamm reports seven diabetic children in one family; Thomas three brothers; Mosler a diabetic woman whose father, mother, two sisters, and son died of diabetes; Naunyn five children in one family. Caron reports the cases of three children of the same mother, at the ages of three and a half and one and a half years, and of three months. I have seen two boys in one family, of five and three years, and other instances of multiplicity of the disease. Hydrocephalus, injuries to and tumors of the head, colds, atrophy of the pancreas, dysentery, morbus maculosus, measles, and scarlatina are referred to as causes. In most of the cases which have come under my own observation I could not elicit one. The highest percentage of sugar I have noticed in a child (boy of four years) was six and one-half. Heubner observed eight and one-half, with a daily quantity of five thousand grammes, or five quarts; Leroux ten and one-half. But it is not so much the percentage as the total amount of glucose eliminated in a day that is of importance. The specific gravity of the urine is not always high; I have seen it as low as 1007 and 1005. The prognosis is not so good as Redon and a few others appear to believe. Twenty-five years ago Külz reported six recoveries in one hundred and eleven, Wegeli, thirty-nine in one hundred and eight cases. I am afraid the diagnosis was obscured by the facility with which copper is reduced by creatinin, creatin, and other constituents of the urine.* Therefore, several (different) tests

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* Possibly, but not probably, as only five pure cases have been reported, a mistake could be made in regard to "pentosuria," which is no illness, it appears, and may occur in full health. In it there is a correct glucose reaction by Fehling and by Nylander, but not by fermentation (Salkowski).

should be employed when dry skin, emaciation in spite of ravenous appetite, polyuria with high specific gravity (up to 1044), also furunculosis, are noticed. A new and reliable test was furnished by J. Rudisch (Festschrift). The disease runs a more rapid course in infants and children than in adults, and terminates more readily in coma and death. I have seen recovery in but twenty cases. Therefore the treatment must be circumspect and energetic. Strict antidiabetic diet should be enforced. Fortunately, the young, with very rare exceptions, are apt to live mostly on milk, which may be given copiously in any form. Thus less difficulties are encountered in them than in adults. For these also milk, skimmed or not, forms a principal and beneficial part of their nutriment. Saccharin or glycerin may be used instead of sugar. "Gluten bread" contains too much starch, the "aleuronat" of the Germans about half as much as common bread. The medicinal treatment of the young requires some modifications. The facility with which cerebral symptoms ("coma") are developed renders the persistent use of alkalies advisable (mineral waters), mainly sodium sulphate. Opium is tolerated in increasing doses. Iodoform, which I have seen render fair service in adults, in daily doses of from ten to twenty grains internally, is seldom tolerated by the young, even in proportionately small doses. Arsenic may be given in increasing doses a long time, the bromide as well as other preparations; one drop and more of Fowler's solution, largely diluted, after meals, three times daily, the medicine to be increased gradually until from two to six drops are taken. As in every disease which resists treatment to an unusual degree, a large number of other medicines have been recommended. As this book is not a library, but written for practical purposes only, I abstain from enumerating drugs which I believe to be useless. There is one, however, which, in connection with everything destined to improve digestion and assimilation, appears to have a very favorable influence on the diabetic process. Sodium salicylate, with an alkaline beverage (Selters, Vichy), has a decidedly favorable effect. A child of five years may take from five to eight grains, three times a day, and continue its use for many weeks, to advantage. Lactic acid (Cantani) may be tried with equal parts of sodium bicarbonate in water, one or two grammes a day (fifteen or thirty grains), calcium lactate in the same or larger doses. Extract of jambul has been powerless in my hands, benzosol in daily doses of a gramme or more acts more favorably. Antipyrin appeared to be a little more efficient, the feeding with pancreas not at all. The prognosis was always bad when oxybutyric acid or renal casts made their appearance. Tuberculosis is not so

frequent as in the adult. Fournier (*Sem. Méd.*, 1900) publishes the case of a diabetic and heredo-syphilitic girl of eight years that got well with antisyphilitic treatment.

Diabetes insipidus is a rare disease, but more common than diabetes mellitus. A large amount of urine of low specific gravity (1000½ to 1005) is secreted daily. Increased micturition, great thirst, and emaciation are among the prominent symptoms. In some cases there appeared to be an hereditary influence. Syphilitic and other brain lesions, and injuries, have been found to explain its occurrence. In one case of mine (that of a girl of five years) it ceased, together with a copious and constant salivation, after the removal of a tænia mediocanellata. Inveterate masturbation and consecutive "neurasthenia" appeared to be the cause of the excessive flow of urine in several children of from four to eight years. It ceased gradually with the restoration of correct habits and better general health. Of the remedies which have been recommended, I mention valerian, zinc valerianate, bromides, sodium salicylate, and galvanization of the head. All of these proved unsatisfactory in my hands. But I have seen good results, and sometimes speedy improvement, from the administration of ergot and atropine. In other cases they were absolutely useless. A child of five years may take daily, of the former two cubic centimetres (half a drachm) or more (ext. fluid., or the corresponding amount of ext. ergot., or ergotin), of the latter one-hundredth of a grain or less (one-half of a milligramme). More reliable than either has been strychnine, in three daily doses of one-hundredth of a grain each, or more (one-half of a milligramme). Zinc valerianate may be tried in daily doses of from half a gramme to one gramme (seven to fifteen grains). Opiates are highly recommended by Bouchut; pilocarpine, antipyrin, and lead acetate by others. Fortunately, the prognosis is much more favorable than that of diabetes mellitus, particularly in hereditary cases. General roborant treatment, iron, quinine, strychnine, and cold water to improve peripheral and cardiac circulation and the tone of the nervous system.

V

Infectious Diseases*

1. *Tuberculosis.*

In ten hundred and forty-five autopsies made in the New York Foundling Hospital (Northrup) and the Babies' Hospital, all of which were reported by Dr. L. Emmett Holt, tuberculosis was found in fourteen per cent.; altogether one hundred and nineteen cases. These and similar statistics demonstrate the frequency of tuberculosis in infancy. From the first to the fifth year it is the same. In the above one hundred and nineteen cases the lungs were affected one hundred and seventeen times, the pleura sixty-nine, the bronchial lymph-nodes one hundred and eight, the brain forty, the liver seventy-seven, the spleen eighty-eight, the kidneys forty-six, the stomach five, the intestines forty, the mesentery thirty-eight, the peritoneum ten, the pericardium seven, the endocardium one, the thymus three, the adrenals three, and the pancreas three times.

In the young, as in the old, tuberculosis is spread either by mechanical transmission through cough, deglutition, and aspiration, or in the contiguity of tissues after having been developed in a given locality, or through lymph-ducts and blood-vessels. The latter, after having absorbed bacilli from the primarily invaded part, are liable to distribute them in a distant locality or all over the system in the shape of acute miliary tuberculosis. Most frequently the primary seats of the affection in the young are the bones, joints, and lymph-bodies ("glands"). The adenoids harbor tubercle bacilli a long time; they were found in sixteen per cent. of a large number of cases examined. The blood-vessel walls are frequently the original seats of tuberculosis (peri- and endangeitis); that is why the first visible symptom of tuberculosis may be a hemorrhage, and why in tubercular meningitis the tubercles are found along the small blood-vessels. Among the latter, those of the mesentery are by no means so frequently affected as they are still reputed to be; those of the neck

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* With the exception of a very few (intermittent fever, rheumatism), all the diseases enumerated under this heading are also directly or indirectly contagious. As it is not my intention to systematize closely, they all appear in this chapter indiscriminately.

and mediastinum are more subject to early infection through the neighboring mucous membranes. When tubercular they have more tendency to conglutination and adhesions than the benign form, which is more apt to remain isolated. When they have remained for some time it is not advisable to waste time with inunctions or injections of arsenic or zinc chloride. Their only safe treatment is removal. In case of doubt, the diagnosis may be made by the injection into a muscle of from one to five milligrammes of a one-per-cent. solution of Koch's tuberculin.

Bacilli may be swept into the circulation through healthy epithelia, but the majority of infections take place in a morbid condition of the integuments, either epidermoid or mucous. Wounds facilitate the admission of bacilli (circumcision, eczema, ear-rings, medicinal subcutaneous injections, or contact—strenuously denied lately by R. Koch —with cattle tuberculosis; vaccination exceptionally only). The nose, and the pharynx when sore or ulcerated, may be equally dangerous; the former the more frequently the younger the children, with their dirty finger-nails about their nostrils when playing on the floor, or at any time. The mediastinal and bronchial glands are mostly affected through direct inspiration into the pervious endothelial layer of the alveoli.

The most common forms in which tuberculosis makes its appearance in the young are *acute miliary tuberculosis,* many cases of acute or subacute *caseous pneumonia,* and genuine *chronic pulmonary tuberculosis* with cavities. Caseation, however, does not always mean tuberculosis; for it is also met with as the final transformation of pus, of carcinoma, and of typhoid infiltrations. Tubercular abscesses of the lungs are not at all frequent, but we see them at every age. While I have met with but very few cases before the end of the first year, they are not very rare after the sixth or eighth. Pulmonary tuberculosis is often accompanied or preceded by pleurisy; indeed, it appears probable that this pleurisy, with its frequent relapses, is the primary seat of tuberculosis in many.

The most common form of pulmonary tuberculosis in the young is that which is developed after caseous pneumonia. It is a frequent result of bronchitis and catarrhal pneumonia attending measles and whooping-cough, and is quite generally accompanied by considerable changes in the neighboring lymph-bodies. It is often seen in the lower lobes; indeed, what is frequently suspected to be pulmonary tuberculosis of the upper lobes is apt to be induration, resulting from interstitial inflammations of infancy, which retract the corresponding part of the chest, exhibit diminished respiratory murmur, prolonged

expiration, and dulness on percussion, and may last a long lifetime without endangering life or health to any considerable extent.

What I said about the mode of development of these frequent forms points at once to preventive treatment as the principal indication. If bronchitis, catarrhal pneumonia, measles, whooping-cough, and glandular diseases are frequent causes of tuberculosis, those primary affections must be effectually treated. There is no bronchitis which cannot be made milder, many a case of catarrhal pneumonia may be shortened or rendered less dangerous, and most, perhaps all, cases of whooping-cough modified and shortened. In a former chapter I insisted upon the necessity of watching and treating all the self-limited diseases. The sin of omission is as grave as that of commission. And in my remarks on scrofula, to which I here refer, I pointed out the facility of eradicating the coming evil by removing the unabsorbable tumefaction of lymph-bodies. Unfortunately, the success of treatment in cases of acute miliary tuberculosis is so small, and of chronic tuberculosis so unsatisfactory, that the indications for preventive treatment are the more urgent. The fact of universal tuberculosis arising from a local source cannot be denied, having been proven by thousands of experimental and clinical observations. Now and then a case is quite demonstrable. A few years ago I had a little girl in my division in Bellevue Hospital who suffered from the most exquisite and extensive tuberculosis of the skin I have ever seen. She finally died of empyema and general tuberculosis. Coming from a fairly healthy family, she developed a glandular swelling in her right axilla, which was neglected, and permitted to break spontaneously and result in sinuses. From that place the lymphatics transported the accidental bacillary infection, and produced extensive ulcerations over the chest; metastases took place in other parts of the body. It is of no account to investigate whether the original affection was tubercular or whether the tubercular character was developed afterwards. This much is certain, that the child need not have died if the lymph-body which was primarily affected had been extirpated.

It is unnecessary to add that tuberculosis of the bones and joints, so frequent in infancy and childhood, requires prompt attention and in some cases operative procedures.

Among the *causes* of tuberculous consumption which makes its appearance in otherwise healthy persons, both young and old, the following also are given prominence by all observers of note: insufficient supply or change of air, absence of exercise, overwork without rest or vacation, monotonous food, and in larger children persistent mental emotions; also trauma. Most of these sources of disease act

as well on the young as on the old, and may lead to infiltration before there is any cough, but anæmia, muscular debility, and loss of appetite only. Therefore tubercular infiltrations are frequently found among the inmates of prisons, particularly those who have been isolated a long time, workmen in factories, soldiers in barracks, students in seminaries, children in orphan asylums and large boarding-schools, those attending crowded public schools and overworked in their private studies, besides being crippled by unwise discipline, which requires absolute immobility, and by loss of time or opportunity for exercising. It is not very probable that the occasional stately promenades of the young by couples—though not handcuffed, though on a Madison Avenue sidewalk, though attended by the good-will, moral character, and Argus eyes of two elderly ladies—are equivalents for the free and unhampered play and development of the growing organs. If it be a fact that there is so much less tubercular disease among hunters, farmers, gardeners, and sailors than among factory men and women of all trades, school-masters, and tailors, it is certain that rowing, skating, gymnastics, and tennis, even the so-called calisthenics, if practised in the open air, would expand many a child's chest, aërate his blood, keep his organs vigorous, and eliminate invading poisons.

There are many other causes or influences creating or increasing the possibility of tubercular invasion. A considerable predisposition is created by the vulnerability and fragility and œdematous infiltration of scrofula; by the catarrh produced by sedentary life and foul inhalations. Koch has proved that active bacilli pass the stomach unmolested and may infect the intestine when this has a superficial lesion, thus rendering even a primary intestinal tuberculosis possible.

While direct heredity is rare, hereditary predisposition to tuberculosis is quite frequent, and is transmitted even by such parents as appear to be in fair health. Constitutional parental disorders resulting from the influence of scrofula, rhachitis, and even syphilis may finally prepare the children for a predisposition to tuberculosis. In such children every catarrh must be carefully watched. The premature ossification of the costal cartilages, most frequently found about the superior part of the chest, and the consecutive shortening of the sterno-vertebral diameter give rise to contraction of the thorax and insufficient expansibility of the (upper lobes of the) lungs. In such cases the aëration of the blood suffers at a very early date, catarrhal and inflammatory thoracic diseases are liable to become dangerous, and gymnastic exercises are required in early childhood.

Direct transmission from the diseased parents to the children is probably more frequent than is commonly believed, and therefore

the child should not share the room and bed of the consumptive. Kissing must be omitted under these circumstances; it may often be the cause of contagion, though, perhaps, not so frequently as, for example, diphtheria is transmitted in that manner.

The origin of pulmonary consumption is uniformly, in almost all instances, attributed to the *inhalation* of bacilli. As they are deposited on bedding, clothing, and on the floors and walls of rooms, in handkerchiefs and towels, where they dry and are easily movable, nothing appears more natural than that the long-lived microbes should be admixed with the dust of the room, and thus inhaled. In this way the contagion of acute exanthemata is certainly disseminated. Tubercle bacilli, like everything solid, when floating in motionless air, are certain to sink gradually, and the inference is that children are more liable to inhale them. This mode of propagation has been taken to be the principal one in pulmonary tuberculosis. To such an extent has this belief controlled the teachings of medical men that the rules and regulations of health departments concerned themselves with this mode of transmission only. Experiments, however, appear to prove that the air-currents usually found in a room are not sufficient to detach dry bacilli fastened with their surrounding sputum to the walls or floors. It is only strong currents, such as are caused by sweeping, beating, brushing, perhaps even by violent slamming of doors, that will float them. Under these latter circumstances it is certainly possible that dry bacilli may be detached and infect those present.

Flügge (*Zeitsch. f. Hyg. u. Inf. Krankh.*, vol. xxv., 1897) published a long series of experiments and observations which appear to be able to stand accurate tests. Crying, sneezing, coughing, even talking, detach sputum in more or less invisible quantities. Everybody's experience yields such instances—palpable ones—in the sick and well. Such *moist particles*, mostly infinitely small, were proven to remain in the air of a room five hours. Indeed, an air-current of from one to four millimetres a second (= twelve to fifty feet an hour) sufficed to float them for that length of time. In this manner the contagiousness of pulmonary tuberculosis is even more pronounced than by assuming the dry sputum to be the only means of conveying the disease, and the direct transmission from husband to wife or children, from the woman in childbed to her newly-born, or between patients in a hospital ward or sanitarium becomes almost a matter of course.

It is evident that the newly-born cannot be safe with its consumptive mother, and just as probable that a "sanitarium," a ward, a hospital filled with tuberculous patients, is a hotbed of mutual infection.

A consumptive mother must not nurse her infant because of the danger of immediate contagion through sputum. Besides, her milk may be, though it rarely is, infected like the milk of tubercular cows, even though their udders may not be diseased. Two cows, at least, out of a hundred are tubercular. Thus the least that can be done is to boil the milk intended for the nourishment of the infant. Koch's and other attempts at proving the disparity of bovine and human tuberculosis are not yet successful. Morphologically, chemically, and in their cultures they are alike or similar. The bacilli are active in both races, mutually, but their virulence differs even when going from man to man, and also when going from cattle to man after having been quite marked when disseminated among cattle. Thus, if we obey the rules I have enjoined more than forty years, the milk can be made more innocuous than is possible even for butter * or cheese obtained from such cows. These rules ought to be strictly followed, though there be exceptions to the universal experience. An instance of such exceptions is mentioned by Biedert, than whom there is no more reliable observer. He reports the cases of children who were fed a long time on the milk of tubercular cows without being attacked themselves. The meat of tubercular cattle is not infected (for bacilli are not found in muscles) and therefore not so dangerous as possibly their milk. But, after all, the presence of tubercular cattle in a community is more than simply objectionable. Its dangers exist, though they may have been exaggerated. That is why Koch's tuberculin, which failed as a cure, has proved a preventive, inasmuch as it reveals the presence of tuberculosis by the elevation of temperature following its subcutaneous injection.

Among the causes of consumption monotony of food has been enumerated by many. It is evident that it is of little account in the cases of infants or children, whose habits are plainer and digestive functions more adapted to simpler and more uniform articles of diet. Most of these, while in health, are satisfied with milk, cereals, and but little meat. Sweet cream may be added to the milk, but more than a few ounces are not digested through the course of a day. Cod-liver oil acts not only through its fat. During the afebrile con-

* Butter does not seem to be very dangerous, for neither Schuchardt nor Rabinowitsch (Koch's Institute) found tubercle bacilli in eighty samples of butter taken from different stores and markets. Twenty-three of them caused, in guinea-pigs, alterations resembling, but not exactly like, tuberculosis (Deutsche med. Woch., August 5, 1897). Many similar investigations have since proved that the bacilli change in virulence, which decreases or increases according to changing circumstances, culture-media, etc.

dition and chronic emaciation, over-alimentation, introduced by Debove, may be tried to advantage, while the insufficiency of gastric digestion may be stimulated by the administration of artificial gastric juice (pepsin with muriatic acid) and mild stomachics (gentian, nux, diluted alcoholic beverages) and orexin tannate in three daily doses of from one to three grains (0.06 to 0.2). When exercise cannot be taken to a sufficient extent, or is contraindicated by the necessity of enforcing temporary, but absolute, rest, massage, according to S. Weir Mitchell's plan, will take its place. During fever, over-alimentation is to be stopped; it deranges digestion and increases bodily heat. Alcoholic stimulants will at that time often take its place to advantage. While they do not act well in certain over-irritable natures with over-sensitive hearts, and in hæmoptysis, they are good stimuli for the general system, diminish perspiration, and act favorably in diarrhœa.

In the treatment of tuberculosis no single factor is a cure by itself. The quality of the air alone will not cure the sick any more than a certain mixture of salts and water in a mineral spring, or some known chemical relation of albuminoids and carbohydrates in an article of food. Insufficient clothing and bedding, unheated rooms, draughty halls, indigestible food, strong coffee and tea, hot cakes and cold drinks, late hours, lively hops, brass instruments and pianos disturbing midnight rest, kill as many, in proportion, in Colorado, Florida, Southern France, and Italy as in New York. Unfortunately, we know too well that our patients believe they have done enough for their physician (or themselves?) when they have followed his advice to change climate. In this respect, too, it is true that those who speed over the sea are changing their sky, but not their spirit.* It should never be forgotten that the change of climate is mostly a negative remedy, and cannot be expected to offer more than the possibility of favorable external circumstances. Some caution should be observed in regard to places with an old and established reputation. A mountain resort of deserved great repute will change its character when the village changes into a big manufacturing place, with soot and sulphuric acid in place of a clear atmosphere.

Moist air is a better conductor of warmth than dry air. Thus loss of temperature is more rapid in moist air than in dry air. Dry air, therefore, may be very much cooler, and is still better tolerated in spite of its lower temperature, and affords more protection. Hæmoptysis appears to be a frequent occurrence at the times and

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* "Cœlum non animam mutant qui trans mare currunt."

seasons of increasing atmospheric moisture (spring). According to Rohden's researches, a rapid increase of the percentage of water in the blood is frequently sufficient to produce a hemorrhage. Thus the drinking of large quantities of water ought to be avoided, and no residence be selected for a patient subject to hæmoptysis where the atmosphere is very moist. Dry altitudes, such as those of New Mexico, have given me good results in pulmonary hemorrhage. At all events, no place should be selected where the percentages of moisture in the air are liable to change rapidly. The uniformity of an insular climate is, for that reason only, not so dangerous to those who have bled from their lungs. Still, dry air and a higher scale of the barometer are preferable.

The diversity of opinions in reference to the climato-therapeutics of phthisis resulted from the circumstance that the indications were not distinctly understood. Neither cold nor warm, neither dry nor moist, air by itself is a remedy. Warm air does not cure, but it enables the patient to remain out of doors. The temperature should be uniform, sudden currents of air avoided, and the atmosphere free of microphytes. At an altitude of sixteen hundred feet their number is greatly reduced (Miquel), there are but few at a height of two thousand six hundred feet (Freudenreich), very few at six thousand, and absolutely none at twelve thousand feet, provided the parts are not, or but little, inhabited. Over-population of elevated villages and cities diminishes or destroys their immunity. In the factories of the Jura Mountains, with a great working population, at an altitude of three thousand five hundred feet, tuberculosis is frequent.

Protection against sudden gusts of wind and rapid changes of temperature is an absolute necessity. The elevated valleys or rather recesses of mountains (Colorado) deserve their reputation in pulmonary diseases. Davos is dusty, windy, and exposed to frequent changes of temperature during the summer, and must not be advised for that season. Woods are warmer in winter, cooler in summer; so is the ocean. Both, therefore, deserve their reputation in the chronic ailments of the respiratory organs.

Not the thinness of the atmosphere, but its purity, both on plains and on mountains, is the requisite, and a high percentage of ozone. The latter is developed under the influence of intense light, the presence of luxuriant vegetable growth, particularly of evergreen trees (Terebinthinaceæ), and the evaporation of large sheets of water. Thus, ozone is found at moderate or high altitudes, in needle-wood forests, and near or on the ocean.

In the general hygienic treatment of tuberculosis the skin requires

particular attention. Sudden changes of temperature, which strike the surface suddenly and work their effects on internal organs by reflex,—" colds,"—in spite of the modern superciliousness of those who deny any pathological change unless by the exclusive work of bacteria, will always hold their places in nosology. The skin must be both protected and hardened. Wool, or wool and cotton, must be worn near the skin, the feet particularly kept warm, no wet or moist feet permitted, undergarments changed according to season and the alternating temperatures of days or weeks and every night and morning. It is of the greatest importance to impress upon the minds of the very poorest that they must not wear during the day what they have slept in. Still, while protection is to be sought anxiously, vigor and strength are to be obtained by accustoming the surface to cold water. The daily morning wash may be warm in the beginning, and become gradually cooler; alcohol may be added to the water in the beginning (alcohol alone is unpleasant by its withdrawing water from the tissues), or salt. The temperature of the water being gradually diminished, the same treatment can be continued during the winter, with a pleasant sensation of vigor. The subsequent friction with coarse bathing towels sends a glow over the surface and through the whole body; it is desirable that, as much as possible, the patient perform it himself. The easiest way to start the habit is by washing, a short sponge- or shower-bath will take its place soon, and a cold plunge will be borne, even by the weak, afterwards.

It has become fashionable with many to feign a contempt for internal medicines in the treatment of tuberculosis, pulmonary and other. I am glad that I cannot share their opinion. Thus, for instance, I look upon arsenic as a powerful remedy in phthisis. It was eulogized as early as 1867 by Isnard, in a monograph, for its effect both in malaria and consumption, in both of which he explained its usefulness through its operation upon the nervous system. He asserted that suppuration, debility, emaciation, vomiting, diarrhœa, and constipation would improve or disappear under its administration. The doses of arsenous acid used by him in the cases of adults amounted to from one to five centigrammes (one-sixth to five-sixths of a grain) daily.

Arsenic is certainly a powerful remedy. It is known to act as a poison and a strong caustic. It prevents putrefaction, though as an antiseptic it ranks even below salicylic acid. It acts favorably in malaria, chronic skin diseases, and maladies of the nervous system, and has considerable, and sometimes unexpected, effects in the treatment of lymphosarcoma and sarcoma. It is also said to increase

sexual desire and power, and in animals physical courage. Thus there is a variety of effects the intrinsic nature of which may be found, uniformly, in the action of the drug on the function and structure of the cells, which, though varying in different organs, have the same nutritive processes. Arsenic has a stimulating effect on cell-growth. In small and frequent doses it stimulates the development of connective tissue in the stomach, in the bone and periosteum, everywhere; in large doses, by over-irritation, it leads to granular degeneration. Like phosphorus, arsenic builds in small doses, destroys in large ones. By fortifying the cellular and all tissues, both fibres and cells, it enables them to resist the attack of invasions, both chemical and parasitic, or to encyst or eliminate such enemies as have already penetrated them. Thus it finds its principal indication in the peculiar fragility of the blood-vessel walls resulting in pulmonary hemorrhage.

The doses should be small. A child a few years old may take two drops of Fowler's solution daily, or a fiftieth or fortieth of a grain of arsenous acid for weeks or months in succession. This amount may be divided in three doses and administered after meals; the solution should be largely diluted. There is no objection to combining it, according to necessity, with stimulants, roborants, or narcotics, and to giving it for an indefinite period, unless the well-known symptoms of an overdose—gastric and intestinal irritation and local œdema—make their appearance. But they seldom will, particularly when small doses of opiates are judiciously added to them. In almost every case, perhaps in every one, it is desirable to administer it in conjunction with digitalis.

In the vertebrate animal, *digitalis* increases the energy of the heart muscle and its contraction; thereby it increases arterial pressure and diminishes the frequency of the pulse. By increasing arterial pressure it favors the secretion of the kidneys, improves the pulmonary circulation, empties the veins, thereby accelerates the flow of lymph and of the tissue fluids, and exerts a powerful influence on the metamorphosis of organic material,—that is, general nutrition. Besides, what it does for the general circulation and nutrition it also accomplishes for the heart muscle itself. The blood-vessels and lymph circulation of the latter are benefited equally with the rest. Thus digitalis, while called a cardiac stimulant, contributes largely to the permanent nutrition and development of the heart. This effect is not only of vital importance to the economy of the system on general principles, but an urgent necessity in view of the fact that there appears to be a relative undersize of the heart, either congenital

or acquired, in cases of pulmonary tuberculosis; and there is certainly such a predominance of the size of the pulmonary artery in the young, particularly over the aorta, that the normal succulence of the lung becomes pathological quite readily when the insufficiency of the heart muscle tends to lower arterial pressure within the distributions of the pulmonary artery. The selection of the preparation to be administered is not always an indifferent matter. The infusion and the tincture are not always well tolerated by the stomach; digitalin, not being a soluble alkaloid but a glucoside, is not reliable in its effects and not of equal consistency and strength; a good fluid extract, or the extract, is borne well and may be taken a long time. A child five years old may take about two minims of the former daily, more or less, for weeks and months, or its equivalent in the shape of the extract (two-thirds of a grain daily); the latter can easily be given in pills, to be taken in bread or jelly, and combined with any medicines indicated for special purposes, such as narcotics, or nux, or arsenic, or iron; the latter to be excluded in all feverish cases or in all cases while there is fever. So long as there is no urgent necessity for a speedy effect, digitalis will suffice by itself; as a rule, it does not operate immediately in these small doses. The addition of strophanthus, or sparteine, or caffeine, all of which are speedily absorbed and eliminated, and exhibit their effects rapidly and without the danger or inconvenience of accumulation, will prove advantageous in many cases.

Creosote has been introduced into practice, both for inhalation and internal administration, since 1877. No direct influence on bacilli should be looked for. What it can do is to better the condition of the patient. It will often improve appetite, combat putrefaction, thereby facilitate assimilation, and (sometimes) relieve diarrhœa. The doses vary. Almost incredible doses have been given (from ten to fifteen cubic centimetres = two to four drachms daily, and more to adults). Probably from two to ten drops daily is a dose for children, which, according to their ages, may be administered for a long time. Creosote carbonate, almost tasteless and easily borne, is a proper substitute, one or two drachms (4.0 or 8.0) or more daily. Neither ought to be persisted in when the appetite does not improve within a reasonable time, nor during a pulmonary hemorrhage, nor when the urine, which requires frequent examination, contains albumin.

This dozen years I have replaced creosote by *guaiacol,* recommended by Schüller, Sahli, and others, which constitutes nearly sixty per cent. of the very best creosote in the market. A child will readily take from six to fifteen drops daily (according to age) in from three

to four doses. It is best taken after meals, in sugar-water, in milk, or in cod-liver oil. There are but few who object to it. Those who do may take one of its salts, the benzoate (benzosol), salicylate, cinnamylate, or carbonate. Of these I have mostly employed the last, also the first. They are (almost) tasteless and readily taken, in doses of as many (or more) grains as the fluid guaiacol in drops. In guaiacol I have been less disappointed than in any other internal remedy administered in pulmonary tuberculosis, cod-liver oil not excepted. It is a good stomachic, appetite and digestion improve under its use, the cough gradually becomes looser, less purulent, the râles more mucous, and the body weight is apt to increase. While creosote is not well tolerated in the stage of cavities and hectic fever, guaiacol is not only borne, but appears to exert its beneficial influence even in that condition. There are but few patients who do not derive some benefit from its internal use. Externally it has been recommended to subdue hectic fevers; for that purpose the chest and abdomen are painted with the pure guaiacol several times daily. It has the advantage over creosote of not being contraindicated either in hemorrhage or in renal complications.*

I do not fear that it will be replaced by *ichthyol* (sulpho-ichthyolate of ammonium), which has been eulogized by Cohn, Scarpa, Le Tanneur, H. Fraenkel, and others. Adults (children in proportion) are expected to take 0.25 = four grains in a capsule before every meal, or from twenty to forty drops four times a day of a solution in equal parts of distilled water. In spite of the admixture of aromatic oil, it has a bad taste and will be administered with difficulty.

After the failure of Koch's *tuberculin* several antitoxins and *serums* made their appearance. The tuberculocidin of Klebs and the serum of Maragliano (which is said to contain no antitoxin) have not conquered the universal good opinion of the profession any more than the cantharidin recommended by Liebreich, or the cinnamic acid recommended by Landerer, who asserts that it stimulates and causes leucocytosis, and that leucocytes penetrate the tubercular deposits, which are then absorbed or cicatrize. Koch's new tuberculin is introduced as containing the insoluble parts of the bacilli in finest mechanical disintegration, while the old was said to be a glycerin extract of the bacilli. What it will do remains to be seen. A patient (adult) in Bellevue to whom I gave increasing doses, beginning with the minute doses recommended (one-fifth of a milligramme of the fluid)

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* See my paper in International Medical Magazine, November, 1892, and Transactions of the Climatological Association, 1892.

and rising to three minims, showed no reaction whatsoever, though the autopsy proved the presence of extensive tuberculosis. Nor are the exaggerated promises held out for the old tuberculin repeated in the new. This is said by Koch to exert its influence in the very beginning of the morbid process in the lungs, when there is no complication at all with streptococci or septicæmia, and when the temperature of the body does not exceed 38° C. (100.4° F.). It is readily seen that under such circumstances there will be but few cases of pulmonary tuberculosis in children in whom, because of the extreme difficulty of the diagnosis at that age and in that stage, the remedy can be administered with any show of justification. The tuberculin promised * by Behring has not materialized.

Other remedies have been used in great numbers. Specifics have been recommended, and symptomatic treatment was resorted to. The success of the latter depends on the judgment of the individual practitioner. No text-book or essay can teach more than general principles and their adaptability to the average case, and the measures to be taken in a number of exceptional occurrences. The indications for the use of narcotics, stimulants, expectorants, and febrifuges will change according to the cases and their various phases. In every case the necessity may arise for antipyrin, phenacetin, sodium salicylate, or quinine, never for acetanilid (antifebrin), which is a strong anilin poison and apt to change, even in small doses, hæmoglobin into methæmoglobin. It may be necessary to decide the question whether the administration is to be made through the mouth, rectum, or subcutaneous tissue, or how their effects are to be corrected or combined. I have often found that a hectic fever was not influenced by quinine, or antipyrin, or sodium salicylate; but the combination of the first with one of the latter frequently had a happy effect.

The change in our pathological views, or rather the addition of a new factor to our etiological knowledge, has directed our attention to the antisepsis of the respiratory organs. To destroy bacteria is not necessary in order to make them relatively harmless. It is impossible to kill the bacillus without killing the normal cell, but very mild antiseptics suffice to stop the efficiency and proliferation of the parasite. Thus we can hope that the future will teach us how to reach the destructive process in the lungs. For the present, however, neither the inhalation of hot air nor of hydrochloric acid, nor the rectal injections of hydrogen sulphide have done any good. *Turpentine*

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* Fifteenth Congress for Internal Medicine, Berlin, session of June 10, 1897.

inhalations are frequently beneficial by loosening, in some cases diminishing, expectoration from suppurating surfaces, as they have the effect, mixed or not with eucalyptol or other disinfectants, of destroying the fetor of pulmonary gangrene. The inhalations of *compressed air,* or the breathing of normal air while the body is surrounded by rarefied air, will prove advantageous in chronic processes where the object is to expand the contracted lung tissue. Inhalations of ozone may render better services in future than A. Caillé acknowledged in 1892 (*Arch. of Ped.,* August, 1892). Later personal communications of his express themselves very hopefully (p. 74).

Operative procedures are less indicated in pulmonary tuberculosis of children than even in that of advanced age. The opening of a superficial large and copiously secreting abscess is a rare indication, for the latter seldom occurs except in the semi-adolescent; and if it does, the prognosis is anyway absolutely fatal. Besides, the dissemination of the tubercular process is so general in the lungs of the young that not more than a slight temporary improvement can be expected of an operation.

Among the localizations of tuberculosis in children that in the *larynx* is not frequent. A complication with emphysema of the neck and face has been reported. According to Heinze, laryngeal tuberculosis is not produced by contact, but through the medium of the blood. But the expectorated masses are undoubtedly a frequent cause of the local infection, which is preceded by hyperæmia with injured or detached epithelium. Besides nodulated inflammatory swellings in the mucous membrane, submucous tissue and glands, sometimes even between the muscles, there are small granulations and ulcerations on the cords, with universal catarrh, œdema, and phlegmonous destruction. The symptoms are those of catarrh and ulceration, and depend on the locality and severity of the lesion. In some cases the diagnosis of pulmonary tuberculosis could not be made in the beginning, and that of the local affection was based on the duration of the ailment, the persistence of the fever, and the steady emaciation. At first the laryngoscopic examination revealed catarrh only, and afterwards ulceration and infiltration. The local treatment is that of the catarrh,—inhalation of warm vapors, steam, turpentine, carbolic acid, ammonium chloride; poultices around the neck; opiates at bedtime. The spray with lactic acid and the application of iodoform have served me less well than a daily spray of a solution of one part of silver nitrate in from two to five hundred parts of distilled water. Stronger solutions are rather harmful. The pain produced by ulcerations located on the epiglottis and arytenoid cartilages is

somewhat relieved by the application (brush or spray) of potassium bromide, morphine, or cocaine, or of an appropriate mixture of two or three of them. Gleitsmann reports cures obtained by lactic acid.

The air around patients suffering from laryngeal phthisis may be moist; but it is a mistake to believe that it must be warm. Cold air is warmed before it enters the larynx and lungs, provided it enters the respiratory tract through the nares. Only when it is admitted through the mouth it remains somewhat cool when reaching the larynx. Thus the nares must be kept as normal as possible, and competent, no matter with what difficulties; nor will open windows interfere with the comfort of the patient, provided draught is avoided. That can easily be accomplished by screens or otherwise.

Ulcerations of the *tongue* and *pharynx* are painful, sometimes to such an extent as to require frequent attention. A well-directed spray, as mentioned above, of one part of silver nitrate in two hundred of distilled water (glass to be of neutral, blue, or black color), administered once a day, will be found serviceable in average cases. When ulcerations are localized a drop of the same solution may be applied with a glass rod. Some are so bad as seriously to interfere with deglutition. I have been obliged to use a cocaine spray before every meal, or a drop of Magendie's solution (very effective!) on the tongue. For the purposes both of cure and of prevention the nose and nasopharynx should be irrigated copiously and frequently with a warm salt solution (6 to 1000).

Tubercular ulcerations of the *intestines* may descend to the rectum; in that case the local symptoms, and mainly the tenesmus, may be alleviated by warm injections containing gum acacia or bismuth, with or without opiates. Food and drink must be warm; bismuth may be given in doses of from two to ten grains every hour or two, so as to form a protection to the sore intestine. Tannin I have not seen do much good. Naphtalin sweeps the whole length of the tract and acts favorably as a disinfectant. I have seen almost immediate improvement after its use. From four to ten grains may be given daily (two to six decigrammes). Now and then the stomach rebels against it; in that case, resorcin, in doses of from one-fourth to one grain (fifteen to sixty milligrammes), in powder or in solution, may be given for the purpose of disinfection from three to eight times daily. Though it be very soluble, it certainly is effective to a certain extent. All of them may be combined with bismuth, or lead, or opium. Hydrargyrum bichloride cannot be relied upon for any effect in the lowest parts of the intestinal tract because of its great solubility, the necessity of great dilution, and its ready absorba-

bility. Salol in several daily doses of from one to five decigrammes (one and a half to eight grains) is palatable and effective.

Fistula in ano is not such a rare occurrence in children as I was led to believe many years ago. No matter whether it is an accidental complication, or the bacilli are conveyed to the parts through the circulation, or the fistula is the result of the presence, in the fæces, of bacilli and of their action on defective epithelium, or the hands of the child or of the nurse convey the infection from the mouth, or the linen, or the floor to the anus, practice has changed entirely during the last decade. The axiom that in a consumptive patient fistula must not be interfered with has given way to a more rational theory and sounder practice. The sooner they are operated upon and treated the better.

Pulmonary hemorrhages are not of such frequent occurrence as in adults, but I have observed them in children of from three to eight years. The prognosis is always serious, and rather bad when hemorrhage is followed by rise of temperature, which means either secondary broncho-pneumonia or disseminated tuberculosis. A single attack of hæmoptysis in a girl of eleven years proved fatal by suffocation. The patient should rest upon the diseased side, to prevent, as much as possible, the aspiration of blood, with or without bacilli, into the healthy part. The application of a lump of ice or an ice-bag over the locality of the hemorrhage acts favorably, either through the direct influence of the cold temperature or the reflex contraction of the bleeding vessels. Subcutaneous injections of the fluid extract of ergot, or ergotin in glycerin and water, are very apt to give rise to induration or abscesses; thus it will be left to the practitioner to decide in an individual case whether that risk may be taken. Its constituents, cornutin and sclerotinic acid, should not be recommended on account of their rapid decomposition and irritating effect. Morphine may be given internally also for the purpose of relieving the patient's symptoms, both objective and subjective. If it cannot be swallowed well, the proper quantity of Magendie's solution, not diluted with water, is readily absorbed through the mucous membrane of the mouth or throat. The internal administration of ergot may be supported by that of mineral acids and digitalis. Of the latter, a single dose of from two to five grains (one to three decigrammes), or its equivalent, acts well. Dilute sulphuric acid is both efficient and palatable; ten or fifteen drops in a tumbler of (sweetened) water will readily be taken to advantage. Fluid extract of hydrastis, from ten to twenty drops frequently repeated, in an emergency, or hydrastin hydrochlorate in doses of one-one-hundred-and-twentieth grain (0.0005), or stypticin in repeated doses of one-

thirtieth grain or more (0.002) is an effective remedy. Lead acetate, in doses of from one-sixth to one-half of a grain, every hour or two, according to age and the severity of the case, is preferable to tannin; it can be given with morphine or digitalis, or both. The patient requires absolute rest and encouragement, and must be induced to make long, forcible inhalations, and told to suppress the cough as much as possible. To relieve it opiates may be required. For the purpose of stopping hemorrhages the inhalation of the sesquichloride of iron (1 to 100) has been recommended. As it was not expected to enter the bronchial tubes, its effect was presumed to be by reflex action. I have tried it a number of times, like many others, but cannot recommend it. Ligature of the extremities tight enough to constrict the veins, but not the arteries, is sometimes quite effective, but should not be continued longer than half an hour at a time. Among the best hæmostyptics are calcium chloride, several grains every few hours in emergencies, eight or twelve grains daily for a long time as a preventive; the dry extract of suprarenal capsule, from three to five grains every few hours in an urgent case; a sterilized solution (two per cent.) of gelatin in salt water (6 to 1000), of which several ounces (from fifty to one hundred cubic centimetres) may be injected under the skin. But extensive lesions of a large blood-vessel cannot be expected to be greatly influenced by any of these remedies. Absolute rest (opiates) will contribute to the spontaneous coagulation of extravasating blood and the relief of the hemorrhage.

Night-sweats, the result of toxins, are not uncommon in the tubercular phthisis of children from five to twelve years of age. They are favorably influenced by the same remedies which are apt to relieve the adult; such are sponging with vinegar and water, or alum in vinegar and water. A powder of salicylic acid three parts, zinc oxide ten, and amylum ninety, or salicylic acid three, amylum ten to twenty, and talcum eighty to ninety, dusted over the perspiring surface from a powder-blower, is quite beneficial and soothing. For internal administration dilute sulphuric acid, ten or fifteen drops in a tumblerful of water, taken gradually, is found enjoyable by a great many. A single dose of atropine sulphate, from one-half or one-quarter of a milligramme (one-one-hundred-and-twentieth or one-two-hundred-and-fiftieth grain) at bedtime, or agaric acid (from four to ten milligrammes), or duboisine (from one-half to one milligramme), or camphoric acid in doses of from five to ten centigrammes will bring relief. When there is an indication for opium, it may be combined with any of them. When the digestion is good, a fair dose of quinine (from three to six grains), with or without extr. ergot.

(the same dose), or extr. ergot. fluid. (from one scruple to half a drachm), deserves a trial when for some reason or other the above remedies are discarded.

2. *Syphilis.*

The nutrition of an infant suffering from hereditary syphilis is attended by great difficulties. Many of the mothers who contracted syphilis either before conception or during gestation are anæmic in addition to their constitutional ailment; thus their milk is certain to be incompetent. The former class is very numerous, although women syphilitic before conception are apt to miscarry and have no living children. The latter class (those who contracted syphilis during their pregnancy) is not quite so large, fortunately; but still the question will come up now and then whether the baby of a woman who acquired syphilis in the course of her pregnancy should be nursed by her or not. The theoretical answer to this question has been this: that the baby may be permitted to nurse if it have been infected already, but must not be put to the breast if still healthy. That answer is no answer; for in most cases of syphilis thus acquired, and even in the majority of hereditary syphilis (derived mostly from the father, syphilitic before conception), the first symptoms of the disease in the infant are visible after some, or many, weeks only. Thus, nobody knows whether the newly-born is infected or not. If such a baby be puny, feeble, and in poor general health, nobody would have the courage to deprive it of its mother's milk. Artificial feeding, as frequently carried on, would be a death-warrant. That is why such a baby ought to be nursed by its mother, and, if exceptions be permissible in favor of the puny, and the puny be expected to thrive on its mother's milk, the vigorous baby's chance will be the better. Therefore I certainly advocate the baby's nursing at the breast of the mother who acquired syphilis during pregnancy, no matter whether or not the symptoms of the disease be visible in the baby. Meanwhile, both mother and baby must be subjected to a thorough and prolonged antisyphilitic treatment.

The same baby must not be put to the breast of a healthy wet-nurse, no matter whether or not symptoms have made their appearance in the baby, or whether or not the baby has been subjected to an antisyphilitic treatment. For the nurse must not be exposed under any circumstances, without at least having been made fully aware of the risk she is running.

The mother of a baby infected with hereditary syphilis (by the father) is herself either syphilitic or not. If the latter, she is immune as regards her infant,—that is, she will not be infected by her nursing

syphilitic infant. In both cases she must and may nurse. For if syphilitic herself, she will not render the case of her infant more serious; if not, she cannot transmit a disease she has not herself.* In neither case can she be infected by the diseased infant. For safety's sake, however, both mother and child must be treated.

As said before, no baby, either hereditarily syphilitic or suspected of hereditary syphilis, must be put to the breast of a healthy wet-nurse. Syphilis contracted through the infection of the nipple is liable to be as destructive as that which attacks physicians through their fingers. Such a wet-nurse must be forbidden to nurse altogether, or permitted only with a full knowledge of the circumstances, and directed, if she accept a place after all, to nurse through an artificial nipple. Meanwhile, the syphilitic or suspected baby must undergo an antisyphilitic treatment. If he be only suspected, but for good reasons, the treatment should not be postponed until positive symptoms may have made their appearance. For mercurial treatment is a less grave interference in the young than in the old, and nothing can be more reprehensible than the opportunity given to constitutional syphilis to obtain full sway.

From what has been said of the many contraindications to the infant being brought up at the breast, it follows that artificial feeding must often be resorted to. This circumstance impairs the prognosis considerably, and claims the best knowledge and soundest judgment of the well-informed practitioner. Improved methods of artificial feeding, however, improve the prognosis.

The prevention of hereditary syphilis is based in part on that of syphilis in general. Public hygiene is not benefited, as they try to do in New York, under the guidance of a combination of ignorance and hypocrisy, by disseminating venereal diseases throughout the whole city; but by wise superintendence and control of the "social evil." A syphilitic person must not marry. When a man has contracted syphilis he ought to be treated methodically two years, and three years ought to elapse after the last symptoms of syphilis were noticed before he marries. During pregnancy, when there is a suspicion, both man and woman ought to be treated.

Preventive treatment is required both on the paternal and mater-

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* "Colles's law." There is also "Profeta's law," according to which children born in good health of syphilitic parents are immune against syphilis. There are cases, however, in which children of syphilitic parents acquired syphilis afterwards, and others of persons who, while carrying the traces of hereditary, acquired a new syphilis.

nal side. Syphilitic endometritis leads mostly to miscarriage; when the embryo and fœtus survive, the newly-born exhibits syphilis at once. Women infected during pregnancy may, or may not, infect their offspring, according to the time of their own primary and secondary symptoms. It is impossible to be sure. In all of these cases, and mainly also in those of women, not themselves syphilitic, who have been impregnated by syphilitic men, a thorough and protracted antisyphilitic treatment is required. Both mercury and iodides reach the fœtus through the maternal circulation. For practical reasons, for women with habitual abortion, in whom the diagnosis cannot positively be made, I advise and practise mercurial treatment. It has given me better successes, even in those cases in which thirty or forty years ago, according to Simpson, I gave alkaline (potassic chlorate) treatment. Most cases of hereditary syphilis, however, are derived from the father. It is he who must undergo a strict and effective treatment for the purpose of extinguishing the calamitous malady.

The medicinal treatment of hereditary syphilis requires the several preparations of mercury, in many cases iodides also. Mercurial preparations are well borne by infants and children. Stomatitis and gingivitis are very exceptional occurrences. The indications, modes of administration, and doses of the remedies depend, to a great extent, on the locality or organ affected, whether skin, mucous membrane, subcutaneous tissue, lymphatic glands, muscles, bones, the viscera of the thoracic or abdominal cavities, the nervous system, or the sensory organs; and on the time at which the first symptoms become perceptible. In the majority of cases this takes place between the fifth and eighth weeks of life. Then the nose, lips, and anus exhibit rhagades; these fissures are apt to be quite painful; the skin is covered with roseola, the palm of the hand and sole of the foot with efflorescences; the complexion becomes sallow without being uniformly so at all times, for changes and a certain degree of intermission are observed. After a while maculous, squamous, and papulous eruptions make their appearance, pustules and vesicles spring up and terminate in ulcerations, gummata appear in the skin. This form permits of a fair prognosis, particularly in the cases of infants reared at the breast. The treatment can be carried out slowly and systematically. It consists in the internal administration of calomel; doses of from one-twentieth to one-sixth of a grain can safely be given three times a day for months in succession. If in any case diarrhœa set in, and no fault be found in the food administered or in the condition of the digestive organs, which may have been impaired by other

causes, from a twentieth to a twelfth of a grain (three to five milligrammes) of Dover's powder may be added to each dose.

Other preparations which have been recommended are the bichloride and the cyanide in doses of from one-thousandth to three-hundredth of a grain several times daily. The green iodide of hydrargyrum is not so well tolerated as calomel, and the oxidulated tannate of mercury, recommended by Lustgarten, does not seem to offer any advantages. As these pages, however, are being written for practical guidance, and not for the elaboration of the history of therapeutics of infant syphilis, I can but advise the use of calomel as effective and sufficient. The use of the blue ointment has been eulogized under the impression that the internal administration of the drug might lead to digestive disorders. As inunctions made in the usual way were found to irritate the skin (oleates are objectionable for that reason alone), it was recommended to apply it to a sheet of soft leather surrounding the knee, and to secure its slow absorption by the spontaneous movements of the baby's extremities. Thus the treatment is left to a great extent to the patient, and the actual dose cannot, to say the least, be determined upon or even estimated. Widerhofer modifies inunctions by applying a mercurial plaster of the size of the hand, which he changes once a week, to the intrascapular region, and praises his results. When the skin is badly affected, from one to two grammes (fifteen to thirty grains) of mercuric bichloride may be added to the daily bath of the infant. This external treatment may be continued for weeks.

A similar treatment is required in those cases in which an infant or child (in the latter in larger doses) has acquired syphilis in one of the many ways in which the disease can be contracted. The ritualistic sucking out of the circumcised prepuce has given rise to syphilis as it has produced tuberculosis; syphilitic nipples of a mother or nurse, vaccination, kissing, the brushing of the throat with infected instruments, in older children sexual contact, are much too frequently causes of syphilis. This acquired syphilis of infancy and childhood is apt to run a swifter and more deleterious course than the same disease in most adults. Therefore it may become necessary to add to the above treatment such methods as have proved most effective and speedy in urgent cases of hereditary syphilis also.

These urgent cases run a different course from those briefly sketched above. In many of them the diagnosis of hereditary syphilis can be made immediately after birth. General pemphigus of the surface of the newly-born is not a symptom of syphilis, but localized pemphigus of the palms of the hands and the soles of the feet is. It

is seldom the only symptom, though it often requires close observation not to overlook the affections of the internal viscera and the bones. The latter are often the seat of syphilitic disintegration; in the costo-cartilaginous junctures Wegner studied the changes caused by syphilis, which resemble very much those of early rhachitis. Liver, spleen, pancreas, and lungs exhibit two different changes, either gummata or interstitial proliferations of the connective tissue. In the liver these are mainly met with along the blood-vessels and bile-ducts, and are capable of producing jaundice and even total and permanent obstruction of the ducts in the fœtus or the newly-born. An early tumefaction of the spleen was the first prominent symptom in one of my cases. Twice I have seen both testicles the seat of syphilitic tumors in the newly-born. The blood-vessels suffer at an early period. Syphilitic arteritis, first described by Heubner, gives rise to congestions and hemorrhages (petechiæ and purpura) on the skin and serous membranes, in the intestines and kidneys, in the cranium, and in the thymus gland; and many early brain symptoms and sudden deaths of the newly-born are due to intracranial hemorrhages, œdema, and softening from the same causes. Nor have the sensory organs of the newly-born any immunity. C. S. Bull has met with iritis and choroiditis.

These are the cases in which the systematic calomel treatment is insufficient. In them it is of the utmost importance to get the system immediately under the influence of mercury. With or without the internal treatment, subcutaneous injections of mercury must be made at once. The subcutaneous injections of calomel, which I, like many others, have tried in the adult, have given me, contrary to many assertions of their sponsors, so much trouble in the shape of abscesses or indurations that I cannot bring myself to recommend them in the newly-born, with its spare connective tissue. But a solution of from one to two grains of hydrargyrum bichloride in an ounce of distilled water (1 to 240) is quite innocuous. It can safely be injected once or twice daily, in doses of from one-hundredth to one-fiftieth of a grain (one to two milligrammes). That treatment I have followed in many an urgent case more than thirty years, and can safely recommend it. No reliance should be placed on mercury given to the mother or nurse, for its elimination through breast-milk is an uncertain process and an unknown quantity.

When the bones and glands suffer at an early period, the mercurial treatment ought to be combined with the administration of the iodides. Potassium iodide may be given to the infant in doses of from five to ten grains (three to six decigrammes) daily. Under all circum-

stances, the treatment must be persisted in for many months after the disappearance of the very last symptoms. In spite of that the constitutional disorder may break out again, either in its original form or as an osteitis only, leading either to caries or to sclerosis; or as a cerebral or spinal affection. That is why, when the symptoms have disappeared, recovery should not be taken for granted. After it seems to have been accomplished, the patient may be let alone for a month or two. Then the treatment ought to be resumed for the same reason that makes renewed treatment obligatory for adults; he should not be considered safe until years have elapsed without a symptom. Syphilitic arteritis, meningeal exudation, or gummatous tumor may lead to ptosis, nystagmus, facial paralysis, hemiplegia, hemichorea, or idiotism, to myelosclerosis or transverse myelitis. A syphilitic inflammation of the labyrinth with Ménière's symptoms has been observed in a girl of five years by Knapp, and interstitial keratitis, also retinitis, appears to result from syphilis quite often. A painless otitis media was noticed by Fournier. In all such cases the energetic treatment with mercury and iodides combined must be resumed and continued for an indefinite period. But it has often appeared to me that syphilis will do more than produce these unmistakable symptoms. There are many cases of "scrofula," chronic lymphadenitis, and rhachitis which—with no other causes to account for them—appear to point to previous syphilis not completely extinguished. In a number of my own cases I have personal knowledge of such a history. Such cases not only explain the fact that many old authors recommended mercury in "scrofula" and "rhachitis," but also that there are some in which that treatment is indispensable. Only lately I had to deal with chronic cervical adenitis, mainly of the left side, and pulmonary infiltration of the left upper lobe, in a baby of two years. They resisted the usual treatment for more than a year before the suspicion of their syphilitic nature was roused and the history of the disease elicited. Six weeks of a mercurial and iodide treatment have worked a miraculous change in the local and general condition. Besides, there are children of five or more years that, without a possibility of arriving at a local diagnosis, remain puny, underweight, undersized and anæmic, spiritless and feeble. This constitutional incompetency is sometimes one of the results of parasyphilis (Fournier); neither arsenic, iron, nor oxygen will do good in many of them. A protracted antisyphilitic treatment will fatten and strengthen them.

More than a conscientious and persistent antisyphilitic treatment is rarely required. Exceptions may be cardiac lesions; syphilitic myo-,

peri-, or endocarditis, or several of these forms combined, may require, occasionally, digitalis or very feeble doses of an opiate; brain and cord lesions bromides or chloral; and fevers an occasional antifebrile, for a brief period. Fever may be very puzzling, though it is more frequent in acquired than in hereditary syphilis. In the former it is quite frequent,—in from twenty to thirty-three per cent. of the cases, in the eruptive stage, rarely before the fortieth day. It should be suspected in both forms of syphilis because, though it was mentioned as early as 1514 by de Vigo, and very often since, it is often not looked for.

3. *Intermittent Fever.*

In older children the type is the same as in adults. We have acute and chronic forms, the quotidian, tertian, and quartan types. There are the same results and anatomical lesions. There are the general anæmia,—in infants and children most rapid and detrimental,—the splenic tumor, the hemorrhages, and the amyloid degeneration.

It is only in newly-born infants and very young children that the diagnosis becomes difficult. In them the type is mostly quotidian. Besides, the attack may come at irregular times. Not infrequently it is seen in connection with catarrhal diseases, which appear to create a susceptibility to the poison. The chills are not easily diagnosticated. Perspiration is very frequently not profuse. The tumor of the spleen can be recognized by palpation at a late period only, but the temperature is apt to be very high. Sometimes the attack is not recognized because of the first symptom being a convulsion. Masked cases are not uncommon; intermittent pneumonia, neuralgia, even paralysis have been noted. Dr. L. Emmett Holt observed intermittent torticollis and bronchial asthma, but the peribronchial lymph-bodies have never been found to contain plasmodia,—a proof, it appears, that malaria is not inhaled (or possibly that the endothelial layers of the alveoli, which are believed to pass tubercle bacilli, refuse access to protozoa). Attacks of vomiting, also diarrhœa, have been noticed. For all these reasons the diagnosis is often not made. On the other hand, the diagnosis of malaria is made improperly in too many instances. In every doubtful case the blood should be examined for plasmodia. The subsequent severe anæmia, as blood-cells are rapidly destroyed, is liable to be very obstinate. Among the sequelæ glomerulo-nephritis, also the hemorrhagic form, is not uncommon. Immunity there is, but it cannot be produced. As preventive measures, the drinking-water should be boiled; nursing mothers should

be cured quickly, for their milk may transmit the fever; malarial regions should be avoided; the child should sleep under mosquito netting.

Quinine ought to be given, if the attacks come at regular intervals, in a single dose, three or four hours before the attack. That is the time when the plasmodia are small and movable. If the attacks occur at irregular periods, it is better to divide the total amount of quinine in three or four doses, to be given through the day. In the first case a dose of five grains (three decigrammes) will suffice for a child of three years; in the second case eight or ten grains (five decigrammes) will be required. If possible, quinine should not be given during the high temperature. When this lasts long, with dangerous symptoms, it should be modified by a few doses of phenacetin or antipyrin,—never acetanilid.

It is not always easy to give quinine because of the taste. A solution ought not to be tried for the same reason. One part of quinine sulphate may be given with forty parts of elixir simplex, but in every case the dose must be mixed just before it is taken. Euquinine is almost tasteless; its doses are like those of quinine. The neutral quinine tannate is tasteless, and may be given as a powder; but for one part of the sulphate two and a half of the neutral tannate should be administered. The sulphate may be given mixed in chocolate —older children will take it greedily—or in coffee or syrup of coffee. When it cannot be given internally, rectal injections may take the place of the internal administration. No acid must be added to the solution; therefore very soluble preparations only must be used,—for instance, the bromide, the muriate, the bisulphate, the carbamide (bimuriate with urea); or suppositories may be given, but with less positive effect than that of other modes of administration. Inunction of quinine has been recommended a great many times. The ointments made, as usual, with animal fats have very little effect. When it is impossible to use any other method, quinine may be dissolved and mixed with fat and a larger quantity of lanolin; but even in this case the dose which really penetrates the skin and enters the circulation cannot be determined. A subcutaneous administration of quinine becomes necessary when no other can be resorted to or when an immediate effect is required. The best preparation for the purpose is the carbamide, which will dissolve in from four to six parts of warm water, and give rise to less induration than we are liable to meet with when using the other salts. When recovery appears to be established, it is advisable to give a weekly dose of the drug for some time.

In the chronic form arsenic, with occasional doses of quinine, is the principal remedy, as in the cases of adults. A child of three years may commence with one drop of liquor potassii arsenitis (Fowler) three times a day, to be administered as detailed in a former chapter. The liquor sodii arsenatis of the Pharmacopœia may take its place in those cases in which the stomach is very irritable; also the preparation of the same name introduced by Pearson, which is ten times milder than the official preparation, and must be given in proportionate doses. If the solutions of arsenic be not well tolerated, arsenous acid may be given instead. It may be administered in the shape of pills in doses of from one-hundred-and-fiftieth to one-hundredth of a grain, three times a day, or more, to children of three years, or it may be administered as a powder in combination with other medicines. It may safely be mixed with bismuth, for the disagreeable odor emanating from persons taking bismuth, which has been attributed to arsenic contained in it, really belongs to a minute dose of tellurium inseparable from some specimens of bismuth in the market. All these preparations of arsenic may and should be given for many weeks or months. Constitutional symptoms belonging to an overdose I have seen more frequently when using Fowler's solution than any of the other preparations; but, after all, they are rare.

Tincture of eucalyptus has been given in acute, and particularly in chronic, cases. It renders good service now and then in doses of from ten to twenty-five drops, three or more times a day. Methylene-blue is unreliable.

As there are very obstinate cases in the adult, so there are in children. In them, too, the spleen may remain large and the attacks return indefinitely. These are the cases which try the endurance of the patient and the patience of the physician. In them I have seen excellent results from the use of ergot these more than forty years. Ergot may be given as fluid extract, and a child of three years may take from a scruple to a drachm (four cubic centimetres) every day for weeks in succession, or a corresponding quantity of the extract of ergot,—that is, from three to ten grains (two to six decigrammes) every day, either in mixtures or, for older children, in pills. I have noticed in a good many cases in which the fluid extract was not borne at all, that the extract of ergot, when given in the latter shape, was easily tolerated. In many cases the combination of ergot with quinine or (and) arsenic is advisable.

Subsequent anæmia demands the syrup of iodide of iron and other medicinal and hygienic treatment. Polyneuritis has been observed

after malaria. It may be due to malaria toxins (proven to exist) or to those which are produced by the destruction of numerous erythrocytes.

4. *Typhoid Fever.*

Though occurring in the first few weeks of life, it is rare in the first year, not uncommon after the second. Most cases are met with between the sixth and the twelfth years.

Its danger may come from many causes: from previous ill health and anæmia, which may depend on a feeble constitution, hereditary syphilis, chronic ailments of the organs of digestion, of respiration, and of circulation; from the intensity of the invasion, which is sometimes manifested by a high initiating temperature and early septic symptoms; from an unusually high temperature; from insufficient power or actual failure of the heart; from diarrhœa, intestinal hemorrhages, perforations, and local or general peritonitis; from complications such as meningitis and nephritis; and, finally, from consecutive diseases.

The uncertain symptoms of the first days render the diagnosis difficult. Sometimes it is made by exclusion only. If a characteristic curve of the typhoid fever, the tongue of infectious fevers, diarrhœa, tympanites, large spleen, roseola (appearing between the sixth and the eleventh days), and a positive diazo and Widal test are present, it is not doubtful. It may be difficult to detect a pneumonia even after days, but after a while local symptoms will permit a differentiation. Trichinosis has been mistaken for it (Osler in *Am. Jour. Med. Sci.*, 1899, No. 3); its pain, œdema, muscular swelling, leucocytosis up to 17,000, and large percentage of eosinophile cells (from forty-eight to sixty-eight) should secure a diagnosis. Miliary tuberculosis may be mistaken for a severe case of typhoid fever, but when it is localized in the cerebral meninges, the slow and irregular pulse, vomiting, constipation, and diminished action of the kidneys secure the diagnosis of tubercular meningitis. There are, however, cases in which the general symptoms do not seem to agree with the elevation of the temperature and other symptoms. I know of no other serious and protracted disease in which the patients so often declare themselves to be well in spite of marked objective symptoms to the contrary. Widal's test and the diazo reaction, though not always positive, and found in other diseases also, and mostly available in the second week only, are suggestive of the presence of typhoid fever. The demonstration of the bacillus, if well distinguished from bacterium coli commune, is proof positive, but it is not yet feasible in general practice.

Preventive treatment has led to very good results. Many houses and towns which were the seats of endemic typhoid fever have been rendered immune by improving the sewerage and the general condition of the neighborhood. For typhoid fever (the bacilli being long-lived) and dysentery can be traced positively to exhalations of privies and sewers, while with regard to other diseases we can only say that animal exhalations from the same sources may create a predisposition by impairing the general health, but are not able to produce specific diseases independently of other influences.* When the drinking-water is suspected, it ought to be boiled. No raw milk should be given. The fæces of the patient must be disinfected, though there be no diarrhœa, by crude muriatic acid, or a five-per-cent. solution of carbolic acid, or by copperas. The thermometer with which rectal temperatures are taken should be disinfected after every application. The sick should be isolated when they suffer from typhoid diarrhœa, and the practice, still prevalent in hospitals, of placing many typhoid patients in general wards should be abolished. The nurse attending a typhoid case should disinfect her hands immediately before turning to another patient.

Can typhoid fever be *aborted?* or, in other words, can its first stage be interrupted? An affirmative answer to this question has often been given, but it is difficult to prove the correctness of the diagnosis in an alleged case of typhoid fever that lasted a few days only. While with our present knowledge we cannot believe that the proliferation of the toxin floating in the blood may be interrupted by antifermentative treatment, it is certainly either justifiable or advisable to try the effect of otherwise not injurious antifermentatives, such, perhaps, as creosote or hydrochloric acid, if it be only for their effect on the intestinal tract. As regards the early administration of a large dose of calomel, its effect is notoriously good, no matter whether it acts as a disinfectant directly on the bacilli or whether it simply relieves the intestinal tract of the poison introduced and in multiple proliferation. A child of three years may take a dose of three or four grains (two or three decigrammes); a child of eight years one of seven or eight grains. While the purgative effect of the calomel can be obtained by simply introducing the powder into the mouth, there to be absorbed, it is better in this case to let it be swallowed. It can safely be given during all of the first week

* A. Jacobi, The Production of Diseases by Sewer Air, Transactions of the Congress of American Physicians and Surgeons, 1894, and N. Y. Med. Journ., 1894.

of the disease. When, as frequently, there is constipation during the course of the disease, calomel is no less beneficial, but then it should be given in smaller doses; not enough to cause diarrhœa. During the diarrhœa of the second or third week it should not be given.

With regard to the *general treatment* of the typhoid fever of children, we are equally liable to injure either by overactivity or by neglect. The so-called *expectant* treatment has its great dangers when persevered in by those who make it their invariable rule; it is safe in the hands of those only who have learned to treat the sick rather than the sickness. The air in the sick-room should be cool, the windows open. Draughts, it is true, should be avoided, but screens around the bed will permit the opening of both windows and doors. The bed-sheets must be smooth; four or eight safety-pins will fasten them to the corners and sides of the mattress. At an early period the whole surface ought to be washed often either with water or with alcohol and water. The hair, when long, ought to be cut. The children should be allowed plenty of water. Those who are liable to have dry lips and tongue must be made to drink a small quantity of either water or dilute muriatic acid in water, ten minims to the tumblerful, every ten or twenty minutes. Fissures around the lips or in the tongue ought to be washed with a saturated solution of boracic acid, or, when bleeding, should be painted once a day with a mild solution of silver nitrate (not more than one per cent.), the lips also with an ointment consisting of boracic acid and lanolin.

Very much depends on the mode of *feeding*. No solid food must be given. Boiled milk, milk on the Rudisch plan, broths, farinaceous decoctions, strained. For older children, one or two soft-boiled eggs daily, diluted in broth, either the whole of them or the white only; meat-juice, albumoses. As a general thing, more albuminoids than carbohydrates ought to be given. The food should be such as will be digested in the stomach and small intestines, and not encumber the colon. If necessary, a small quantity of pepsin and muriatic acid may be given with it. Peptones may be given, but they must not form anything like the exclusive diet. I allow no solid food until ten days have elapsed after apyrexia sets in.

The tendency to complications with *bronchitis* requires frequent changes in the position of the patients. They ought to be turned from their backs to their sides every few hours, and back after a while; otherwise they ought not to be moved too much. Particular care ought to be taken not to raise them too often. Physical and mental rest is an absolute necessity. Pleuritis is an ominous compli-

cation and should be looked for early. Defecation must take place in the recumbent posture. They must not be permitted to strain. Some tepid antifermentative injections into the bowels should be made daily (thymol 1 to 3000).

The danger arising from *high temperatures* varies in different patients. Their injurious influences depend, from a clinical point of view, on many causes, foremost among which are both individual susceptibility and the length of time during which the child is exposed to its internal heat. A high temperature lasting but a certain time, and alternating with either an intermission or a remission (as, for instance, intermittent or relapsing fevers), may not prove dangerous at all, and may not require any treatment; but the frequent repetition of elevated temperatures, or their long duration, demands interference. Therefore they ought to be measured at least four times a day, particularly as typhoid fever is apt to yield two daily exacerbations and remissions.

Continued high temperatures in the course of typhoid fever or intense fever at the very beginning of the disease require treatment. In them the frequency and quality of the pulse, which in the average case is relatively slow, and the functions of the nervous system are seriously disturbed at an early period. Under the influence of a short cold bath both temperature and heart-beats diminish, arterial pressure increases, and the intellect becomes clear; it has a peculiarly favorable influence on the infant and child. In them the surface is relatively larger than in adults, and the cooling by radiation is more rapid and intense. Sometimes the circulation is disturbed and the surface temperature not readily restored afterwards. It may happen that the internal temperature rises while the external blood-vessels are contracted by cold, and the internal organs become engorged. In these cases a hot bath is more liable to restore radiation from the skin and reduce internal heat. Whenever no immediate reaction takes place—mainly about the extremities—after the child has been taken from the cold bath, this must not be repeated, and the feet kept thoroughly warm. In such cases a warm bath is infinitely milder and more useful; or when the temperature is high and threatening, a cold pack—as detailed in a former chapter—around the trunk is preferable. At the same time the feet must be kept warm and a stimulant given. Cold applications to the heart are frequently sufficient to reduce the temperature. In such cases as develop sopor at an early period, together with high temperatures, the pouring of tepid or cool water over the head, or head and shoulders, is very beneficial. The contraindications to the use of the cold bath are general debility, weakness of the heart, cold

extremities, a cold surface complicated with high internal temperature, and intestinal hemorrhage.

The medicinal agents used to reduce temperatures in typhoid fever are sodium salicylate, antipyrin, phenacetin, and quinine. All of the medicines mentioned above must be given carefully. To avoid a possible debilitating effect on the heart, a general or cardiac stimulant should be given at the same time. All of them may be given in small doses, and frequently repeated, when the remission is not marked; but, as a rule, an occasional larger dose is preferable. Antipyrin can be administered internally, through the rectum, or, if urgently demanded, subcutaneously. A child of three years may take from five to ten grains (one-third to two-thirds of a gramme) a day, in from two to four doses, two of which have often to be given in close proximity (the second after an hour or two hours). Phenacetin may be given in doses of from one to three grains (five to twenty centigrammes), twice or three times a day, to a child of the same age. The administration of quinine follows, as a rule, the method detailed above, but in typhoid fever it is liable to disorder the stomach and intestine and produce diarrhœa or tenesmus. Its time is the remission, its single dose from five to seven grains (half a gramme or less), once a day or every other day, and its best indication the persistence of the splenic enlargement in the course of the third week of the disease. The combination of quinine with one of the other antifebriles yields good results quite often when one of them does not appear to be sufficient, in the same way that the effect of a tepid bath combined with an antifebrile is now and then quite astonishing. Euquinine may take the place of quinine.

The intestinal tract is the seat of many dangers. *Tympanites* and *meteorismus* depend on the paralytic condition resulting from enteritis only, or from enteritis and peritonitis. The latter is either local, and corresponds with the local ulcerations, or general. Cold applications are serviceable. Enemata of ice-water will sometimes do good; or of an aromatic infusion (chamomile, anise, fennel, catnip); sometimes of turpentine, half a teaspoonful or a tablespoonful mixed with the fluid (water or soap and water). The introduction of a large catheter with one or more additional eyes may relieve the lowest part of the intestine of gas. Puncture of the inflated intestine by means of a small syringe ("hypodermic") is not dangerous in cases in which it is not required. Where it would be of service, however,—that is, in the very worst forms of intestinal paralysis, with intense and dangerous inflation,—it is injurious; for in these cases the elasticity of the intestinal wall is gone and the small punctures remain open.

I have seen fæces entering the abdominal cavity through them, and fatal peritonitis, of my own making.

Diarrhœa, when moderate, need not be interfered with at any period of the disease. It is probable that the initial dose of calomel prevents it in a great many cases. When it is copious, such remedies as pass through the whole length of the intestine will render good service either by their soothing or disinfectant effect. Bismuth subgallate or subcarbonate, from a scruple to a drachm daily (one to four grammes), is valuable. Bismuth salicylate does not always act kindly in the stomach. Naphtalin, from half a grain to a grain (three to six centigrammes) every two hours, when tolerated by the stomach,—in most cases it is,—improves the odor of the evacuations and diminishes their number. In many cases I have given it for its disinfectant action from the very beginning of the fever. Salol, in doses of from one to three grains every two hours, has a similar effect. Mild doses of opium may be added, from half a minim to a minim of the tincture, every two or four hours. Resorcin is better tolerated than either, but it does not pass the whole tract. Cold applications, covered with rubber cloth and (or) flannel, must be changed every twenty or thirty minutes. Warm applications may take their place when the little patients are quite feeble and anæmic. Among the astringents, when required, I prefer lead acetate in small doses of five or more milligrammes each. Both tannin (gallic acid is milder) and alum are liable to annoy the stomach.

Constipation is much more frequent in our cases of typhoid fever in both the young and old than in the descriptions of the books, both European and copied. When not too persistent it may not prove dangerous; for most children have not suffered from constipation before the disease began, and accumulation of fæces is not a very prominent feature in them. When there is peritonitis it must not be wantonly disturbed. In no case should strong purgatives be given. Castor oil in small doses may become necessary; half a teaspoonful or a teaspoonful every few hours may then be given, or small repeated doses of calomel, from a quarter to one-half of a grain. Rectal injections of tepid water, with six per mille salt, with, or mostly without, turpentine or thymol, will be all that is required in most cases. But it is a good rule—a very good rule—to enforce by enemata a daily movement, or even several when the evacuations are fetid. In diarrhœa they will disinfect, in constipation they will relieve. It should be remembered that the condition of the fæces need not correspond with that of the intestines. There may be constipation while there is ulceration, and ulceration without symptoms, so

that even perforation may take place without previous diarrhœa. On the other hand, there are cases of typhoid without intestinal lesions (Hodenpyl, Opie and Bassett), or these are very slight or very few in number, perhaps in the appendix only, or there are mere infiltrations of the solitary glands and Peyer's plaques.

Peritonitis requires absolute rest, opium in large doses, internally or subcutaneously, together with stimulants (caffeine, alcohol, musk), cool or cold (warm in very bad, apparently moribund, very anæmic cases) applications to the abdomen, hot ones to the feet. Perforations may be met with the same treatment, but the results of laparotomy when performed within a few hours after perforation have proved encouraging.

Hemorrhages are not so frequent in the typhoid fevers of the very young as in those of adults, because of the mostly superficial character of the ulcerations. But in older children the intestinal lesions are apt to be as grave as in more advanced periods of life. No food should be given for some time, drink in small quantities only, but repeatedly. Applications of iced cloths, an ice-bag, or a lump of ice—to lose no time—to the right hypochondrium. They may be moderately heavy, for compression may have a local influence. Hot injections into the rectum have no styptic effect; iced ones may act through reflex. Internally, alum or lead, one-quarter or one-half grain (fifteen or thirty milligrammes) or more, every hour or two hours, with opium and digitalis. Ergotin, or fluid extract of ergot, and other preparations of the drug which were asserted to be innocuous, I have seen to give rise, frequently, to indurations or abscesses after their subcutaneous administration. Their effect is mostly questionable. I have seen gangrene over a large surface after their use, and pyæmia several times. In the case of a little girl I had to incise about sixty metastases in the course of two months before she was saved from a pyæmia which resulted from a single hypodermic injection. The internal administration of ergot may be tried when the condition of the stomach permits it. To combat the imminent fatal termination I have been compelled to perform transfusion of blood in the case of an adult; she recovered, but died of a relapse on the fiftieth day. Injections of large quantities of sterilized salt water into the subcutaneous tissue (6 to 1000) yield most surprising and life-saving effects in urgent cases of utter exhaustion.

The condition of the *heart* cannot but influence the course of the disease, its complications and consecutive disorders. It cannot help being enfeebled by a serious and protracted disease such as typhoid

fever; still, how far this feebleness will extend cannot be predicted. Besides, it depends to a great extent on causes not exactly connected with the infection itself. Among these accessory causes are original —congenital—debility and chronic heart diseases previously contracted. Moreover, the infection itself with its accompanying fever is apt to give rise to an acute myocarditis or to granular degeneration of the heart muscle. Among the symptoms of debility of the heart, which may easily lead to complete *heart-failure,* are pallor of the skin and of the mucous membranes, purplish and cyanotic hue, particularly of the lips, ears, and finger-ends, mottled appearance of the surface depending on venous stagnation in the small blood-vessels, cold extremities and nose, slow or, more commonly, frequent pulse, which, moreover, is arrhythmic, and a heart-beat the sounds of which are either split or embryocardiac,—that is, exhibiting equal intervals between the first and second sounds. In other cases the danger is indicated by the close proximity of the second sound to the first to such a degree that the former is scarcely audible.

The *brain symptoms* belonging to heart-failure are those of anæmia. When beginning to treat them, we should not forget the possibility of an error in the diagnosis of the condition, which may be quite serious, because the signs of anæmia and hyperæmia are in many respects the same. However, the general indications for the treatment of heart-failure may be laid down in a few rules, the first of which refers to prevention. As heart feebleness must be expected in every protracted disease, and failure feared in many, we ought to act, as a matter of prevention, exactly as the surgeon does in his operations. Before the times of antisepsis and asepsis there were performed a great many operations that did not lead to sepsis or erysipelas. Indeed, these mishaps were the minority, perhaps a small one at that. But they did occur, and that is why no surgeon would at present perform any operation, either serious or trifling, without measures to secure asepsis. If he neglected them, he would justly be held responsible for any mishap in the shape of erysipelas or pyæmia. Now, the certainty of cardiac debility and the danger of heart-failure are much more threatening in an infectious fever than in those complications of convalescence after an operation. Therefore in no case of typhoid fever ought the heart to be left to fight its own battle unaided, with the chances of being overexerted (with possible dilatation from that cause), fatigued, or exhausted. The doses of cardiac stimulants cannot be stated categorically, but the principle must be established that it is a good rule to give moderate amounts of digitalis, strophanthus, convallaria, sparteine, caffeine,

or an alcoholic beverage. The particulars have been stated in former chapters and must be left to the judgment of the practitioner. Digitalis and strophanthus may derange the stomach after a while; digitalis may not act quickly enough under certain circumstances; in such a case sparteine sulphate, which is readily dissolved, absorbed, and eliminated, in doses of one-half of a grain or more (0.03 or 0.05) every two or three hours, may be given for some time. Caffeine must not be given when there is hyperæmia of the brain. Caffeine sodio-benzoate and sodio-salicylate dissolve readily in two parts of water, and are reliable aids in sudden attacks of heart-failure, in hypodermic administration. (Dose: from twenty to thirty centigrammes.) Camphor internally, in doses and according to methods described above, will answer well in either the presence or absence of pulmonary complications. In cases of emergency its subcutaneous administration works admirably in sweet almond oil, in a twenty-per-cent. solution.

Ammonium carbonate disorders the stomach more frequently than camphor is apt to do. Ammonium muriate has no stimulant effect at all. Brandy and whiskey, when of good quality and well diluted (at least one in four or five parts of water or milk), hold the first rank. That they should, while sufficient doses must be insisted upon, not be given at all unless indicated, and omitted as soon as no longer wanted, is self-understood. Still, I know that they are often continued too long, and the occurrence of cirrhosis of the liver in children who exhibited no other cause of the disease except the protracted use of alcohol for alleged medical reasons is by no means unheard of. Champagne will often take the place of brandy and whiskey when speedy stimulation is required, or Tokay, Madeira, sherry, or a California wine when the former are objected to because of their taste. When there is diarrhœa, opium given in small doses—perhaps one-quarter of a minim of the tincture every hour or every two hours to a child of three years—will act both as a cardiac stimulant and astringent. Of musk as a powerful stimulant I have seen the best possible results. Nitroglycerin in doses of a two-hundredth or one-hundredth of a grain, repeated frequently until four or six doses have been taken, will be found a vigorous remedy when, while the heart is still acting, the arterial pulse is flagging.

Whatever medicines may be found desirable, the child should be kept absolutely quiet. In a recumbent posture it must remain, as a rule; thus the food has to be given, thus it has to be carried to the window or into the open air, if circumstances permit. Many a case that looked like being near extinction within the four walls

will exhibit a wonderful improvement on the lawn or under shade-trees.

Besides, the surface must be kept warm. It is principally the extremities which require external heat. A hot bath, without or with an aromatic addition, and hot injections into the bowels will do a world of good in many a desperate case of collapse, always provided the manipulations required are absolutely gentle and not exhausting.

To relieve inflammatory complications of the *brain* in typhoid fever the hair ought to be cut very short, the head kept high and washed frequently, or water may be poured over it while the body and throat are protected by an India-rubber cloth. The application of ice-water directly to the head in small children is not tolerated for a long time. It may give rise to collapse, and should be watched carefully. While the head is to be kept cool, the feet must be kept warm. Mustard foot-baths and hot applications to the feet, cold water or an ice-bag to the heart, an ice-bag around the neck, will be found very comfortable. When there is the slightest brain complication not depending on the infection itself or anæmia, no alcohol should be given, no opium, and no caffeine, though they may appear indicated by the condition of the heart. It is rarely necessary to resort to local depletion when the meningitic symptoms are quite clear. In these cases leeches may be applied to the mastoid process or, better still, to the septum narium. When the brain symptoms belong to the infection alone or to anæmia, opium is, however, well tolerated, and relieves sleeplessness and the general irritability. Now and then codeine may take its place, or amylene hydrate, chloral hydrate, or sulphonal. Sometimes the subcutaneous injection of morphine—one or two minims of Magendie's solution—will give instantaneous relief. Warm bathing will prove beneficial in such conditions of general excitability. In these cases the use of cold must be carefully avoided. It is understood that all such measures are meant for exceptional cases only. Mild cases will take care of themselves without them. But insidiously chronic diseases of the brain and spinal cord, such as insanity or ataxia, may come on. Neuritis should be looked for. An ounce of prevention may save your patient.

During *convalescence* sudden changes in feeding must be avoided. I repeat, it is dangerous to give other than fluid diet before the tenth day after the fever has disappeared. After that time white meats, plain puddings, and jellies may be added. Raw fruit must not be given under any circumstances. Patients should not be taken out

of bed sooner than a fortnight after their fever has disappeared. Older children should not be allowed to read. No visitors should be admitted during the early part of convalescence; neither the heart nor the brain bear any strain. The body temperature and the movements should be watched very carefully, for relapses may occur. Such relapses are very frequently the result of improper food, which will irritate the intestinal ulcerations, the process of whose healing is thereby interrupted. The greatest care must be taken in those cases in which the spleen, when tumefied during the progress of the disease, does not nearly assume its normal size about the middle of the third week. When it remains large, a relapse may be looked for.

The large number of *consecutive diseases* which may result from typhoid fever is ample proof that all such measures are by no means superfluous; multiple abscesses of the muscles, osteitis, epiphysitis, and arthritis are not very uncommon after typhoid fever. Noma is now and then seen, but it is only just to state that epiphysitis and arthritis are not so frequent after typhoid fever as, for instance, after scarlet fever, and noma not so frequent as after measles. But purpura may remain behind. Parotitis is not very uncommon. Thrombi in the extremities are sometimes met with. Erysipelas, laryngeal perichondritis, and cutaneous gangrene are by no means rare. But it is certain that many of these occurrences can be avoided if greater care be taken during the progress of the disease. The kidneys suffer in typhoid fever as they do in most infectious fevers, and frequently at an early stage. The majority of such consecutive cases of nephritis are mild and run a favorable course. Bad cases will be considered below.

Among possible complications—not only as the pretext of an uncertain diagnosis — we frequently hear of that with malaria. Whether typho-malaria is a disease *sui generis,* as Manson says he has seen in China, may be uncertain; but there is no reason why plasmodia and bacilli should not be co-ordinate and co-operative. I have seen such cases. Having met with cases which appeared to permit the two diagnoses, and mainly such as during and after a clear course of typhoid fever developed regular attacks of chills and fever, I have administered quinine for some time. Several times these attacks appeared to be quite grave, and were mostly obstinate.

The *paratyphoid* fever described by Gwyn, Schottmüller, and Meltzer, without Widal reaction, and with a bacillus more nearly related to the colon than the typhoid bacillus, offers no new therapeutic indications.

5. *Typhus. Relapsing Fever. Weil's Disease.*

The hygienic and therapeutical measures to be taken in (petechial) *exanthematic typhus* are in part like those of typhoid fever. Fresh air, hydrotherapy, plenty of water, some alcohol, as few antifebrile medicines as possible, and heart stimulants when indicated, comprise the treatment. Convulsions are not rare, conjunctivitis, laryngitis, and capillary bronchitis frequent. But the duration of the illness is much shorter than that of typhoid, and the prognosis is better in the child than in the adult. As there are no intestinal symptoms, feeding need not be exclusively fluid during recovery.

Relapsing fever permits of solid food in the intermissions. The spleen, when very large and sensitive, requires ice applications. Complications with eye or ear diseases have their own indications. Quinine appears to do very little. Indications should be met as they appear.

Of *Weil's disease* (fever, large liver and spleen, icterus, nephritis, delirium, coma, erythema, labial herpes) even Baginsky has seen but a single case ("Lehrbuch," 5th ed., p. 214).

6. *Epidemic Cerebro-Spinal Meningitis.*

It is both endemic and contagious, and demands absolute isolation and exclusion of brothers and sisters from schools and public playgrounds, also rest both of mind and body from the very beginning and for weeks or months after recovery. Though the prognosis of those cases which do not terminate fatally in the first twenty-four hours, and in some of which not even a differential diagnosis can be made with certainty, be much better than in the different forms of cerebral meningitis, the long duration of the disease endangers the result. Noise and glaring light must be excluded, no muscular exertion permitted, the neck supported; in bad cases of hyperæsthesia the bedclothing should not be permitted to touch the body. Hot bathing, once or twice a day in the beginning, may be tried to advantage. Lumbar puncture, formerly used for diagnostic purposes only, may do good, but cannot have the same effect as when the exudation is altogether serous. The urinary bladder may require emptying. Leeches applied to the painful spine will do some good in the very early stages; an ice-bag, on which the neck must be made to rest comfortably, another one to the occiput, and a purgative dose of calomel ought to usher in the remedial treatment. Unless contraindicated by great sensitiveness, mercurial ointment externally and potassium iodide internally are expected to do good. The latter is

generally given in too small doses, and thus misses its effect; from three to five grammes (forty-five to eighty grains) daily, and more, are easily tolerated, and are required by a child of five years. It may be preceded by a purgative dose of calomel; altogether, it is necessary to keep the bowels open. Much handling, however (enemata), is mostly contraindicated on account of the pain and convulsions caused thereby. Stimulants are contraindicated, certainly in the first period of the illness. The diet of the acute stage should be milk, cereals, and fruit-juices. Bromides will quiet excessive restlessness (doses of from one to four grammes a day); there are, however, very few cases that are not greatly benefited by sufficient doses of opiates or chloral to insure comfort and sleep. Sinapisms should be applied for a few minutes at a time, and frequently repeated; in the later stages a vesicatory over the cervical part of the spine is indicated. I am not pleased with the effects of tincture of iodine or iodoform ointments. Salicylic acid and salicylates have been praised; but I am afraid that the cases in which their good effects were observed were those of mistaken diagnoses; for, indeed, rheumatism both of the muscles and the meninges has been taken for different forms—even the very gravest—of meningitis. The after-effects of the disease, particularly paralysis and contractures, are difficult to handle; their treatment does not call for any special measures dictated by the original disease. Deafness originating in the labyrinth or in the acoustic nerve is liable to prove permanent, in spite of hydrotherapy, diaphoresis, and electrotherapy. Amblyopia from inflammation of the chiasma and the optic nerves gives a bad prognosis; keratitis and panophthalmitis are serious. The actual cautery has been used extensively. In the acute stage of the disease it is useless or harmful; in the chronic it has been known to do good, and may be applied regularly.

The modern progress of our acquaintance with the etiology of infectious diseases adds to our preventive, not yet to our curative, powers. H. Jaeger (*Zeitsch. f. Hyg. u. Infect.*, vol. xix. p. 351) asserts that sixty per cent. of all cases of cerebro-spinal meningitis are connected with or dependent on the pneumococcus (and diplococcus intracellularis?). This explains the frequent complication with pneumonia. Thus, the nasal secretion in which the diplococcus is of frequent occurrence requires particular attention. Indeed, as early as 1888 the Prussian government ordered the disinfection of linen—mainly handkerchiefs—from this point of view. For the same reason the violent aspiration of the naso-pharyngeal secretion, for the purpose of expectoration, may prove unfortunate for the individual and, secondarily, for the community. Weichselbaum, Heubner, and

Fürbringer charge the meningococcus intracellularis with being the cause. This microbe may also penetrate into articulations and give rise to a sero-fibrinous exudation, which, like the cerebro-spinal, has a tendency to absorption and recovery, different from the termination of those forms of arthritis which depend on streptococci and staphylococci.

7. *Glandular Fever.*

Under the name of "glandular fever," Pfeiffer (1887), A. Seibert (1894), I. P. West (1896), and Dawson Williams (1897) described a complex of symptoms which is claimed as a well-characterized disease *sui generis*. Patients were from seven months to thirteen years old (Dr. Seibert's case fourteen). Parotids not affected. West's ninety-six cases occurred in forty-three families within three years, none during the summers. Many of the families lived at a distance from one another, but exposure and contagion could be proven in the majority. Incubation mostly seven days (Williams's five to seven, also fifteen days, mostly seven). Williams also observed many cases in the same family. The disease begins with anorexia, malaise, sometimes vomiting, some slight diarrhœa, after some days dysphagia. There is (Seibert) no pseudo-membrane in the throat, no pharyngitis; in a few cases opisthotonos, which is explained by the swelling of the lymph-nodes. Fever moderate, in some cases temperature (Seibert) normal in the morning, 104° F. in the evening. Some abdominal pain, diarrhœa in milder cases, constipation in more severe ones. No sequelæ and no second attacks in West's cases. The disease lasted up to six weeks, in West's cases sixteen days, in Williams's from four to twenty-seven, with an average of sixteen; one death in ninety-six cases (West), one in twenty-four (Seibert). The main symptoms were the swellings of lymph-nodes, rarely of one side, mostly of both, beginning, however, on the left side; the right side followed in a few days. The glandular swellings extend downward and forward from the angle of the jaw and can be felt distinctly and separated from one another (West). The number of these swellings varies from four described by West to many small hard nodes, distinctly palpable, mostly between the deep-seated muscles of the posterior half of the neck (Seibert). Posterior cervical, axillary, and inguinal lymph-nodes could be felt in seventy-five per cent., the mesenteric in thirty-seven cases. The liver was found enlarged in eighty-seven cases (by Williams in ninety per cent.), the spleen in fifty-three cases (by Williams in fifty per cent., by Seibert in none), the tracheo-bronchial glands in

all of Williams's cases. There were no œdema, no suppuration, no permanent enlargement. In the discussion of the Pediatric Section of the New York Academy of Medicine, Koplik (who never saw a case in his many thousands of observations) suggested the possibility of an intestinal infection because of the fact that the local symptoms started on the left side. The reports regarding the existence of an incubation and the occurrence of contagion cause me, for the present, to connect the affection here with infectious diseases of a special type. The treatment should be mostly symptomatic; the (streptococcus?) invasion seems to find its spontaneous termination. But there may be a transmission to the nares and antra, also occasionally a latero-pharyngeal abscess.

8. *Catarrhal Fever.*

This is not the "ephemeral fever" of a feverish infant or child the cause of which has not been diagnosticated, nor the result of overloaded stomach or of intestinal putrefaction, nor of cocci in the throat or nose, but of the reflex irritation depending on "cold," exposure to a cold temperature, or to a sudden change of temperature from hot to cold, particularly while the skin is perspiring. Sometimes a chill is noted in the beginning, or merely a high temperature, aching muscles, anorexia, headache, perspiration, and some catarrhal angina; in other cases very slight elevation of temperature and little perspiration, but lassitude, sleepiness, and constipation. Labial herpes is apt to appear on the second or third day and a copious perspiration is frequently noticed on the fourth or fifth day, after which, with plenty of urates in the urine, improvement takes place. To speak of a gastric, hepatic, or cerebral variety, in order to denote the most prominent symptoms, is superfluous. The treatment consists in rest in bed, at a temperature of from 65° to 75° F., plenty of water (preferably hot), or of hot lemonade for older children, a purgative (ol. ricini), tinct. aconiti in from one-quarter- to one-half-drop doses every hour or every two hours, liquor ammonii acetatis from three to ten drops every two hours in hot water, and, if there be much headache and a high temperature, phenacetin in from one-half- to one-grain (0.03 to 0.06) doses from time to time.

9. *Asiatic Cholera.*

It is almost always fatal in the infant, and little less so up to the fifth or sixth year. Its diagnosis is, during an epidemic, secured by the presence of the characteristic diarrhœa and vomiting, with cold extremities, cyanosis, algidity, and the absence of pulse and

of urine; lastly and positively, by the presence of the comma bacillus in the fecal discharges. The differential diagnosis should be made from arsenic and tartar-emetic poisoning, also from very acute nephritis. The latter may exhibit the same copious rushing "rice-water" discharges of serum with masses of epithelium.

As the disease is identical with that in the adult, so the general features of the treatment are the same. Preventive immunization has been practised, after many previous attempts made in vain, by Haffkin. If his favorable results obtained in the East Indies are confirmed, and the Mecca pilgrimages closely watched, the world will be threatened with one less danger. During the prevalence of an epidemic no child should be permitted to suffer either from diarrhœa or from vomiting. Wet or soiled linen must be disinfected and boiled immediately. Whatever is to pass beyond the lips, mouth-wash or food or drink, should be boiled. Invalid or dyspeptic children should be sent away, and the schools closely watched for the slightest attack of loose bowels. A child suspected of cholera is to be kept in bed, with small hourly doses (five or ten milligrammes) of calomel, which ought to be continued until the fæces show the characteristic color. Creosote may be given in water, in moderate doses only, for the kidneys are apt to suffer; salol in doses of from five to fifty centigrammes every few hours. Diluted hydrochloric acid (1 to 500) as a drink after the administration of calomel has been stopped. The extremities should be kept warm, the abdomen, if hot and tender, covered with cold applications, which should be changed when they become warm, and stimulants given freely (alcohol, coffee, caffeine, strychnine, camphor, tincture of musk), subcutaneously if, or because, the stomach retains nothing. Warm bathing with friction while in the bath; the bath water should be boiled before being used, to destroy the comma bacillus, if not its toxins. No internal diaphoretics, and absolutely no pilocarpine subcutaneously. For the heart is too feeble; even when the condition appears to improve, sudden relapses and collapse may ensue. The enteroclysis of Cantani (the irrigation to be carried up as far into the bowels as possible) is made with a solution of three or five parts of tannic acid in a thousand of warm, or hot, water. The action of the heart may be re-established by subcutaneous salt-water infusions. For these Cantani's original prescription contained four parts of sodium chloride and three of sodium bicarbonate in one thousand of water. Opium is badly tolerated in all stages. High temperatures and delirium demand cold to the head; pneumonia, parotitis, nephritis, and other complications furnish their own indications.

10. *Dysentery.*

It is communicated from person to person, but by fecal discharges only; by the use of the same chamber, for instance. Indeed, all the bacillary diseases of the intestinal tract may enter through the anus. Privies and sewers are sources of dysentery, as of typhoid fever; but a more frequent cause is the drinking of water infected by sewage, which need not always contain specific microbes. Their toxins suffice. Amœbæ, which were believed to be very rare, and the cause of a specific variety, are probably concomitants of most cases. The catarrhal, the follicular, and the diphtheritic varieties may run their courses separately; in many instances, however, the first will only be the initial stage of the more serious forms. The treatment is not, for the present, influenced by the species of microbes causing or complicating the malady, bacterium dysenteriæ, diphtheriæ, coli, or amœbæ.

To prevent contagion, a patient with dysentery should be isolated. During the heat of the summer children should be protected against colds (the systematic external use of cold water is, as always, the best prophylactic) and unripe fruit.

The sufferings from dysentery are so intense, and the dangers from its acute (fever, convulsions, exhaustion) or chronic (scurvy, noma, nephritis, paralysis, neuritis, diseases of joints, abscess of the liver) state so threatening, that active measures should be taken at once. A brisk purgative ought to precede every other treatment. Castor oil in sufficient quantities, or calomel—according to age—in doses of from one to eight grains (0.05 to 0.5), will have a favorable effect, the latter acting both as a laxative and a disinfectant.

The food should be liquid, milk and strained farinaceous decoctions the exclusive diet for the first acute stage. It is on the general condition of the patient that the administration of other articles of food, such as jellies without sugar, beef- or mutton-broth with farinaceous decoctions, egg albumin, or alcoholic and medicinal stimulants (either general or cardiac), will depend in the course of the disease.

Great sensitiveness of the left hypogastric region and local heat will be alleviated by the application of ice. Very young infants, however, bear ice but a short time, whether applied to head or abdomen. I advise to watch the effect of the application of either the ice-bag or the ice-cold cloth. Now and then, even in adults, we meet with an individual intolerance of cold which must be respected. Indeed, quite often warm applications of either water or poultices prove more

efficient in regard to the two indications, which consist in alleviating irritation and reducing temperature.

Bismuth subgallate and subcarbonate not only cover and protect the mucous membrane, but have also a decided antifermentative effect. Thus bismuth is surely indicated in irritated conditions of the mucous membrane; it seldom fails when given in sufficient doses. There is no harm in sometimes giving it in such doses that part of the introduced material will pass through the entire length of the intestinal tract without undergoing decomposition. As its taste is not disagreeable, it may be given together with tannin (gallic acid is better) and opium; the daily dose ought not to be less than one drachm or a drachm and a half (4.0 to 6.0). At the same time the passages ought to be examined as to their reaction. Abundant acid, so frequently found in the slightest intestinal anomalies, requires the additional administration of alkalies. Boiled milk should be mixed with equal parts of lime-water. In most cases carbonate of lime is preferable to either magnesium or sodium carbonate or bicarbonate, the salts of both of which are apt to increase diarrhœa. Sometimes, particularly when the stomach can be relied upon, sodium salicylate may be added to the internal treatment. Besides the favorable effect of the sodium on the intestinal tract, the salicylic acid may prove beneficial both by its antifebrile and disinfectant action. Salol, about one or two grains (0.05 or 0.15), or resorcin, one-quarter or one grain (0.015 or 0.06), given every two hours, may take its place. The latter is better tolerated than the former, but salol has a better chance to reach the lower part of the intestine.

Opium and its alkaloids are invaluable in the treatment of intestinal ulcerations. The objections to their use are decidedly exaggerated. Such accidents as have been reported in isolated cases as resulting from the administration of opium are to be attributed to the fact that the dose was either absolutely or relatively too large compared with the idiosyncrasy of the patient. Dysentery both requires and tolerates larger doses of opium than an average diarrhœa, no matter whether the latter be the result of catarrh or ulceration of the small intestine or the cæcum or the upper part of the colon. In this respect dysentery stands almost abreast with peritonitis. The main indications are to relieve pain, reduce peristalsis, and diminish the copious serous secretion; no other remedy fulfils all of them so well. For these purposes it ought to be given internally; for enemata containing opium may act favorably, but the more intense the tenesmus and the greater the hyperæmia or the more extensive the ulceration the less reliance can be placed on their effect, and the amount

of the opiate thus brought into real action cannot be estimated. Among all the opiates I prefer a tincture, or the wine, or opium in substance, or Dover's powder; rarely have I injected morphine under the skin. The effect of the drug is easily watched and controlled by commencing with moderate doses, not repeating them too often, and being guided by the effect obtained. If opium is to be discarded, opium with hyoscyamus, or with belladonna, or hyoscyamus or belladonna alone, may take its place temporarily. Severe tenesmus may require the painting of the protruding part with Magendie's solution.

Astringents may be given either in combination with opium or separately. They are expected to pass wholly or partly through the entire length of the intestinal canal, thus coming into contact with the inflamed and ulcerous mucous membrane. Among those eligible are (tannin) gallic acid and vegetables containing the same (ratanhia, catechu), besides lead subacetate, silver nitrate, and pernitrate of iron.

The daily dose of gallic acid, when it is to be taken for a long time in succession, is from five to fifteen grains (0.3 to 1.0), lead subacetate one to five grains (0.05 to 0.3), silver nitrate one-fourth to one-half grain (0.015 to 0.03). The latter ought not to be given more than a week or two in succession, for fear of argyria, two cases of which occurred in my own practice, and of my own making, many years ago. All of these medicines, except gallic acid, are best taken, if possible, in the form of pills. They appear to be better tolerated, and are certainly more effective. Silver nitrate in solution (distilled water) demands a bottle of neutral color and administration from a glass or china vessel.

Another antiseptic which I have frequently administered internally in every description of intestinal ulcerations, in both the acute and the chronic forms, is naphtalin. For its doses and the methods of its administration, and some account of its effect on intestinal ulceration in general, I refer to the article on typhoid fever. We expect a great deal from such topical medication, and it appears that it will be one of the great aids in all infectious diseases whose principal localization is in the intestine, as, for instance, Asiatic cholera.

Adults will take from fifteen to seventy-five grains (1.0 to 5.0) daily, in powders, capsules, or mucilage. Children bear, as a rule, according to their ages, from one-half of a grain to two or three grains (0.03 to 0.2), every two or three hours, in some mucilaginous substance. Some do not bear it well, but when such is the case the

stomach will give warning at once. Its odor, it is true, is objectionable.

The temperature will rarely be so high as to require antipyretic medication. Frequent enemata will often reduce it effectively. Very young infants may require an occasional dose of antipyrin or phenacetin when the heat threatens either the nervous system or the normal structure of the tissues of the body. A warm bath will often do better than either.

Consecutive paralysis requires a mild galvanic current in the beginning. The daily application both to the spinal cord and the extremities need not exceed ten minutes; the electrodes should be large, and the current reversed after five minutes. After a few weeks the interrupted current may be added the same length of time, but it should be applied to the paralyzed muscles only. Together with the latter, strychnine or (and) phosphorus may be used, in daily doses of one-thirtieth of a grain (0.002), in the case of a child of four or five years; the former is more effective when used subcutaneously.

The local treatment of chronic dysenteric ulcerations requires the use of enemata. Their indications vary. They are to evacuate the bowels, or to reduce the irritability of the diseased intestine, or to accomplish a local cure. These indications cannot be fulfilled separately; sometimes two, sometimes all three, may be met at the same time. The nature and quantity and the temperature of the liquid to be injected depend in part on the end aimed at, in part on the irritability of the individual intestine. Sometimes the bowel objects to the introduction of small amounts; sometimes, however, large quantities are tolerated very easily indeed. To introduce small amounts, the selection of the syringe is a matter of indifference, provided the liquid enters the bowel gently and without pain. To inject large quantities, undue pressure and local irritation should be avoided. Therefore the fountain syringe alone will answer; it ought to hang but a trifle above the level of the anus,—say from six to twenty inches. The temperature of the liquid is not always a matter of great importance. Some recommend the injections to be ice-cold; some, however, tepid; both are frequently recommended as panaceas. But the practitioner will soon ascertain that some bear and require the one, some the other; some, indeed, very hot ones.

In my experience, for the large majority of patients suffering from either acute or chronic dysentery, tepid injections answer best. Not rarely the intestine is in such a condition of irritation that even small quantities of a very cold fluid are expelled at once. And again,

there are cases in which enormous amounts of either cold or warm water are readily received. To accomplish the purpose of evacuating the bowel, plain water will often suffice, but three-fourths-of-one-per-cent. solutions of salt in water will usually prove more acceptable. Additions of potassium bitartrate or castor oil have proved so uncomfortable in my cases that I discarded them long ago. However, when the secretion of mucus on the rectal and intestinal mucous membranes was very large, one- or two-per-cent. solutions of sodium bicarbonate answered very well indeed. For the purpose of clearing the intestines, either of fæces or the morbid products, a single enema is insufficient. It ought to be repeated several times daily. When much mucus is secreted and tenesmus intense, it may be applied after every spontaneous evacuation. In many cases the substitution of flaxseed tea or mucilage of gum acacia will prove advantageous. I have had to continue them for weeks for both their evacuating and alleviating effect. When, however, the latter alone is aimed at,—that is, when tenesmus is to be relieved,—small quantities will usually suffice. An ounce or two of thin mucilage, or starch-water, or flaxseed tea, with tincture of opium or, better, extract of opium, proves very comforting. Glycerin in water has been recommended for the same purpose. The former alone, or but slightly diluted, irritates, nay, cauterizes. It will require close judgment and individual experience to ascertain the degree of dilution, if it be used at all. In these cases I avoid it.

When a local curative effect is aimed at, injections of small quantities are sometimes insufficient. As the local lesions are often extensive, the amount to be injected must be pretty large. Astringents are almost always required. Zinc or aluminum sulphate, lead subacetate, silver nitrate, tannin, potassium chlorate, ergotin, salicylic and carbolic acids, and creosote have been recommended. Of the more common astringents I prefer alumina or tannin in less than one-per-cent. solutions. Salicylic acid resulted more frequently in pain than in benefit. Carbolic acid, in solutions of one-half of one per cent., has proved very beneficial, but I have learned long ago to be very careful in regard to its administration because of its detrimental effects, particularly on the kidneys of very young patients.

Injections of silver nitrate may prove very useful in cases not quite acute. Before the solutions of a quarter of one per cent. or of one or two per cent. are injected, the intestine ought to be washed out with warm water (without salt) or with a two- or three-per-cent. boracic acid solution. After the injection has been made, it ought to be neutralized with a solution of sodium chloride; it is still

better to wash the anus and the portion of the rectum within easy reach with that solution before the medicinal injection is made. For even the mildest solutions, when acting on the sore sphincters, are liable to give rise to intense tenesmus when no such care has been taken.

When the ulcerations are few, or in the lower portion of the bowels only, small quantities suffice; but extensive lesions require large injections, the patient being on his side or in the knee-elbow position. For older children the nozzle of the fountain syringe should be lengthened by attaching to it an elastic catheter, which is introduced as high up as possible, after the same plan that nutrient enemata are to be given. In a number of cases, both mild and severe, in which neither the usual astringents nor silver nitrate appeared to answer, I have been very successful these thirty years, when resorting to injections of bismuth subcarbonate. The drug is mixed with six or twenty times its amount of water; of this mixture from one to three ounces (30.0 to 100.0) are injected into the bowel, which has been washed out previously, twice or three times daily. The result is satisfactory, though a large portion of the injected mixture be soon expelled.

Suppositories containing the above substances may prove beneficial; but in order not to irritate they must be so soft as to melt readily. They may always contain some opium; but its admixture is not always sufficient to relieve the irritability of the rectum. Indeed, to accomplish this end opium must at least begin to liquefy and to be absorbed, and absorption cannot be relied upon except where a part, at least, of the mucous surface is in a fair state of integrity. When no suppository is tolerated, and the administration of an opiate to the intestine is indicated, painting with Magendie's solution or the injection of a small quantity of olive oil with tincture of opium may be tried. The local application of cocaine relieves pain, but the drug is readily absorbed, and great caution should be used in its administration because of its poisonous effects.

11. *Scarlatina.*

Preventive measures of the strictest nature are indicated in regard to no disease more than to scarlatina. Its mortality is very great, in some epidemics even excessive; and when the child survives, there may be a large number of sequelæ which either terminate fatally or in persistent injury to health and in the curtailing of the enjoyment or usefulness of life. Among these are cardiac diseases, glandular affections, suppurative otitis, and nephritis. The first attack

of the latter is not limited to the second or third week, when, it is true, it is mostly met with; for I have seen it appear on the thirty-seventh and on the fifty-second day of the disease. Bäumler reports the case of a child with hemorrhagic nephritis which started as late as the forty-fourth day of scarlatina.

There is another momentous indication for strict prevention. The liability to attack is by no means so great as, for instance, in measles. It is but rarely that any of the young inmates of a house escape contagion when measles has attacked one of them. The virus of scarlatina, however, is less catching. Infants of less than a year suffer but seldom, though very severely when taken. The vast majority of those affected, however, are less than five years old. After that period susceptibility becomes less from year to year; so that, indeed, a child that has been protected against scarlatina during its first half-dozen years attains a certain degree of immunity for the future.

The efficacy of the virus is so persistent, and clings so long to clothing, bedding, and furniture, that it can be carried and transmitted long distances by persons, towels, toys, letters, and even domestic animals and articles of food, principally milk. It is transferable through the whole duration of the disease, from the incubation to the disappearance of the very last trace of desquamation, and perhaps later; even before the appearance of the eruption. The incubation of scarlatina may last but a few hours, like that of diphtheria and erysipelas, or as long as nine days; in this it differs greatly from measles, variola, and varicella. The last symptoms may not disappear until long after the fortieth day, which, it is true, is the average termination. The fine desquamation of the second week may have terminated entirely, but the gross peeling, particularly of the hands and feet, extends frequently to the end of the seventh or eighth week. It carries contagion as well as the desquamation of the former weeks, or as the breath of the patient, or his expectoration in the earlier periods. So slow is sometimes the process of elimination that Spottiswood Cameron asserts that the end of the disease is seldom reached before the eighth week, and not always in the thirteenth. Whether the urine or the alvine dejections of the patient can spread the disease is not quite certain; but so long as there is an uncertainty they ought to be treated as dangerous elements and disinfected and removed.

Sore surfaces appear to admit the poison. Scarlatina will enter through the integuments denuded by eczema. I believe that I lost, many years ago, two patients because I operated upon them during

the prevalence of an epidemic of scarlatina. A child of four years, on whom I resected the head of a femur, was taken with the eruption on the fourth day and died. Another one was stricken down thirty-six hours after the resection of a tonsil. In both cases I had reason to believe that I opened an inroad to the poison. Indeed, catarrhal or otherwise sore tonsils—even healthy tonsils with the normal interruptions of their epithelial covering—are very likely to furnish a means of invasion. Several times I observed scarlatina a few days after tracheotomy.

Dispensaries and schools are the hotbeds of scarlatina. A single case waiting in the anteroom of a public charity until it is seen and diagnosticated may destroy a dozen innocents while craving the blessings of public beneficence. Schools ought to be closed during an epidemic as soon as a few cases have appeared. No child coming from a house with scarlatina must be admitted. Such as have been removed from the dangerous neighborhood and not exposed since may, after thorough disinfection of the clothing worn during the time of exposure, be allowed to return after an interval of ten days.

The daily school inspection of the New York Health Department, organized a few years ago, after the profession had urged its necessity from time to time these thirty years, cannot fail to be very beneficent, and is among the best methods to improve public health employed by the health department of the city. There cannot be a doubt as to its example being imitated in other places. The "inspectors are to carefully examine each pupil that has been set apart from the other pupils by the teachers of the school, and cause to be excluded from schools all those affected with, or showing symptoms of, any contagious disease, more especially the following: measles, diphtheria, scarlet fever, croup, whooping-cough, mumps, contagious eye diseases, parasitic diseases of the head and body, or any illness which, in their judgment, shall require the pupil to be excluded from school."

The inunction of the patient with pork, vaseline, and similar substances adds to the safety of the attendants by preventing the carrying into the air of the eliminated particles of epidermis. Soaping and bathing contribute to the same end, but are not perfectly reliable safeguards because the virus penetrates the whole skin down to the rete Malpighii.

The sick and their attendants must be strictly isolated; during the winter, when the warm air rises and carries contagion with it to the upper part of the house, in the highest story. Whoever enters the sick-room—friend, nurse, or physician—ought to wear special

clothing while inside, or at least a linen or India-rubber cover. The physician should disinfect his hands after leaving the patient. In the room the air ought to be changed often. Draught can be avoided by means of screens. No dry linen or clothing must leave the room. It should be soaked in water or, better still, in a disinfectant fluid before it is carried off, and boiled in soap and water immediately after arriving in the laundry. The same rules which hold good in the cases of infectious and contagious diseases in general, and those which refer to the disinfection of the room and furniture and public vehicles which may have been used, must be obeyed to the letter. No room, in fair weather, will afford the same safety as a tent would, and in no disease, with the exception of variola and diphtheria, is the erection and maintenance of special hospitals more needed than in scarlatina.

In connection with the question of prevention of contagious diseases, scarlatina and others, I cannot render better service than by giving the greatest possible publicity to the directions of the New York Health Department. They contain all that is known and all that ought to be done, in city or country, to prevent scarlet fever, diphtheria, and measles in the present state of society and of our knowledge.

"DIPHTHERIA, SCARLET FEVER, MEASLES.

"These diseases are very contagious. Diphtheria is usually transmitted from the sick to the well by the moist or dry discharges from the nose and throat of the sick person. Scarlet fever and measles are transmitted by the discharges from the nose and throat and also by the scales thrown off from the surface of the skin. These discharges and scales contain the minute germs that cause these diseases. The importance, therefore, of their proper disinfection can be at once understood.

"DIRECTIONS TO PREVENT OTHER CASES OF DIPHTHERIA, SCARLET FEVER, AND MEASLES OCCURRING IN A FAMILY WHERE ONE CASE EXISTS.

"1. If possible, one attendant should take the entire care of the sick person, and no one else besides the physician should be allowed to enter the sick-room. The attendant should have no communication with the rest of the family. The members of the family should not receive or make visits during the illness.

"2. The discharges from the nose and mouth must be received on handkerchiefs or cloths, which should be at once immersed in a

carbolic solution (made by dissolving six ounces of pure carbolic acid in one gallon of hot water, which may be diluted with an equal quantity of water). All handkerchiefs, cloths, towels, napkins, bed-linen, personal clothing, night clothes, etc., that have come in contact in any way with the sick person, after use should be immediately immersed without removal from the room in the above solution. These should be soaked for two or three hours and then boiled in water or soapsuds for one hour.

"3. In diphtheria and scarlet fever great care should be taken, in making applications to the throat or nose, that the discharges from them in the act of coughing are not thrown into the face or on the clothing of the person making the applications, as in this way the disease is likely to be caught.

"4. The hands of the attendant should always be thoroughly disinfected by washing in the carbolic solution, and then in soapsuds, after making applications to the throat or nose, and before eating.

"5. Surfaces of any kind soiled by the discharges should be immediately flooded with the carbolic solution.

"6. Plates, cups, glasses, knives, forks, spoons, etc., used by the sick person for eating and drinking must be kept for his especial use, and under no circumstances removed from the room or mixed with similar utensils used by others, but must be washed in the room in the carbolic solution and then in hot soapsuds. After use the soapsuds should be thrown in the water-closet, and the vessel which contained it should be washed in the carbolic solution.

"7. The room occupied by the sick person should be thoroughly aired several times daily, and swept frequently, after scattering wet newspapers, sawdust, or tea-leaves on the floor to prevent the dust from rising. After sweeping, the dust upon the wood-work and furniture should be removed with damp cloths. The sweepings should be burned and the cloths soaked in the carbolic solution. In cold weather, the sick person should be protected from draughts of air by a sheet or blanket thrown over his head while the room is being aired.

"8. When the contagious nature of the disease is recognized within a short time after the beginning of the illness, *after the approval of the Health Department Inspector*, it is advised that all articles of furniture not necessary for immediate use in the care of the sick person, especially upholstered furniture, carpets, and curtains, should be removed from the sick-room.

"9. In scarlet fever and measles, when the patient is beginning to recover and the skin is peeling off, the body should be washed once

daily in warm soapsuds, and afterwards anointed with oil or vaseline. This should be continued until all roughness of the skin has disappeared.

"10. When the patient has recovered from any one of these diseases, the entire body should be bathed and the hair washed with hot soapsuds, and the patient should be dressed in clean clothes (which have not been in the room during the sickness) and removed from the room. Then the Health Department should be immediately notified, and disinfectors will be sent to disinfect the room, bedding, clothing, etc., and under no conditions should it be again entered or occupied until it has been thoroughly disinfected. Nothing used in the room during the sickness should be removed until this has been done.

"11. The attendant and any one who has assisted in caring for the sick person should also take a bath, wash the hair, and put on clean clothes, before mingling with the family or other people, after the recovery of the patient. The clothes worn in the sick-room should be left there, to be disinfected with the room and its contents by the Health Department.

"METHODS OF DISINFECTION.

"1. *Hands and Person.*—Standard Solution No. 1 should be diluted with an equal amount of water. Hands soiled in caring for persons suffering from contagious diseases, or soiled portions of the patient's person, should be immediately and thoroughly washed in this solution, and then washed with soap and water. The nails should be kept perfectly clean and the hands should always be carefully disinfected before eating.

"2. *Soiled Clothing, Towels, Napkins, Bedding, etc.,* should be immediately immersed in Standard Solution No. 1, and soaked for twelve hours, being occasionally moved about in the fluid so as to bring the disinfectant in contact with all parts. They should then be wrung out and boiled in soapsuds for one hour. Articles, such as beds, etc., that cannot be washed should be burned.

"3. *Food and Drink.*—Food thoroughly cooked and drinks that have been boiled are free from disease germs. In presence of an epidemic of cholera or typhoid fever, milk and the water used for drinking, cooking, washing dishes, etc., should be boiled just before using, and all persons should avoid eating fruit, fresh vegetables, and ice. Ice may, however, be used when ordered for the sick by a physician.

"4. *Discharges* of all kinds from patients suffering from contagious diseases should be received into earthen vessels containing

Standard Solution No. 1 or 3. Special care should be observed to disinfect at once the vomited matter and the intestinal discharges from cholera patients, as these alone contain the dangerous germs. The volume of the disinfecting solution used should be at least four times as great as that of the discharge. After standing for at least one hour in the disinfecting solution, these discharges may be thrown into the water-closet. Bedding or clothing soiled by the discharges must be at once placed in Solution No. 1, and the hands of the attendants disinfected, as described above.

"5. *Closets, Sinks, etc.*—Each time the closet is used for infected material, at least one quart of Solution No. 1 should be poured into the emptied pan and allowed to remain there. All discharges should be disinfected before being thrown into the closet. Sinks should be flushed at least once daily with the same solution.

"6. *Dishes, Spoons, etc.*, used by the patient should be kept for his exclusive use, should not be removed from the room, but should be washed there, first in Solution No. 1, and then boiled in strong soapsuds. These washing-fluids should afterwards be thrown into the water-closet. The remains of meals should be thrown into a vessel containing milk of lime. The contents of the vessel, after standing half an hour or more, should be thrown into the water-closet.

"7. *Soiled Wood-work, Floors, Plain Furniture, etc.*, should be thoroughly washed with Solution No. 2. Upholstered furniture, curtains, or carpets which have been soiled by the discharges should be referred to the Health Department for disinfection or destruction.

"It is important to remember that an abundance of fresh air, sunlight, and absolute cleanliness not only help protect the attendant from infection, but also aid in the recovery of the sick.

"NOTE.—The cost of the carbolic solution is much greater than that of the other solutions, but generally is to be much preferred. When the cost is an important element, the bichloride solution may be substituted for all purposes for which the carbolic is recommended, excepting for the disinfection of discharges, eating utensils, or articles made of metal, and of clothing, bedding, etc., which is very much soiled. Its poisonous character, except for external use, must be kept constantly in mind.

"DISINFECTION AND DISINFECTANTS.

"The contagious diseases are caused by minute living germs. The object of disinfection is to destroy these. In order that as few articles as possible shall be exposed to infection by the disease germs,

at the very beginning of the illness all unnecessary furniture (especially upholstered furniture and curtains), and other unnecessary articles, should be removed from the sick-room.

"The following are the best-known disinfectants:

"1. *Heat.*—Continued high temperatures destroy all forms of life. Boiling for at least one-half hour will destroy all disease germs.

"2. *Carbolic Acid.*—Standard Solution No. 1 is composed of six ounces of carbolic acid, dissolved in one gallon of hot water. This makes approximately a five-per-cent. solution of carbolic acid. The commercial colored impure carbolic acid will not answer for this purpose. Great care must be taken that the pure acid does not come in contact with the skin. When practicable, the carbolic solution should be used as hot as possible.

"3. *Corrosive Sublimate* (bichloride of mercury).—Standard Solution No. 2 is composed of sixty grains pulverized corrosive sublimate and sixty grains of chloride of ammonia, dissolved in one gallon of water. This solution must be kept in glass, earthen, or wooden vessels (not in metal vessels).

"The above solutions are very poisonous when taken by mouth, but are harmless when used externally.

"4. *Milk of Lime.*—Standard Solution No. 3 is made by mixing one quart of dry freshly slaked lime with five quarts of water. Lime is slaked by pouring a small quantity of water on a lump of quick-lime. The lime becomes hot, crumbles, and as the slaking is completed a white dry powder results. The powder is used to make Solution No. 3. *Air-slaked* lime has no value as a disinfectant.

"The proprietary disinfectants, often widely advertised, and whose composition is kept secret, are relatively expensive and often unreliable and inefficient. It is important to remember that substances which destroy bad odors are not necessarily disinfectants."

The medicinal treatment of mild cases may be expectant. Cooling drinks—ten or twelve drops of dilute hydrochloric acid in a goblet of water—will often suffice. The food must be liquid, or at most semi-solid; in the first week milk and farinacea. Constipation during the first period is relieved by a dose of calomel or a vegetable aperient. Diarrhœa, particularly in the later stages, requires bismuth, opium, perhaps astringents, such as lead, and at all events antifermentatives, such as resorcin, salol, or naphtalin; the mild form of stomatitis and pharyngitis, half a grain or a grain of potassium chlorate in a teaspoonful of water every hour or two hours. Larger children should be taught how to gargle at regular intervals; but the posterior wall of the fauces is reached better by frequent drinking

of ever so small quantities of water, or of water with a few drops of dilute hydrochloric acid, and by nasal irrigations. There should be no waiting for glandular swelling before the nose and the pharynx are attended to. The carbolic acid injections of Heubner and those of chlorine-water of Dr. A. Seibert into the tissue of the tonsils have not received the approval of the profession to any great extent. The throat complications of scarlatina should be attended to in time, either when caused or attended by streptococci or Klebs-Löffler bacilli. The frequency of the latter varies according to localities, seasons, and epidemics. Some observers claim them in fifteen per cent. of all cases of scarlatina. Ranke found pseudo-membranes in sixty-five per cent. of a season's cases at the Munich Children's Hospital. In 53.7 per cent. of mild or severe (laryngeal) cases he met with the diphtheria bacillus, in 38.8 with streptococci. The former were also observed in most of those cases in which the pseudo-membranous complication arose in the later stages of the disease. That is why he recommends the use of the diphtheria antitoxin in doubtful cases also. This and the important subject of general and local treatment of pseudo-membranous affections will be discussed in the article on diphtheria. In most cases (there are exceptions to that rule) when they are first observed on the fourth or fifth day of scarlatina they are seldom alarming; when on the first day, or previous to the scarlatinous eruption, they are quite ominous. In such instances they are often accompanied by rapid glandular swelling and serious symptoms of sepsis. Applications of ice to the swollen neck will often keep the tumefaction within certain limits. When gangrenous degeneration of the glands cannot be prevented, and local suppuration occurs in the centre, deep incisions and the local use of carbolic acid are required in the same manner in which the same affection is dealt with in diphtheric diseases generally. In milder cases, two applications daily of one part of iodoform in eight or twelve of flexible collodion have a good effect. Even they are mostly not wanted; cool applications will suffice. Occasional retropharyngeal abscesses require incisions.

High temperatures do not demand very active treatment unless they result in functional or organic changes of the heart or brain. So long as these two organs perform their duties normally the temperatures may be let alone. A very frequent and feeble pulse with a high temperature indicates, besides a cardiac tonic, quinine, rubbing with cool water or water and alcohol, cold applications to the heart, or a warm bath. A cold bath is not borne well; in urgent cases a cold pack may do good. A feeble and arrhythmic pulse requires the very

strongest stimulants. Phenacetin and antipyrin are not to be recommended in these conditions. Delirium and somnolence, also convulsions, may be the results of high temperatures, and, particularly when the whole body, feet included, is hot, require the same treatment. Antipyrin, however, I have never seen to reduce the temperature in congestive or inflammatory conditions of the brain. The latter may be the direct result of the infection, but also, at a somewhat later period, of rheumatism. In either case the treatment does not materially differ from what it would be under ordinary circumstances. The latter form requires salicylates, the application of ice to the head, counter-irritants to the feet (sinapisms) and intestines (calomel), and in rare cases leeches to the septum narium or to the mastoid processes. The vital indication proceeding from the condition of the brain is here of the greatest importance.

When the same symptoms set in with or without a high rectal temperature and cold extremities, a mottled skin, and a cyanotic hue, the large amount of the toxin which has invaded the system demands strong stimulants,—ammonia, musk, and camphor. They act better than alcohol. To their internal administration may be added camphor dissolved in sweet almond oil, and sparteine sulphate in water, subcutaneously, in free and frequent doses. These toxic symptoms while the temperature is low bear opiates (morphine, one-fiftieth or one-twentieth of a grain, one to three milligrammes), in repeated doses, quite well. Universal heat requires tepid bathing, with cold affusions over, or applications to, the head; a cool surface, with cold extremities and frequent and filiform pulse, hot bathing and powerful friction, and hot enemata, with stimulants.

Vomiting before and with the eruption is a frequent symptom. When moderate, it may be let alone; no food must be given for a number of hours, ice-water in teaspoon doses, or an ice pill, every five or fifteen minutes. When quite severe and exhausting, small doses of an opiate, once every hour or two, will be found useful. In a few obstinate cases cocaine muriate, in doses of one-twentieth or one-fifteenth of a grain, answered well; in others, arsenous acid, every two hours, a two- or three-hundredth part of a grain (one-third or one-fifth of a milligramme).

One of the early complications is "rheumatism." It makes its appearance often on the third or fifth day. In some cases it is muscular, and then mostly confined to the lower extremities; in others articular, but with less swelling than we are inclined to expect. Indeed, articular rheumatism in children exhibits the usual symptoms to a less characteristic degree than in adults, but they are so pro-

nounced as not to be mistaken. This rheumatism ought to be treated at once, for endocarditis complicates it in infancy and childhood very much more readily than in advanced age. Most of the cases of scarlatinal endocarditis carried into later life are due to rheumatism. The joints ought to be well covered with soft cotton, and sodium salicylate given every two or three hours, in doses of from four to ten grains (three to ten decigrammes).

Endocarditis and pericarditis, without rheumatism, are rare. Ulcerous endocarditis I have not seen except with serious general sepsis, caries of bones, thrombosis of sinus, and other symptoms of a general pyæmia.

Suppurative inflammations of joints are very rare. They are the cause, or part, of generalized pyæmia. This can sometimes be prevented by early surgical treatment. There is an affection of the epiphyses, however, which is very common and differs from the above. It consists in extensive hyperæmia, and possibly inflammation. Clinical observation yields quite a number of cases of infectious diseases, but mainly scarlatina, in which during convalescence, and long afterwards, the regions of the joints are swollen and painful. This epiphysitis is the cause of the rapid increase in the growth of children who have passed through scarlatina, but may also be the cause of serious changes, from simple "growing pains" to suppurative separations of the epiphysis from the diaphysis. In every such case, during convalescence and afterwards, the joint ought to be well supported by soft splints and emplastr. hydrarg., or iodoform collodion, absolute rest enjoined, and phosphorus given in three daily doses of a two-hundredth of a grain (one-third of a milligramme), or more, several times daily.

Complications with pneumonia and pleuritis are quite frequent; the latter is apt to be purulent; if so, its existence explains in many cases the continuance of the high temperature. In every case, purulent or not, the indications are not those of an expectant plan of treatment. Both general and cardiac stimulants and tonics are required, and pyothorax requires an operation always.

Hemorrhages are not frequent, but ominous when they occur. Some appear, like the symptoms of generalized purpura, more towards the end of the malady; some in the muscles in the third week or later, with the result of starting a more or less universal myositis; others in the mucous membranes. Many are the result of embolic processes, and complicated with local gangrene. Spontaneous thromboses, however, of the extremities or the cheeks ("noma") are not so frequent in scarlatina as in measles.

The presence of pemphigus during the eruption appears to indicate a high degree of vasomotor paralysis. It is an ominous complication and requires stimulants as above. Urticaria is more troublesome than dangerous. The inunction with pork, vaseline, glycerin, or lanolin—soothing and pleasing in most cases of scarlatina—may suffice to relieve it. Now and then mild alkaline lotions (sodium bicarbonate in water, 1 to 100), or washing with carbonated alkaline waters (from the siphon) or with a proper dilution of carbolic acid (1 to 200), will prove beneficial. When the burning and itching are quite annoying, naphtol five parts and vaseline one hundred or one hundred and fifty may be tried to advantage.

The rules for the general treatment of scarlatina must necessarily be very much like those applicable to all infectious diseases. Thus, in regard to them, and particularly to the debility and failure of the heart, I refer to my remarks on the treatment of patients suffering from typhoid fever. In scarlatina and eruptive fevers generally there is, however, an additional indication resulting from the participation of the skin in the process. Indeed, more than in other diseases, the hygiene of the surface must be attended to. During the course of the disease, particularly during desquamation, a tepid bath, with soap, ought to be given from time to time, and the temperature of the room and bed kept uniform. While the former is to be cool, the body must be well covered and kept warm. This is the more necessary, as nephritis may set in at any time during many weeks. This serious complication, it is true, may occur though the patient be kept in bed, in consequence of voluminous elimination of renal epithelia, and also, perhaps, of bacteric invasion; but exposure and sudden changes of temperature will always hold their places in etiology in the minds of those who do not forget to notice the living clinical case besides the microscopical excrement.

In this connection, while I reserve the subject of nephritis for some future occasion, I will only urge the advisability of beginning the treatment of scarlatinal nephritis with a moderate dose, from one-half to one grain (0.03 to 0.06), of calomel, repeated from time to time through the first two or three days. Its purgative effect, if too great, may be stopped by a small dose of opium given after every loose movement.

There are a great many other complications, such as otitis media, purpura, noma, onychia, keratomalacia, etc. Each of them will be discussed in their proper places. Mere combinations with other diseases, such as whooping-cough, measles, varicella, vaccinia, variola, and typhoid fever, do not add to, or alter, the indications for treatment.

At all events, the belief in scarlet fever specifics should be discarded in the present state of our knowledge. Neither magnesium nor sodium sulphite, nor sodium benzoate, nor belladonna has fulfilled the promises of its sponsors. What some special antitoxin will do remains to be seen. Marmorek's antistreptococcus serum is still in its experimental stage, though the number of favorable reports is increasing. If anywhere, an antitoxin is the only possible remedy which can hold out any hope in those cases which perish in a day, sometimes in the first few hours of the illness, under the influence of an overwhelming intoxication, and are not relieved by hot bathing, or purging, or stimulation. My own experience with Marmorek's antistreptococcus serum in very bad septic cases of scarlatina is fairly good. A few desperate-looking cases recovered under its use. Repeated communications from the discoverer arrive at the same conclusion,—viz., that the streptococcus found in man is the same, no matter where found and in what infections. "Varieties" are but apparent. The scarlatina streptococcus is no exception, and yields the same toxin as that formed by the others (it belongs to the group of those diastases which are destroyed by a temperature of 70° C.).

Credé's preparations of soluble silver should be remembered in connection with scarlatina. In 1897 he recommended the soluble silver, first described by M. Carey Lea in 1889, for many sorts of infectious diseases. From being extensively used in puerperal sepsis, it extended its indications to erysipelas, scarlet fever, severe typhoid, pyæmia, etc. As usual, enthusiasm greeted its introduction and indifference scoffed at it. I believe it is of some use, and that it has benefited a good many cases under my observation. A fifteen-per-cent. ointment ("Credé ointment") is rubbed in once or twice daily, half an hour each time, best on those parts on which the integument is thin and the lymphatics superficial and numerous (inner aspect of thighs and forearms). The dose for an adult is one drachm (4.0), for a child from fifteen to twenty grains (1.0 to 1.25). It should be rubbed in until there remains but little discoloration from it, usually half an hour; to accomplish that, the skin should be moistened with a few drops of water. As the preparation ("colloidal silver") is soluble in twenty parts of (sterile) water, a few cubic centimetres of a one-per-cent. solution may be used subcutaneously. A solution of one part in from two to five hundred parts has been injected into a vein, and pills containing one-sixth of a grain (0.01) and one and one-half grains (0.1) of sugar of milk have been given internally: two to an adult, three times a day. My experience is limited to the "Credé ointment."

12. *Measles.*

The virus of measles appears to be more volatile (communication even intra-uterine) than that of any of the other contagious diseases with the exception of influenza. Its communicability appears to be greatest during the prodromal stage, and the invasion takes place, in all probability, through the bronchial mucous membrane. The incubation may last from eight to fourteen days, the first four or five of which may be attended by some fever. During all this time, and during its whole course, the disease is contagious.

Very few cases are seen during the first six months of life. After that it is common, and repeated invasions are frequent. In many seasons the mortality is very trifling; in some epidemics it has reached thirty-three per cent. of all the cases. The first epidemic occurring in regions where measles had not been known previously was found to be very dangerous, and those which occur after long interruptions are likely to prove very severe. Thus, the question whether the well should be separated from the sick will depend a great deal on the severity of the epidemic.

The temperature of the room should be comfortable, about 70° F., a little warmer than in scarlatina, and the air moist. The light ought to be excluded to a certain extent, but not to absolute darkness. For a number of days the child should be kept in bed, unless very restless; in that case it may be taken out, well covered. It is a good rule to keep the patient in bed a week after the disappearance of the fever, and in the house ten days or a fortnight more. Relapses are not uncommon, and those particularly who have an hereditary tendency to tuberculosis ought to be protected from exposure. Especial care must be taken during the cool or rainy season.

Mild cases require mostly a hygienic treatment only; still, every case has its own indications. When there are otitis, bronchitis, pneumonia, or dysentery, it is self-understood that the patient must be kept in bed during the continuance of the complication. Warm and dry weather and a sandy soil will permit a patient to leave the house sooner than would be permitted under other circumstances.

Constipation may demand gentle treatment in the beginning. As a rule, an enema will suffice. Castor oil or the elixir of rhamnus purshiana (Nat. Form.) may sometimes be required. No drastic should be used because of the tendency to diarrhœa or dysentery prevailing in many instances. For the same reason no glycerin should be injected into the rectum.

A convulsion in the beginning of the disease does not always

mean great harm. It takes the place of the chill in the adult, but is more dangerous because of the possibility of cerebral hemorrhages while it lasts. Therefore it ought to be cut short as soon as possible. Chloroform inhalations will relieve the spasm, chloral hydrate internally, or in an enema, the persistent irritability. Warm bathing may be resorted to when, under these circumstances, the eruption is slow in showing itself. The head must be kept cool, the feet should be warmed.

Epistaxis may be let alone while mild. Sometimes it relieves the congested mucous membrane of the nares. When severe it must be stopped.

The organs of circulation do not often suffer in measles. Pericarditis and endocarditis are met with very rarely, but Baginsky reported a case of purulent pericarditis and myocarditis. In epidemics of unusual severity heart-failure is of frequent occurrence. It is to be treated according to the principles laid down in the articles on scarlatina and typhoid fever. A peculiar feature in very severe measles is the frequency of thromboses (microbic?). Indeed, in no other infectious disease are they met with so often as in measles. The thrombi occur in the vulva, in the skin and subcutaneous tissue, about the face as cancrum oris (noma), and on the distal parts of the extremities, particularly the legs. Disseminated purpura is not frequent, but gangrene of the skin is not at all uncommon. The odor of such gangrene, and of cancrum oris, is exceedingly offensive, and requires strong disinfectants and deodorizers. Thymol in solution of 1 to 1000, iodoform in powder or in vaseline ointment, or a mild solution (one to two per cent.) of formalin will be found serviceable. The subject of noma will be discussed later.

What has been called hemorrhagic measles is not always very malignant. In a great many cases it means nothing but the effusion of some hæmatin into the eruption. The complication of the eruption with a simple erythema or with a mild pemphigus is mostly an indifferent matter; with extensive pemphigus it may be dangerous, and require early stimulation.

The respiratory organs suffer mostly in measles. There is always catarrh of the nose, which may lead at an early period to tumefaction of the lymph-bodies around the neck. If such be the case the catarrh should not be let alone, but treated with gentle injections of a mild solution of salt water or boracic acid. The conjunctivitis connected with it requires tepid or cool application or instillation several times a day of a few drops of a two-per-cent. cocaine solution. It should have close attention, for it is sometimes followed by destructive pro-

cesses of the cornea. A moderate amount of bronchial catarrh may be let alone, provided the cough is not very severe; for severe attacks of coughing, even without much congestion or inflammation, may produce bronchiectasis or emphysema. Particularly is this the case when there is complication with pertussis. Here morphine may be given in sufficient doses. Bronchitis is rarely dangerous unless it be capillary. Broncho-pneumonia is always a serious complication and a very frequent one. In a number of cases its course is very rapid, accompanied by cyanosis and a very small pulse. Active treatment is required in these cases. The inhalation of oxygen will now and then bridge over urgent conditions. Warm bathing and cold affusion in a warm bath will be of service, for it is necessary that the patients, particularly small children, should cry. Unless they cry they will suffocate. Stimulant expectorants are in order, such as camphor, benzoic acid, or ammonium carbonate. Ammonium muriate is not sufficient. Cardiac stimulants are required at the same time, such as digitalis, sparteine, camphor, and musk. No depressing expectorants should be given. Antimonials should be avoided, at any rate.

There is always some catarrh of the larynx and sometimes a pseudo-membranous laryngitis holding, or caused by, either cocci or Klebs-Löffler bacilli. In the latter case the treatment is that of diphtheritic deposits. (See article on Diphtheria.) When the croupous symptoms are very urgent the air of the room ought to be filled with steam, and the patient encouraged to drink as much as possible, particularly alkaline waters. The internal administration of potassium iodide in moderate doses will do good service occasionally. So will an opiate, particularly at bedtime. In connection with the catarrhal affection of the nose, otitis is seen now and then. According to Schwartze, three per cent. of all the cases of otitis can be traced to measles.

During all this time the kidneys ought to be watched. It is true that nephritis is by no means a frequent occurrence in measles, but it has been found often enough to justify the greatest attention.

Cerebral complications have no special indications. Rules for their treatment will form the subject of a future discussion. Meningitis, as one of the localizations of tuberculosis which often follows measles, is not infrequent.

13. *Rötheln* (*Rubella*).

It has not yet conquered an undisputed place in nosology. There are still many who do not consider it a separate disease. The

eruption looks mostly like measles, sometimes like erythema, or urticaria, or scarlatina. According to some, it begins, after an incubation of from nine to eighteen days, on the face; others deny this, and speak of a suffused blush only. It lasts one or two days, becomes rather yellowish, and is followed by a very mild desquamation. Many cases have been described which were connected with catarrh of the respiratory organs, of the conjunctiva, and of the throat (by no means always present; sometimes only a day before the eruption takes place), with glandular swellings (submaxillary, mastoid, axillary, inguinal) and very moderate fever. These are the cases which have been described under the name of rubella morbillosa, and would be diagnosticated by many, myself included, not as rötheln, or rubella, but as a mild form of measles. The redness of the fauces is not always intense; a punctated exanthema of the palate is frequently found; diazo-reaction is rare. If there be any such special disease, no particular treatment is required, except that of complications (catarrh, coryza, conjunctivitis, bronchitis, meningitis, arthritis, albuminuria), most of which are rare.

14. *Mumps.*

Its incubation lasts a fortnight, and sometimes three weeks. Thus prevention by isolation can seldom be accomplished. The infection must be presumed to take place through the Stenonian duct; that is why a careful hygiene of the mouth should be considered the best preventive. Often the patients do not feel very sick. Many do not take to their beds. In many cases covering the swelling with cotton is sufficient to protect it. When there is a great deal of pain narcotic applications may be made or ice applied. The latter certainly reduces the amount of swelling, although it may not shorten the course of the disease. I have often found the application of iodoform collodion (one to eight or ten), made twice a day over the whole surface, quite successful. When there is a tendency to suppuration, warm applications will favor it. Unless perforation take place into the mouth or the external ear, a large incision must be made in time and treated antiseptically. The diet must be that of all fevers,—fluid. A consecutive anæmia which is more frequent than the apparent mildness of the affection would seem to explain requires generous feeding, iron, nux, and a change of climate. Complications with otitis, nephritis, or orchitis have their own indications.

15. *Variola. Variolois.*

Vaccination ought to take place early, for genuine variola in the first year is quite frequent among those not vaccinated. There are also many cases of variola between the eleventh and twelfth years among those not vaccinated. The small-pox reports of the German empire emphasize the fact that no case of variola (variolois) occurring in vaccinated children who had more than two cicatrices terminated fatally; nor was there a fatal case among those who were revaccinated. There was no fatal case, where the vaccination marks were very distinct, between the thirteenth and forty-fourth years. The fact that none died that exhibited more than two scars appears to prove that the single mark customary among us is not sufficient. At all events, many children vaccinated in the first year of life will undergo a successful revaccination when they are only from four to six years old. At that time revaccination ought to be tried, and, if unsuccessful, should be repeated from year to year.

Disinfection of bedding, clothing, furniture, and dwelling, and isolation, are now recognized as absolute necessities in variola more than in any other disease. Thus little difficulty is caused by ill will or ignorance. Patients with variola ought to be kept cool and washed frequently with cold or tepid water; now and then an ether spray or an ice-bag over sore parts will be found quite agreeable. Fever is sometimes very high, and ought then to be modified by antipyretics. The delirium is sometimes so violent, bordering on mania, that the inhalation of chloroform or the administration of chloral hydrate is required. The influence of universal compulsory vaccination cannot be shown better than by the report of Baginsky, who has not met, in children, a single case of genuine variola and but few of variolois. The eyes ought to be covered with cold compresses, sore eyelids covered with vaseline or zinc ointment. Superficial sores on the skin, and those which yield an offensive odor, should be treated with thymol, salicylic acid, or iodoform. Scabs must be removed from the nostrils so as to facilitate respiration; abscesses should be opened in time and disinfected, and complications treated. Septic symptoms require strong stimulants, general and cardiac. Two of the most severe complications are œdema of the larynx and laryngitis, which may require, on short notice, tracheotomy or intubation.

After the disappearance of the feverish stage the patient ought to be bathed once every day or every other day, and inunctions of fat made all over the surface until desquamation is complete.

16. *Varicella* (*Chicken-Pox*).

When varicella vesicles are in the mouth, they require washes with potassium chlorate (1 to 30 or 50); when on the vulva, dermatol powder, or dermatol with cold cream (1 to 6 or 8). Constipation and gastric symptoms should be relieved. As the disease is very contagious, and not always mild, the child ought to be isolated, and on no account sent to school. Dissemination in schools and in dispensaries is an every-day experience.

Bad cases must be kept in bed. Very few require medicinal treatment, except when there is local or disseminated gangrene, which I and many others have seen. In such cases local antiseptic applications are required: aluminum acetate (1 to 100), potassium permanganate (1 to 250 or 1000), formalin (1 to 50 or 100), or an ointment of resorcin (1 to 20 or 40), salicylic acid (1 to 40), or iodoform (1 to 6), or as a powder. Besides, alcoholic and other internal stimulants are demanded. A small number of instances of consecutive nephritis are now on record, as also in vaccinia; thus the urine ought to be examined in every case for several weeks.

17. *Vaccinia.*

Irregularities in the development of vaccinia cannot always be prevented. As a rule, the inflamed areola and fever which indicate the beginning of immunity appear on the eighth or ninth, sometimes on the eleventh day. In the newly-born they are not well pronounced, and the success of the vaccination becomes doubtful. Still, it should be obligatory during an epidemic. The appearance of the vaccination vesicles (and pustules) will be delayed sometimes without an apparent cause. Accidentally (transmission by scratching) they may come on distant parts. A universal eruption (from no such cause) has been reported by Colcott Fox (*Lancet,* 1893, vol. i. p. 362), by Baginsky ("Lehrb. d. Kind.," 5th ed., p. 178), and by others. Very high temperatures with nervous symptoms may require, in rare instances, an antipyretic treatment; they accompany mostly a high degree of local inflammation, which will be soothed by the application of cool water or of diluted aqua plumbi. Ulcerations result mostly from uncleanliness and from scratching. They may be prevented by great care and cleanliness in vaccination, which requires the same asepsis as any other operation. No plaster should be applied before the wound is perfectly dry. Moreover, they appear to be more frequent when humanized rather than animal lymph is used. Iodoform or dermatol, in powder or in ointments, is indicated. The latter should

always be preferred. When the former is employed, however, no lymph should be taken from a vesicle that has been opened hours before. Nor does it appear to be safe to use vaccine which has passed through more than three individuals. Axillary lymphadenitis disappears, with very rare exceptions, with the local inflammation. Rhachitis, scrofula, and tuberculosis, when they are observed after vaccination, are accidental. Syphilis has been transmitted when the serum taken from the arm contained blood of a syphilitic infant; that is another reason why animal lymph should uniformly be preferred. Erysipelas does not always originate from the margin of the local inflammation, but sometimes at some distance. Neither in regard to prevention nor to treatment can anything be said in addition to the remarks on erysipelas in general (p. 224). Diphtheria has arisen from vaccination wounds, when we knew less about its communicability and its preventability, and were more careless than we are (or ought to be) at present. The local treatment of such accidents (or sins) will be discussed under Diphtheria. Septicæmia may occur, nephritis also. At the very height of the reactive inflammation, or during the week succeeding it, urticaria may appear, or small or large vesicular eruptions, which are liable to disappear with the desiccation and falling off of the scabs. They should be considered as nervous outbreaks only, and not in the same light as an eczema —local or universal—which dates from the time of vaccination. The latter should not be taken for its real, but for its proximate cause (the fever) and opportunity. A case of universal psoriasis which originated in a fresh vaccination scar has been reported by Bethman.

18. *Erysipelas.*

It is so communicable that even a physician may carry it. Still, it is not probable that the healthy surface can be attacked by it. As in most cases of diphtheria, so in all cases of erysipelas, a sore surface forms the resting-place of the microbe (streptococcus). Erysipelas may make its appearance on an eczematous skin. On the head it sometimes escapes notice for some days. Excoriations of the anus and sexual organs, or slight injuries done by a pin or by the finger-nail, are sufficient to cause it. It often originates in the intertrigo of the infant or in the neighborhood of a vaccination mark. In the latter case it seldom appears immediately after vaccination, very often not before the second week or later. Chronic nasal catarrh is a frequent cause. Some children will have erysipelas extending over both cheeks one or more times every year. Small or large operation wounds are a frequent source; so is diphtheria, with which erysipelas

is occasionally complicated, and many cases are seen to take their start from a tracheotomy wound. In the newly-born it appears, as a rule, on or near the navel, and is generally connected with universal sepsis. Prevention of the disease will mainly depend on the removal or relief of the several causes which have been enumerated.

Every case of erysipelas should be isolated, and diet and general treatment be regulated on general principles. The local treatment may be quite simple in some cases. The erysipelatous surface may simply be covered with soft cotton, or a powder of talcum, or of amylum, or one part of salicylic acid with perhaps ten parts of zinc oxide and twenty-five of amylum. Applications of lead wash and opium or of zinc sulphate have been in general use for a long time; also of solutions of sulphate of iron; now and then the application or inunction of blue ointment. The latter I cannot advise because of the pain and irritation resulting. The inflamed surface has been covered with collodion. Infants and children will not bear it. Ferreire has used, in a case of erysipelas on the leg of a child of two years and a half, a mixture of one part of resorcin in seven thousand five hundred of traumaticin (0.008 to 60.0). Cold applications have been made, ice has been applied, and, where the extent of the erysipelas is limited, to great advantage. Neither the saturated solution of silver nitrate nor the solid caustic has been of advantage.

Hueter recommended many years ago the subcutaneous injection of a two-per-cent. solution of carbolic acid round the inflamed surface, and claimed to have confined every case within its original limits. In place of that, I advised the application, not on, but around the erysipelatous area, of a mixture of one part of carbolic acid in eight, ten, or fifteen parts of oleic acid. I have treated many cases in that way, and most of them quite successfully. The mixture was rubbed into the surface around the diseased part at frequent intervals, or, when the erysipelas was confined to the extremity, a band or compress soaked in the mixture was applied just outside the diseased part, not infrequently with the result of stopping the process. Instead of the carbolic acid as administered by Hueter, Ducrey uses a solution of one part of corrosive sublimate in one thousand of water, and repeats the injections, which are to be made three centimetres apart, after twelve hours. A better plan, however, is, after all, to apply carbolic acid, one part dissolved in ten or fifteen of alcohol, directly to and beyond the surface, every hour or every few hours. It is readily absorbed, and may do good, but also harm by affecting the

kidneys. Thus in every case where it is to be applied the kidneys should be watched carefully, and particularly in young children.

Washing with and applications of a solution of hydrargyrum bichloride in water (1 to 2000) have been highly recommended; also an ointment of resorcin five parts and vaseline and adeps lanæ hydrosus (lanolin) āā ten parts. I have seen a few cases doing well with it, but I have been better pleased with a mixture of equal parts of ichythyol (ammonium sulpho-ichthyolate) and vaseline. In place of this a solution of ichthyol (2 to 10) in equal parts of ether and glycerin (10 to 30) has been employed. The compound tincture of benzoin may be painted all over and beyond the diseased surface once every hour or two hours. Absolute alcohol (ninety-nine per cent.), applied frequently, has rendered me excellent service in limiting the area of infection. That is what is aimed at and accomplished by the hedging in of the morbid process, an operative procedure invented by Kraske and Riedel, and introduced to us by Willy Meyer. Railfence-like scarifications are made under an anæsthetic, down to the rete Malpighii, partly in the diseased and partly in the healthy surface, double so as to cross one another and allow no loophole. Then corrosive sublimate (1 to 500) is rubbed into and kept applied to the wounds, in most cases with almost instantaneous, at all events rapid, success. The modification of this procedure, which is practised in one of the large children's hospitals of Germany, by incising the diseased part and squeezing with the intention of removing the œdematous infiltration of the tissues, then scarifying deeply around it and rubbing in ichthyol, and repeating that " treatment" until scurfs are formed, appears to get dangerously near brutality.

The internal administration of the tincture of chloride of iron has been considered a specific by many. That opinion is certainly based on an exaggeration of its merits. The preparation is, however, an antifermentative, and, while being a vascular stimulant, does not cause a rise of temperature in bad infectious diseases as it would do in the milder forms of fevers.

Abscesses complicating erysipelas require large incisions and antiseptic treatment. Erysipelas of the neck is very often complicated with œdema of the larynx, and may require scarification, tracheotomy, or intubation.

Meningitis, which frequently accompanies erysipelas of the scalp or of the naso-pharynx, has its own indications. It should not be forgotten, however, that many cerebral symptoms simulating meningitis, and mostly attended by high temperatures, are merely those of the toxin infection, and an antiseptic treatment may do good. The

recovery of a young man observed with such symptoms lately I attribute solely to the large quantities of brandy administered. In such cases an efficient streptococcus antitoxin that Marmorek is trying to furnish would be of incalculable benefit, and Credé's ointment and his other preparations of soluble silver are certainly worth trying. The diet should be more stimulant (broths, alcohol in great dilutions) than in (the beginning of) most infectious diseases.

19. *Diphtheria.*

The morphological structure of almost all the pseudo-membranes in the throat, nares, larynx, and other places is identical. They have mostly been studied in the throat, where they are most frequently found. They consist of finely reticulated fibrin holding exudate cells, leucocytes, and some erythrocytes. When they are superficial, it is the epithelial protoplasm which is thus transformed; when they are deep-seated, with a tendency to necrosis, ulceration, and, finally (in cases of recovery), cicatrization, it is the fibrillar basic substance of the connective tissue, mostly of the mucous membrane, sometimes also of the submucous and deeper structures. This view, which underlies the discussions in my "Treatise on Diphtheria" (1880), has been again forcibly demonstrated by P. Baumgarten (*Berl. klin. Woch.*, Nos. 31 and 32, 1897). For years, however, it has been customary to differentiate between those pseudo-membranes which are caused by, or accompanied by, the Klebs-Löffler bacillus and those which contain cocci only. That these microbes do not establish any disease by their mere presence—that, on the contrary, they are met with to an indefinite degree in the mouths of the healthy—is well understood. Max Kober (*Zeitschrift f. Hyg. u. Infect.*, vol. xxxi.) reports Klebs-Löffler bacilli in 18.8 per cent. of all people in contact with diphtheria patients. Personally he found them in eight per cent. People not in contact with such patients harbored Klebs-Löffler bacilli in from 0.85 to seven per cent. To be considered pathological, or pathogenic, their presence in a pseudo-membrane in whatever stage of development is required. The Klebs-Löffler bacillus is found in its superficial layers only, not throughout the whole thickness of the pseudo-membrane, and not towards the macerating period; the coccus pervades its whole substance, and is even found in greater numbers in the deeper layers. To explain the absence of bacilli from these, it is assumed that they are destroyed by other microbes. Still, they are asserted—and that assumption has become an axiom, an article of faith—to evolve the toxin which gives rise to all the symptoms and dangers of certain forms of constitutional diphtheria.

Pseudo-membranes with Klebs-Löffler bacilli are called by pretty general agreement diphtheritic, those with cocci or with the "bacilli of pseudo-diphtheria" pseudo-diphtheritic. The "pseudo-diphtheritic bacillus" differs from the Klebs-Löffler very little, but is asserted by many to constitute an essential variety altogether. Such differences as these, when met with, for instance, in the case of tubercle bacilli, are not admitted to be different varieties, but only modifications of shape with modified virulence. In diphtheria the bacillus of "pseudo-diphtheria" is relegated to a second, inferior class, in spite of many objections. Lately, W. Spierig (*Zeitschrift f. Hyg.*, vol. xxxi.) demonstrated that in a diphtheria epidemic all transitions were found between pseudo- and Klebs-Löffler diphtheria. Besides, cases may be met with that are *only* "pseudo-diphtheria," and still are followed by diphtheritic paralysis.

Those cases which carry both bacilli and cocci are called mixed infections. It has been asserted that the second class is of little virulence and attended by but little danger. This opinion leads to cruel mistakes in their management both by boards of health and such medical men as are influenced by them. For not only are many uncomplicated cases very grave and fatal, but the mixed infections are the very worst forms met with in practice. Moreover, the streptococcus cases *are* contagious. Still, it is important to mention at once that the differentiation has its great practical weight. For it is only the first class, the bacillary diphtheria, and the third which are favorably influenced by antitoxin. The streptococcus variety does not share that advantage. What I have to say of treatment, however, refers—always with the exception of antitoxin—to all varieties. It remains for the attentive and experienced reader to apply it to the individual case, mild or serious, local or generalized, acute or chronic. Between these two latter varieties, however, accurate differentiation is impossible, because diphtheria has no limited course. There are cases that last a week or less; there are those that take many months. Not a few of the latter (see my "Treatise") require, besides the general treatment, a very careful local diagnosis and treatment, as they are in part caused or prolonged by local ulceration, tonsillar or peritonsillar abscess, or concrement or other foreign body.

Local diphtheritis, constitutional diphtheric infection, and diphtheric sepsis are different degrees of the same disease. The first may run a fairly mild course, or be the initial stage of the second and third. The treatment, accordingly, may be simple or complicated, successful or in vain. It should be preventive, local, increase the

power of resistance to the toxin prepared by the bacilli and floating in the circulation and in the tissues, be directly antidotal, and be aimed against the results of the disease, such as swelling of the lymph-nodes, laryngo-stenosis, nephritis, and paralysis. In many cases it may be necessary to fulfil only one or two of these indications; in others a combination of measures and remedial agents may be demanded. Diphtheria is one of the diseases in which it is easy to do too little, but also to kill the patient in the hurry of fighting the disease.

The treatment should be mainly preventive. In the light of the fact that the contagion of diphtheria need not be direct, but may be carried by persons who are not themselves affected, it will readily be seen how difficult it is to prevent or to escape it. Herbert Peck reported (London *Lancet,* December 14, 1895) the case of house B, which was probably infected by the father of the family, who himself did not suffer from the disease. His son did not suffer, though there were germs in his throat, but he carried diphtheria to house C, whence it was taken to house D. This is only an instance of a large class. To what extent the bacilli and cocci in the mouths of healthy persons, where they are frequently found, may infect others it is yet impossible to tell. That may depend on circumstances concerning which we have not yet much knowledge. We know, for instance, that saliva is to a certain extent a disinfectant, but also that it is least so for the diphtheria bacillus (and the pneumococcus). It is also probable that a recent invasion is not so dangerous as older ones, which attain a higher degree of virulence when remaining some time in the crypts of the tonsils (E. Lexer, *Arch. klin. Chir.,* 1897, vol. liv.).

As a preventive measure* every individual case of diphtheria demands isolation, during the winter on the upper floor of the house; the windows should be open as much as possible, furniture of any kind reduced to the least possible quantity, the room changed every few days and the bedding frequently.

To what extent the infecting substance may cling to surroundings is best shown by the cases of diphtheria springing up in premises in which diphtheria had not occurred for a long time, but which had not been interfered with; and best, perhaps, by a series of observations of autoinfection. When a diphtheritic case has been in a room for some time, the room, bedding, curtains, and carpets are infected. The child is getting better, has a new attack, may again improve, and is again stricken down. Thus I have seen them die; but also improve

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* See the New York Health Department's recommendations and rules (p. 207).

immediately after having been removed from that room or that house. If possible, a child with diphtheria ought to change its room and bed every few days.

The sick in crowded houses and quarters ought to be transferred to a special hospital, which ought not to be too large. That is why there should be many of that kind, as I hoped there would be when I commenced the agitation for the new departure twenty years ago (President's address, *Med. Soc. State of N. Y. Trans.*, 1882). Meanwhile the Willard Parker Hospital of New York, with its sixty beds, has been the only one of its kind for many years; and only one-half of the money requested by the present efficient Health Department of New York City for necessary additions to fever hospitals and disinfectant plants has been appropriated. The large amount of good the hospital is doing would grow in geometrical progression if there were, as there ought to be in a large and ambitious metropolis, half a dozen institutions of the same class, not only in behalf of the poor, but of the well-to-do also, both townspeople and strangers. I have advocated for dozens of years the erection of a hospital for the accommodation of infectious diseases breaking out among the thousands of strangers staying in New York City at all times. So long as there is no place to go to, the cases of scarlatina, diphtheria, etc., are hidden in, and are infecting, the boarding-houses and hotels and the population at large. At present there is only one small private hospital of that kind in operation.

When diphtheria breaks out in a house, either private or tenement, with no facility of isolation and no hospital in which to seek refuge, the well should be removed to a healthy place; in large cities, temporary homes ought to be provided for that purpose, to benefit the children of the poor. If the rich would but remember that their children will be affected through the many links between them and the poor (servants, messengers, schools, dresses brought home from the tailor or seamstress, or purchased in the stylish and expensive establishments which give out the work to tenement working-people and sweat-shops), their very egotism would compel them to do in their own interest what humanity does not appear to suggest to them. The sick should be reported to the health boards at once. The well children of a family with diphtheria must not go to school or church until a fortnight—the possible period of incubation, which some extend to twenty days—has elapsed since their last contact with the sick. Schools must even be closed now and then when an epidemic makes its appearance; teachers should know how to examine a throat. In this respect the regular inspection of schools by medical men, as

introduced in New York, will prove an infinite blessing to the community. The condition of the house is to be examined into and improved; attendants, servants, nurses and cooks, seamstresses and laundresses, teachers, shopkeepers, restaurant-keepers, barbers, hairdressers, with their mild diphtheritic attacks and strong pecuniary interests, are frequent sources of infection. In times of common danger, public places, theatres, ball-rooms, dining-halls, public vehicles, hackney-coaches, and railroad-cars should be examined by the authorities. There must be no clashing permitted between the public good and the individual money-bag. Clothing, bedding, room, and house should be thoroughly disinfected; articles used in the sick-room burned or soaked in a disinfecting fluid in the room, not carried over the house in a dry state; they are known to have started epidemics of diphtheria where the disease was unknown, thousands of miles away, after months or years, when carried in travellers' trunks. The rooms should be thoroughly disinfected after a case terminated favorably or unfavorably; the corpse disinfected, the funeral private, nothing removed from the house unless disinfected, no pieces of carpet thrown away to be picked up by beggars, no mattresses benevolently donated to the unsuspecting poor, and books from circulating libraries should be disinfected every time when coming from an infected house, and from time to time, on general principles, during the reign of an epidemic of diphtheria.

Prevention can accomplish a great deal for the individual. Diphtheria will, as a rule, not attack a healthy integument, be this cutis or mucous membrane. The best preventive is, therefore, to keep the mucous membrane in a healthy condition, as I have tried to practise and teach these more than forty years. Catarrh of the mouth, pharynx, and nose should be treated in time. Many a chronic nasal catarrh, with big glands round the neck, requires sometimes but two or three daily salt-water irrigations (1 to 130, warm) of the nose, and, if the children be large enough to do so, gargling. Particular attention should be paid to the following facts. The water, if without salt, irritates; so does water cold or too warm. An average temperature of 90° F. will be found satisfactory. This treatment, however, must be continued for many months, and may require years. Still, there is no hardship in it and no excuse for its omission. A. Caillé's many eloquent appeals have done much to popularize it. The nasal spray of a solution of silver nitrate (1 to 500 or 1000), when there are erosions, will accelerate the cure. Its application should be repeated every other day for some time. Not infrequently has a treatment which was considered obsolete when I was young been of

great service to me. It consists in the internal administration of the tincture of pimpinella saxifraga. It is certainly an efficient remedy in subacute and chronic pharyngitis and laryngitis. I generally give it to adults, diluted with equal parts of glycerin and water, a teaspoonful of the mixture every two or three hours, with the warning that no water must be taken soon after; children in proportion.

Large tonsils should be resected and adenoid growths removed while there is no diphtheria; for during an epidemic every wound in the mouth is liable to become diphtheritic, and such operations ought to be postponed, if feasible. The scooping out of the tonsils, for whatever cause, I have given up since I became better acquainted with the use, under cocaine, of the galvano-cautery. From one to four applications to each side (also to the postnasal space) are usually sufficient for every case of enlarged tonsils or lacunar or deep-seated follicular amygdalitis ("tonsillitis"). It is advisable to cauterize but one side at a time, to avoid inconvenience in swallowing afterwards, and to burn from the surface inward. Cauterization of the centre of the tonsils may result in swelling, pain, and suppuration, unless the cautery is carried entirely to the surface; that is to say, the scurf must be on, or extend to, the surface, not remain inside the tissue. Another precaution is to apply the burner cold, press it on, and then heat. A strong hook, bent in a convenient angle, introduced into a follicular fistula, and torn through the superjacent tissue, will also cause cicatrization and a cure.

Nasal catarrh and proliferation of the mucous and submucous tissues may require the same treatment, but, in my experience, the cases which demand it are less frequent than those in which the tonsils need correction.

The presence of glandular swellings round the neck should not be tolerated. They and the oral and mucous membranes affect one another mutually. Most of them could be prevented if every eczema of the head and face, every stomatitis and rhinitis resulting from uncleanliness, injury, or whatever cause, were relieved at once. Painstaking care of that kind would prevent many a case of diphtheria, glandular suppuration, deformity, or pulmonary consumption.

For its salutary effect on the mucous membrane of the mouth, potassium or sodium chlorate, which was long claimed by some to be a specific in diphtheria, or almost so, is counted by me among the preventive remedies. If it be anything more, it is an adjuvant only. It exhibits its best effects in the catarrhal and ulcerous condition of the oral cavity. In diphtheria it preserves the mucous mem-

brane in a healthy condition or restores it to health. Thus it prevents the diphtheritic process from spreading.

This process is seldom observed on healthy, or apparently healthy, tissues. The pseudo-membrane is mostly surrounded by a sore, hyperæmic, œdematous mucous membrane, to which it will then extend. Indeed, this hyperæmia precedes the appearance of the diphtheritic exudation in almost every case. The exceptions to this rule are formed by those cases in which the virus may take root in the interstices, pointed out by Stoehr, between the normal tonsillar epithelia. Very many cases of throat disease occurring during the prevalence of an epidemic of diphtheria are those of simple pharyngitis, which develops into diphtheria under favorable circumstances only. These throat diseases are so very frequent during the reign of an epidemic, that in my first paper on diphtheria (*Amer. Med. Times,* August 11 and 18, 1860) I based my reasoning on two hundred cases of genuine diphtheria and one hundred and eighty-five of pharyngitis without a visible membrane.

These cases of pharyngitis, and those of stomatitis and pharyngitis which accompany the membranes, are benefited by the local and general effect of potassium chlorate. When the surrounding parts are healthy or return to health, the pseudo-membrane remains circumscribed. The generally benign character of localized tonsillar diphtheria, which is apt to run its full course in from four to six days, has in this manner contributed to secure to potassium chlorate the undeserved reputation of being a remedy, *the* remedy, in diphtheria. The dose of the salt must not be larger than fifteen grains (one gramme) for an infant a year old, not over twenty or thirty (1.5 to 2.0) for a child from three to five years, in the twenty-four hours. An adult should not take more than one and a half drachms (six grammes) daily. These amounts must not be given in a few large doses, but in refracted doses and at short intervals. A solution of one part in sixty will allow a teaspoonful every hour or half a teaspoonful every half-hour in the case of a baby one or two years old.

It is not too late to raise a warning voice against the use of larger doses. Simple truths in practical medicine do more than simply bear repetition: they require it. For though the cases of actual potassium chlorate poisoning are no longer isolated, and ought to be generally known, fatal accidents are still occurring even in the practice of physicians. When I experimented on myself with half-ounce doses, nearly half a century ago, the results were some gastric and intense renal irritation. The same were experienced by Fountain,

of Davenport, Iowa, whose death from an ounce (30.0) of the salt has been impressively described in Alfred Stillé's "Materia Medica," from which I have quoted it in my "Treatise on Diphtheria." His death from potassium chlorate induced me to prohibit large doses as early as 1860. In my contribution to Gerhardt's *Handbuch der Kinderkrankheiten,* vol. ii., 1877, I spoke of a series of cases known to me personally. In a paper read before the Medical Society of the State of New York in 1879 (*Med. Record,* March 15) I treated of the subject monographically, and alluded to the dangers attending the promiscuous use of the drug, which had descended into the ranks of domestic remedies; and finally, in my "Treatise" (New York, 1880), I collected all my cases and the few then recorded by others. Since that time the recorded cases have become quite numerous. The facts are undoubted, though the explanations may differ. The probability is that death occurs from methæmoglobinuria produced by the presence of the poison in the blood (Marchand, 1879), and consecutive nephritis, though Stockvis has tried, by a long series of experiments, to fortify my original assumption that the fatal issue was due to primary acute nephritis.

There is in every individual case a certain danger which, though it be common enough in other exhausting diseases, is of particular moment in diphtheria, where it is most frequent, even in apparently mild cases. It may be averted by meeting it early. It is heart-failure. When it has occurred, the indications for treatment become as clear as they are urgent but often futile. When it is simply feared, a preventive treatment will save many a case.

Heart-failure is usually developed gradually. It is foreshadowed by an increasing frequency and weakness of both heart-beats and pulse, by an occasional intermission, by unequal frequency of the beats in a given period (say of ten seconds), or by the equalization of the interval between systole and diastole and diastole and systole. This latter condition, which is normal in the embryo and fœtus, is always an ominous symptom; so is the too close proximity of the second sound (so as to become almost inaudible) to the first.

Heart-failure is due, besides the influences common to every disease and every fever, to tissue changes in the myocardium, in the nerves, in the endocardium, and to the gradual formation of blood-clots. These changes may be caused by the ill-nutrition of the tissues resulting from every septic condition of the blood, or to specific alterations due to the diphtheritic process. Failure may ensue either after having given warning or without any. Thus, every case of diphtheria ought to make us anxious and afraid. Indeed, there is

no safety and no positive prognosis until the patient is quite recovered, and even advanced beyond the period at which paralysis may develop.

Whatever enfeebles must be avoided; absolute rest must be enjoined. The patients must be in bed, without excitement of any kind; take their medicines—which ought to be as palatable as possible—and their liquid food and evacuate their bowels in a recumbent or semi-recumbent position; crying and worrying must be prevented; the room kept airy and rather dark, so as to encourage sleep if the patients be restless; and restless they are, unless they be under the influence of sepsis, and thereby subject to fatal drowsiness and sopor. In no disease, except, perhaps, in pneumonia, have I seen more fatal results from exertion on the part of the sick, or from anything more fatiguing than a sudden change of posture. Unless absolute rest be enforced, neither physician nor nurse has done his duty. The latter must avoid all the dangers attending the administration of medicines, injections, sprays, and washes. Preparations for the same must be made out of sight; every application should be made quickly and gently. On no account must a patient be taken out of bed for that purpose. I know of children dying between the knees of nurses who called themselves trained and had a diploma.

Pharmaceutical preparations, such as digitalis, strophanthus, sparteine, caffeine, besides camphor, alcohol, and musk, should not be postponed until feebleness and collapse have set in. These are at least possible, even probable; and this is certain, that a cardiac stimulant will do no harm. It is advisable to use it at an early date, particularly in those cases in which, perhaps, antipyrin or phenacetin —the indications for which are certainly rare, as excessive temperatures are very exceptional—is given. Besides, it is not enough that the patients should merely escape death; they ought to get up, *cito, tuto, et jucunde,* with little loss and speedy recuperation; a few grains of digitalis or their equivalent—preferably a good fluid extract —should be given, in a pleasant and digestible form, daily. When a speedy effect is required, one or two doses of two or four minims each are not too large, and must be followed by smaller ones. When it is justly feared that the effect of digitalis is too slow, I give, with or without it, strophanthus, in doses of from one to six drops of the tincture, or sparteine sulphate. Of the latter an infant a year old will take one-tenth or one-fourth of a grain (six or fifteen milligrammes) four times a day as a matter of precaution, and every hour or two hours in an emergency.

Of the same importance are alcoholic stimulants. The advice to

wait for positive symptoms of heart-failure and collapse before employing the life-saving stimulant is bad. There are cases which get well without treatment, but we do not know beforehand which they will be. No alleged mild case is safe until it has recovered. When heart-failure has once set in—and it will often occur in apparently mild cases—our efforts are too often in vain. Thus alcoholic stimulants ought to be given early and often, and in large quantities, thoroughly diluted. There is no such thing as danger from them or intoxication in septic diseases. A few ounces daily may suffice; but I have often seen ten ounces (300.0) daily of brandy or whiskey save children who had been doing badly with three or four (90.0 or 120.0).*

Caffeine or, in its stead, coffee is an excellent cardiac tonic, except in those cases in which the brain is suffering from active congestion. For subcutaneous injections caffeine and sodium salicylate (or benzoate), which readily dissolves in two parts of water, is invaluable for emergencies, in occasional doses of from one to five grains (six to thirty centigrammes) in from two to ten minims of water. From five to twenty grains (0.3 to 1.25) of camphor may be given daily, as camphor-water, or in a mucilaginous emulsion, which is easily taken. It does not disturb the stomach as ammonium carbonate is apt to do. For rapid effect it may be administered hypodermically in four or five parts of sweet almond oil, which is milder and more convenient than ether. Strychnine may be added regularly from the beginning of danger, and mainly in cases with little increase of temperature. Its effect is more than momentarily stimulating. A child of three years will take one-hundredth of a grain (one-half milligramme) three times a day, and more in an urgent case, and then subcutaneously. But the very best internal stimulant in very urgent cases is musk. I prefer to give it from a bottle, in which it is simply shaken up with a thin mucilage. In appropriate cases it ought to be given in sufficient doses and at short intervals. When ten or fifteen grains administered to a child one or two years old within three or four hours will not restore the heart's action to a more satisfactory standard, the prognosis is very bad. One of the latest

* This has been quoted lately from a former edition of this book, as a sin or a crime, by Kassowitz. He might have quoted my name in connection with his statement. If I have performed any creditable acts in my life, my recommendation of large quantities of pure alcoholic beverages in diphtheria is among them. No "theoretical reasoning," no "experiments" outweigh clinical experience repeated thousands of times. Let Kassowitz or any other prohibitionist find me a clinician of renown who would wish to do without alcohol.

stimulants, highly praised, is validol (containing thirty per cent. of menthol). A few drops are to be given in acute collapse, with flying pulse, etc., and are credited with great successes.

The *local treatment* of the pseudo-membranes of the fauces is a subject of great importance. To still look upon them as an excretion which needs no interference is incorrect. If it were possible to remove or destroy them, it would be a great comfort; but they can be reached only in certain places, and just in those in which they do least harm. Pseudo-membranes on the tonsils, when circumscribed, are least dangerous. Almost all circumscribed forms of tonsillar diphtheria are among the most benign, at least so long as the process does not extend. Most cases of the kind run their mild course in from five to seven days, and it is these which have given rise to the many proposals to tear, scratch, cauterize, swab, brush, and burn. There are cases which do not show the harm done. But neither the galvano-cautery, nor carbolic acid, nor tannin and glycerin, nor iron perchloride or subsulphate can be applied with leisure and accuracy to the membrane alone, except in the cases of very docile and very patient children. In almost every case the surrounding epithelium is scratched off or injured, and thus the diphtheritic deposit will spread. Besides, the pseudo-membrane of the tonsil is in part altered surface tissue (it always is wherever the epithelium is pavement), and not deposited upon the mucous membranes, from which it might easily be detached; it is embedded in the tissue. Whatever is done must be accomplished without violence of any kind. Nasal injections or irrigations can be made so as to wash the posterior pharynx and the tonsils sufficiently, and thus render useless the special treatment directed exclusively to the throat. Besides, such treatment is easier, meets with less objection, and gives rise to less exhaustion than the forcible opening of the mouth. This fact is of great importance, as I shall show in connection with the local treatment of the nasal cavity. Where it is possible to make local applications without difficulty, the membrane may be brushed with tincture of iodine several times daily, or with a drop of rather concentrated carbolic acid. Of powders I know only one the application of which is not contraindicated,—viz., calomel, perhaps also iodol. Even this may irritate by its very form. Everything that is dry irritates and gives rise to cough or discomfort. Whatever has, besides, a bad taste or odor, such as sulphur, iodoform, or quinine, must be avoided. *Quidquid delirant medici plectuntur ægroti.* Sugar has been recommended as a panacea, also table salt (!).

In bad cases of septic diphtheria applications of the tincture of the sesquichloride of iron have been highly recommended. The frequent doses of the tincture of chloride of iron introduced by me (see below) have the same, if no better, local effect. Löffler's solution of alcohol sixty, toluol thirty-six, and tincture of iron sesquichloride four parts is not preferable to many others. The injections of carbolic acid or chlorine-water into the tissue of the tonsils are objectionable in most cases, if only for the reason that they strike the least dangerous locality.

Hydrogen dioxide is a two-edged sword. It is certainly a disinfectant, but in contact with mucous membranes it coagulates the soluble albumin of the tissue. More or less extensive discolorations and pseudo-membranous deposits are caused by it, which are quite often large enough to be mistaken for diphtheritic. When they fall off there are sore surfaces ready for another invasion of bacilli or cocci. Many such cases get well only when the dioxide is stopped and a simple local treatment with lime-water substituted. By some the injurious action is attributed to the presence of acid in the drug, while others assert that the acidity is the cause of its beneficial effect (!).

For the purpose of dissolving membranes papayotin, or papain, has been employed. It is soluble in twenty parts of water, and may be injected, sprayed, or brushed on. I have used it in greater concentration, in two or four parts of water and glycerin, in the nose, throat, and, through the tracheotomy tube, in the trachea. One of the irrepressible drug manufacturers and advertisers pushes the claims of a modification of the drug, which he calls papoid. For the same purpose trypsin is preferred by others. The mode of application of papayotin is no indifferent matter. When applied in powder, it resulted in constant irritation of the throat, while the patient otherwise was convalescent. The pharyngeal hyperæmia and slight exudation disappeared when mild alum washes were substituted.

Diphtheria of the *nose* is apt to terminate fatally unless energetic local treatment is commenced at once. This consists in persevering disinfection and cleansing of the mucous surface. The disinfecting procedure must not be omitted long, because general sepsis results from rapid absorption through the surface, which is supplied with lymph-ducts and small superficial blood-vessels to an unusual extent. Disinfectant or merely cleansing injections must be continued every hour for one or more days. If they be well made, the consecutive adenitis, particularly that about the angles of the lower jaw, is soon relieved and the general condition improved. But there are cases in

which it is not the lymph-bodies that are the main gates through which constitutional poisoning takes place, but the blood-vessels only. In the incipient stage of such cases the discharge from the nostrils is more or less sanguineous; in them the blood-vessels, thin and fragile, carry the poison inward with great rapidity without any swelling of the lymph-nodes.

In a few cases injections are unsuccessful. They are those in which the whole nasal cavity is filled with membranous deposits to such an extent as to require forcible removal. Sometimes it is difficult to push a silver probe through them. This procedure may be repeated, the probe dipped in carbolic acid or wrapped in absorbent cotton moistened with carbolic acid of fifty or ninety per cent. After a while injections or irrigations alone will suffice. But now and then the development of pseudo-membranes is very rapid, a few hours suffice to block the nostrils again, and the difficulty is the same.

The liquids which are to be injected should be warm and fairly mild. Solutions of sodium chloride (6 to 1000); saturated solutions of boric acid; one part of mercuric bichloride, thirty-five of sodium chloride, and five thousand of water, more or less; or pure lime-water; or solutions of papayotin, or a solution of sodium hypo-sulphite, will be found satisfactory. From the selection of these remedies it is at once apparent that the objects in view are partly to wash out and dissolve and partly to disinfect. I have not mentioned carbolic acid, which may be used in solutions of one per cent. or less. Its employment requires care, for much of the injected fluid is swallowed, and proves a danger to children of any age, but mostly to the young.

Most of the syringes I find in my rounds are abominations. The nozzle must be large, blunt, and soft. After having recommended for many years the common hard-rubber ear-syringe, the sharp end of which was cut off, I now use always a short, stout glass syringe with soft-rubber mounting in front.

When the children cannot, or must not, be raised, I employ the same solutions from a nasal cup, a spoon, or a plain hard-rubber atomizer, the nozzle being lengthened by a short piece of rubber tubing. These applications can thus be made while the children are lying down, every hour or very much oftener, without any or much annoyance. The nozzle should be large enough to fit the nostril. Sprays will never be so effective as injections or irrigations.

For a day or two these injections of fluids, or sprays, must be made hourly. It is not cruel to wake the children out of their septic drowsiness, for it is certain death not to do so.

Injections of the nose are oftener ordered than judiciously made. Hundreds of times I have been assured that they had been made regularly, hourly, for days in succession; still, there was a steady increase of glandular swelling and sepsis. I never believe a nurse to have made them regularly unless I have seen her doing it. They *will* run up their syringe vertically and not horizontally; the fluid *will* return through the same nostril. On the successful injecting or spraying of the nares hangs every life in a case of nasal diphtheria. I have long learned to look upon a neglect to tell at every visit how to make an injection as a dereliction of duty. This may appear a trifling procedure, but it is a safe one. The nurse must be able to tell you that at every injection the fluid returns through the other nostril, or through the mouth, or that it is swallowed.

The procedure is simple enough, and need not take more than half a minute for both nostrils. A towel is thrown over the child's chest up to the chin, and the child half raised in bed by the person who is to make the injection. This person, sitting on the bed behind the patient, steadies the patient's head against her chest, while somebody else secures his hands. The syringe is introduced horizontally by the person sitting behind the patient, and gently emptied. No time must be lost in refilling and attending to the other side. There ought to be two syringes ready for use. When pain in the ears is complained of, in spite of great gentleness in injecting,—such cases will be found to be very exceptional,—more gentleness is required, or the spray, or pouring in from a spoon, or minim-dropper even, or, better, from a nasal cup, must take the place of the injection. But get used to the injections.

Many sins are committed in doing this very simple thing. The unfortunate little one is allowed to see all the preparations, is worried and excited, and the necessary gentleness in the proceedings is neglected in too many cases.

For the purpose of softening and macerating pseudo-membranes steam has been utilized extensively. Its inhalation is useful in catarrh of the mucous membranes and in many inflammatory and diphtheritic affections. On mucous membranes it will increase the secretion and liquefy it, and thus aid in throwing off the pseudo-membranes. Its action is the more pronounced the greater the amount of muciparous follicles under or alongside a cylindrical or fimbriated epithelium. Thus it is that tracheo-bronchial diphtheria, so-called fibrinous bronchitis, is greatly benefited by it. Children affected with it I have kept in small bath-rooms for days, turning on the hot water and obliging the patient constantly to breathe the hot clouds. Several such

cases I have seen recover under that treatment. Atomized *cold* water will never yield the same result. Nor have I seen the patented inhalers do much good.

Still, where the surface epithelium is pavement rather than cylindrical, and but few muciparous follicles are present, and the pseudo-membrane is rather immerged in, and firmly coherent with, the surface,—for instance, on the tonsils,—the steam treatment is less appropriate. On the contrary, moist heat is liable in such cases to favor the extension of the process by softening the hitherto healthy mucous membrane. Thus it takes all the tact of the practitioner to select the proper cases for the administration of steam, not to speak of the judgment which is required to determine to what extent the expulsion of air from the steam-moistened room or tent is permissible.

Steam can properly be mixed with medicinal vapors. In the room of the patient water is kept boiling constantly over the fireplace, provided the steam is prevented from escaping directly into the chimney; on a stove (the modern self-feeders are insufficient for that purpose and abominations for every reason); over an alcohol-lamp, if we cannot do better; not over gas, if possible, because of the large amount of oxygen which it consumes. Every hour a tablespoonful of crude oil of turpentine is poured on the water and evaporated. The air of the room is filled with steam and vapors, and thus contact with the sore surfaces and the respiratory tract is obtained with absolute certainty.

The secretion of the mucous membranes is sometimes quite abundant under the influence of steam, but still more, like that of the external integuments, increased by the introduction of water into the circulation. Therefore, drinking of large quantities of water, or water mixed with an alcoholic stimulant, must be encouraged. Over a thoroughly moistened mucous membrane the pseudo-membrane is more easily made to float and to macerate.

To evolve large volumes of steam the slaking of lime has been resorted to. It is both an old and an effective procedure. Not only is the object in view accomplished by it, but it is the best means of bringing lime into contact with the morbid surface. In a room in which lime has been slaked everything becomes covered with it. Thus this method of profiting by the local effect of lime is decidedly preferable to the almost nugatory effect of lime-water sprayed into the throat.

It was to fulfil the same indication of softening the pseudo-membrane by increasing the secretion of the mucous membranes that pilocarpine or jaborandi was highly recommended (Guttmann) as a panacea in all forms of diphtheria. There is no doubt that the secre-

tion of the mucous membranes is vastly increased by its internal application and by repeated subcutaneous injections of the muriate or nitrate of the alkaloid, but the heart is enfeebled by its use. I have seen but few cases in which I could continue the treatment for a sufficient time. In many I had to stop it because after some days of persistent administration I feared for the safety of the patients. Therefore, as early as at the meeting of the American Medical Association at Richmond, in 1880, I felt obliged to warn against its indiscriminate use in diphtheria. Thus it has shared the fate of the hundreds of remedies and methods which have been declared to be infallible and found wanting.

Diphtheritic *adenitis*, the swelling of the cervical glands near the angles of the lower jaw, to which I have alluded as an ominous symptom, points to nasal and naso-pharyngeal (mostly mixed) infection. The main treatment consists in disinfection of the absorbing surfaces.

Direct local treatment of the glands, if not entirely useless, is, at all events, of minor importance and efficiency. The application of an ice-bag of moderate size will render fair service. The use of one part of carbolic acid in ten of alcohol irritates both the surface and the patient more than it can do good. Inunctions may do some good by friction (massage); inunctions with some absorbable material in them may do a little better. The common potassium iodide ointment is useless; potassium iodide in three or five parts of glycerin is more readily absorbed; the same in equal parts of water, with a little animal fat and six or eight times its quantity of lanolin, gives an ointment which is so rapidly absorbed that iodine is found in the urine within a few hours. Iodoform may be utilized in the same way. Injections of iodoform in ether, which I suggested years ago, are too painful. Mercurial inunctions, those of blue ointment, require too much time for any effect to take place. Oleates are too irritating locally; a lanolin ointment would prove more satisfactory by doing less harm. After all, however, the readiest method of reducing the swelling of the glands and improving the prognosis accordingly is that of *cleansing and disinfecting the field of absorption.* The rare cases of suppuration in these glands require incision and disinfection. They are, however, as ominous as they are rare. There is, as a rule, little pus, but one or many local deposits of disintegrated gland-cells and gangrenous connective tissue. The incisions must be extensive; the scoop and concentrated carbolic acid should be freely used. In these cases hemorrhages may occur, sometimes very difficult to manage. I have seen some of them terminate fatally. In these carbolic acid must

be avoided. Compression, actual cautery, and acupressure have rendered good service. Solutions of iron must be avoided, for the scurf formed is a shield, behind which deleterious absorption is going on constantly in such wounds, as it does in the uterus. Antipyrin in water (1 to 5 or 2) is an excellent styptic.

The *internal treatment* of an average case of pharyngeal diphtheria can be made to combine the indications of both internal and local administration. For more than forty years I have employed the tincture of the chloride of iron. It is an astringent and an antiseptic. Its contact with the diseased surface is as important as is its general effect; therefore it must be given frequently, in hourly or half-hourly doses, even every twenty or fifteen minutes. An infant of a year may take three or four grammes (one drachm) a day, a child of three or five years eight or twelve grammes (two or three drachms). It is mixed with water to such an extent that the dose is half a teaspoonful or a teaspoonful; a drachm or two drachms, with a small quantity of potassium chlorate (see above), in four ounces, allows half a teaspoonful every twenty minutes. No water must be drunk after the medicine. As a rule, it is well tolerated. There are some, however, who will not bear it well. Vomiting or diarrhœa is a contraindication to persevering in its use, for nothing must be allowed to occur which reduces strength and vigor. A good adjuvant is glycerin,—a better one than syrups. From ten to fifteen per cent. of the mixture may consist of it. Now and then it is not well tolerated. When diarrhœa sets in glycerin should be discontinued. Still, these cases are rare; indeed, the stomach bears glycerin very much better than the rectum.

In connection with this remedy I wish to make a remark of decidedly practical importance. I know quite well that recovery does not always prove the efficacy of the remedy or remedies administered; but I have seen so many bad cases recover with chloride of iron, when treated after the method detailed above, that I cannot rescind former expressions of my belief in its value. Still, I have often been so situated that I had to give it up in peculiar cases. They were those in which the main symptoms were of so intense a sepsis that the iron and other rational treatment were not powerful enough to prevent the rapid progress of the disease. Children with naso-pharyngeal diphtheria, large glandular swelling, feeble heart and frequent pulse, thorough sepsis, besides irritable stomach,—those in whom large doses only of stimulants, general and cardiac, will possibly promise any relief,—are better off without the iron. When the circumstances are such as to leave the choice between iron and

alcohol, it is best to omit the iron and rely on alcoholic stimulants mostly. The quantities required are so large that the absorbent powers of the stomach are no longer sufficient for both. Nor is iron sufficient or safe in those cases which are pre-eminently laryngeal. To rely on iron in membranous croup means waste and danger.

In this latter form of membranous croup, diphtheritic laryngitis, or laryngeal, also in general (pharyngeal and nasal) diphtheria, the most useful internal remedy is mercury. Empiricism has often praised calomel in small and large doses. My acquaintance with mercury in this connection is not at all new. Many years ago I published (*Med. Record,* May 24, 1884) a number of my cases which got well under its use, at the same time that Dr. Thallon, of Brooklyn, published an article on the same subject. Since I have employed it (I prefer the bichloride), my conviction of the utter uselessness of internal medication in laryngeal diphtheria, so-called pseudo-membranous croup, has been thoroughly shaken. Until about that time I felt certain of a mortality of ninety or ninety-five per cent. of all the cases of laryngeal diphtheria not operated upon. These figures were not taken from small numbers, for I compared those of others with my own. The latter are not a few, either; for within thirty years (until about 1890) I have tracheotomized more than six hundred times, have assisted at as many more operations, and have seen at least one thousand cases of laryngeal diphtheria which were not operated upon at all. During the years from 1883 to 1890 I have seen no less than two hundred cases, perhaps many more. Among them recoveries have not been rare at all ages, from four months upward. The uniform internal medication consisted in the administration of a dose of the bichloride every hour. The smallest daily dose ever given by me in the beginning was fifteen milligrammes (one-fourth of a grain) to a baby of four months; this was continued a few days, and the dose then somewhat diminished. Half a grain (0.03) daily may be given to children of from three to five years, for four or eight days or longer. The doses vary from one-sixtieth to one-thirtieth (0.001 to 0.002). They require a dilution of one in eight thousand or ten thousand of water or of whiskey and water. There is no stomatitis; gastric or intestinal irritation is very rare. It occurred in a few cases, but then it was found that the dilution had not been sufficient,—one in two thousand or three thousand only. Whenever it exists, very small doses of opium will remedy it.

The benefit to be derived from the remedy depends greatly upon the time of its administration. Tracheotomy or intubation is required, as a rule, after days only, and can often be avoided if mercury be given

in time. If the operation becomes necessary after all, the treatment must be continued diligently. Never have I seen so many cases of tracheotomy getting well, since 1863, as when the bichloride was being used constantly, since 1882. Nor am I alone with these favorable results. There are dozens of practitioners in New York City, besides Drs. Francis and J. Huber, with whose methods and results I am well acquainted, some of whom are connected with me in one or other capacity, who confirm the above statements.

My experience with the bichloride has been mainly gathered in cases of laryngeal and bronchial diphtheria, so-called pseudo-membranous croup and fibrinous bronchitis; it is in these that it has been particularly effective. Still, but few of these were quite localized affections. Our cases of diphtheritic laryngitis are mostly descending, and complicated with either diphtheritic pharyngitis or rhinitis, or both. Not a few, mainly of the latter kind, exhibit constitutional symptoms of sepsis. Many such have also recovered.

Another method of using mercury is that of sublimating calomel in doses of from ten to fifteen grains, to be inhaled every few hours under a tent. It is particularly adapted to pseudo-membranous laryngitis.

In any case of diphtheria there may occur conditions and complications which yield their own indications and require the closest attention on the part of the practitioner. I need not here refer again to the frequent attacks of exhaustion and heart-failure which carry off a multitude of patients, unless they be met in time. What I have said in previous pages on heart-failure and its prevention (or treatment) holds good in diphtheria, if anywhere. Therapeutical nihilism destroys more lives than any number of direct mistakes in dosing.

Nephritis, parenchymatous, interstitial, and glomerular, and the varieties of *pneumonia* are frequent complications or consequences of diphtheria. The treatment of either of them requires no particular recognition in this place. Nor does œdema of the glottis yield indications differing from that occurring from other causes. Diphtheria of the skin and of the sexual organs requires disinfectant ointments. I have mostly relied on iodoform one part in from six to twelve of fat.

Diphtheritic *paralysis,* though of various anatomical and histological origin, yields in all cases a certain number of identical therapeutical indications. These are: the sustaining of the strength of the heart by digitalis and other cardiac tonics. A child of three years may take daily, for a month, three grains (0.2) or its equivalent; for instance, one grain (0.06) of the extract. This is an indication on which I cannot dwell too much. Many of the acute and most of the

chronic diseases of all ages do very much better by adding to other medications a regular dose of a cardiac tonic. While it is a good practice to follow the golden rule to prescribe simply, and, if possible, a single remedy only, it is a better one to prescribe efficiently.

Besides the above, there are other indications: mild preparations of iron, provided the digestive organs are not interfered with; strychnine or other preparations of nux, at all events. In ordinary cases a child of three years will take an eightieth of a grain three or four times a day (together 0.002). Local friction, massage of the throat, of the extremities, and of the trunk, dry or with hot water or oil, or water and alcohol, and the use of both the interrupted and continuous currents, according to the known rules and the locality of the suffering parts, find their ready indications. The paralysis of the respiratory muscles is quite dangerous; the apnœa resulting from it may prove fatal in a short time. In such cases the electrical current, used for very short periods, but very frequently, and hypodermic injections of strychnine sulphate in more than text-book doses, and frequently repeated, will render good service. I remember a case in which these, the occasional use of an interrupted current, and occasional artificial respiration by Silvester's method, persevered in for the better part of three days, proved effective. In a few cases of diphtheritic paralysis the use of antitoxin appeared to meet with success. Other forms of paralysis (hemiplegia, ataxia) demand a treatment like the above, modified by their peculiar circumstances or symptoms.

In regard to antitoxin, there are but few opposing voices left. Not quite so efficacious as thyroid in myxœdema, it is more generally useful because of the vast number of cases benefited by it. There is no practitioner that has not at present the right—or rather the duty—to give it a place among his most reliable remedies. It would be a pity if many of us, on account of distance or other reasons for its inaccessibility, were deprived of its services and compelled to rely exclusively on the treatment detailed above. There are in the worst forms of diphtheria so many urgent indications every one of which should be fulfilled, that the antidote of the circulating poison, if not on hand, will be sorely missed. For such a specific antidote it is, though it has not the power to cure every case of diphtheria any more than quinine cures every case of malaria or mercury of syphilis. Not counting isolated cases spread over the journals, the three hundred original cases of Heubner, five hundred of Baginsky, one thousand of Roux, and the many hundreds of the hospitals of Paris and Vienna, besides those of our own country, yield a basis on which to establish calculations. All observers agree on this point, that the sooner the

antitoxin is injected the more certain is its effect. Some go so far as to assert that no case injected the first day need die.

The doses to be administered are, according to Behring, as follows: according to the severity of a case, six hundred, one thousand, or fifteen hundred "antitoxin units" should be injected into a part of the body which contains loose subcutaneous tissue and is not exposed to pressure. This dose may be repeated if the symptoms are not improved within a day. A "unit" is equivalent to one cubic centimetre of what is called "normal serum." Normal serum is the blood-serum of an immunized animal, which has been made so efficacious that one-tenth of a cubic centimetre will antagonize ten times the minimum of diphtheria virus fatal to a guinea-pig weighing three hundred grammes (ten ounces).

It appears to be a fact acknowledged by all that there is rarely, if ever, an immediate bad result of the injection, which ought to be made into the subcutaneous tissue, not into the muscles. The point of injection should then be covered with antiseptic gauze or with iodoform collodion. Not infrequently, however, there is redness, erythema, or urticaria around the point of injection. Besides, some of the after-effects are liable to be very severe. Urticaria, polymorphous eruptions, petechiæ and suggillations, excessive perspiration, swelling of glands, severe pain and swelling in feet and limbs and joints, pruritus recti, severe diarrhœa and vomiting, nose-bleeding, and great debility have lasted for weeks, yet terminated in recovery. Dr. Rauschenbusch observed on his four-year-old daughter, who took three times the dose while sick with diphtheria two years previously, pruritus, urticaria, vomiting, sopor, and heart-failure, after two hundred units injected for the purpose of immunization (*Berl. klin. Woch.*, 1897, No. 32). A few sudden deaths have also been reported. No connection between them and the antitoxin has been established in any case, and venturesome generalizing speculations are not able to shed light on obscure subjects.

Dr. James Ewing* studied the effect of antitoxin on the number and nature of leucocytes. While leucocytosis begins a few hours after the invasion of diphtheria, and increases, mainly as regards myelocytes, up to the climax of the disease and steadily declines during convalescence,—remaining high only in most of the bad and fatal cases, —antitoxin, according to Ewing, within thirty minutes after its injection, causes a reduction of the number of leucocytes. This reduction affects specially the uninuclear leucocytes, while the proportion

* New York Medical Journal, August 17, 1895.

of well-stained multinuclear cells is increased. In favorable cases, after the injection of antitoxin the leucocytosis never again reaches its original height. In severe and less favorable cases the injection is followed in a few hours by more hyperleucocytosis and fever. In very bad cases the immediate result may be either rapid increase or decrease of leucocytes, and death. The multinuclear leucocytes found in the blood of favorable cases after treatment with antitoxin show increased affinity for gentian violet. This change may be observed within twelve hours after the injection, and its non-occurrence is a very unfavorable prognostic sign.

The existence of the after-effects mentioned above is not denied by any of the most enthusiastic admirers of antitoxin, but it is asserted that no serious or lasting results follow, and that if every life threatened by diphtheria were known to be protected by enduring the untoward effects of the remedy, we should willingly submit to them in every case. The balance of what we know of antitoxin is thus far favorable, and this addition to our therapeutical powers will forever be remembered as creditable to Emil Behring. It is a pity that he should not have been satisfied with his epoch-making results; if he were a clinician he would be less extravagant in the expression of his opinions and more modest. If he were he would not have been tempted to assert that organotherapy has accomplished nothing, that cellular pathology has proved sterile, that remedies combat main symptoms only, that medicine hitherto had therapeutical principles only but no therapeutical experiments, and that (his) experimental therapeutics is in conscious opposition to medication (German Congress of Int. Med., June, 1897).

Altogether, the effects of antitoxin injections are eminently favorable. The fever of diphtheria is much lessened within or after a day, and the second fever-wave—so common between the third and the fifth days—is not often observed. The membrane is speedily disintegrated and disappears on the sixth day or sooner, while in cases not injected with antitoxin it lasts eight days or longer. Besides, there are but few cases on record in which the membrane returned after antitoxin, and not many in which it grew larger. In 181 cases of Heubner there were but three relapses. Albuminuria and nephritis are common occurrences in diphtheria as early as the (second and) third day. Among these 181 cases, of those injected on the first day, five-sixths remained free; on the second, two-thirds; on the third, one-half; on the fourth, one-third. The results of Baginsky, Roux, and Widerhofer are similar. In 525 cases of Baginsky treated with antitoxin there were albuminuria in 40.95 per cent., clini-

cal nephritis in 12.57 per cent., and post-mortem nephritis in 15.80 per cent. However, among 933 cases treated without antitoxin there were albuminuria in 42 per cent., clinical nephritis in 25.78 per cent., and post-mortem nephritis in 16.31 per cent.,—rather a favorable showing for antitoxin. In his 525 cases, heart-failure was noticed as the cause of death in eight; it occurred in 5.69 per cent. of all the cases, while it took place in 10.9 per cent. of the 933 treated without serum from 1891 to 1894. In Heubner's practice it occurred nine times, but was not fatal.

It is asserted that whenever antitoxin is injected before laryngeal stenosis has developed the larynx will remain free. That is an exaggeration, but it is certain that both tracheotomies and intubations have become less in number, and the speedier disintegration of the membranes and the (almost general) discontinuance of their growth after the injection of antitoxin have made it possible for intubation to take the place of tracheotomy in nearly every case of operative interference.

Paralysis is no less frequent in antitoxin cases than it was formerly. But we must not lose sight of the fact that it never was exclusively found in very bad cases, but quite often after mild ones. Perhaps it results more from a mild but protracted poisoning than from a sudden and severe one. It may be, also, that many cases which survive with antitoxin and develop paralysis would not have lived to become paralyzed under a less satisfactory treatment.

The principal question, however, to be raised in reference to any medication in cases of serious disease is its life-saving power. In its issue of August 8, 1895, the *Deutsche medicinische Wochenschrift* published a preliminary result of its collective investigation of antitoxin treatment. The report refers to 10,312 cases of diphtheria treated in the city of Berlin and outside.

It showed that the milder cases, in which six hundred units were considered enough, did best; that those which from the beginning offered a worse prognosis were given more antitoxin and did not behave so well. That means, among other things, that, in proportion, mild cases do better under any treatment than severe ones. It also proves the necessity of not relying on a single method of treatment exclusively.

Among the most enthusiastic eulogizers of antitoxin there is none but admits failures. Many of these are attributed to insufficient strength of the serum. Mere serum of an immune animal does not suffice. Others—and these are the most conclusive—depend on the insufficient power of resistance on the part of the patient. That is

why *the antitoxin injection alone should not be relied on.* Nutrition and alcoholic and other medicinal stimulation must be resorted to. In regard to other treatment the authorities differ. Some, like Escherich, Baginsky, and Roux, favor it, Escherich particularly after the membranes have fallen off. Heubner rejects it. At all events, there are but few left who maltreat the child by the former cruel methods of local applications and cauterizations. It should not be overlooked that the antitoxin does not destroy bacilli, which continue the evolution of toxin persistently. I have advised, whenever I had an opportunity, the combination of my mercurial treatment with the antitoxin, for the reports on the efficacy of mercurial treatment as recommended by me (p. 243) are becoming more and more favorable. Benney's Australian reports are very conclusive.* Some New York friends, to whom I offered antitoxin, declined it, declaring themselves fully satisfied with the results they obtained from mercury and intubation. On the other hand, a townsman of ours who handles antitoxin a good deal pronounces mercury and antitoxin to be incompatible, and believes that mercury will interfere with the effect of antitoxin. This assertion has not been proved, but shows the facility with which postulates may be substituted for experience during a period of enthusiasm. No greater eulogy, both on mercury and on antitoxin, can ever be pronounced than the figures detailed by Dillon Brown and referred to below.

These results tally perfectly with the very exhaustive report of the hospitals of the London Metropolitan Asylums Board (London *Lancet,* June 5, 1897), which for the year 1896 proves a great reduction in the mortality of cases brought under treatment on the first three days of illness, the lowering of the combined general mortality to a point below that of any former year, the still more remarkable reduction in the mortality of the laryngeal cases, the uniform improvement in the results of tracheotomy, and, finally, the beneficial effect produced on the clinical course of the disease (*N. Y. Med. Rec.,* September 4).

Additional statistics concerning the effect of antitoxin are too numerous to be reported here. The collective investigation of the American Pediatric Society, of 1895, the results of the Boston City Hospital and of numerous other institutions, and those of painstaking practitioners all over the world are unanimous in regard to its efficiency and to the lowered mortality following its use. The doses are, however, larger than those employed at first. Thousands of units are easily borne, and are required in bad cases.

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* Australian Medical Journal, January 20, 1895.

So far as immunization through small doses of antitoxin (from three hundred to five hundred units) is concerned, it appears to have been accomplished, in the opinion of many; but they all agree that it does not last over a few weeks. Those who know that diphtheria, once introduced, predisposes rather than protects will have no particular confidence in the effect of antitoxin as an immunizer, except to bridge over a number of dangerous weeks; but as in full doses it saves the lives of many who are stricken, its sphere of usefulness is indeed extensive enough.

20. *Rheumatism.*

Acute articular rheumatism is frequent both in infancy and childhood.

Since I made this statement nearly thirty years ago,* after observations extending over more than twenty years, a few authors have accepted and verified it; but the majority are still of the opinion, inherited from their predecessors, that infancy and childhood are immune or almost so. Thus, only seventeen years ago Edlefsen reported to the German Congress for Internal Medicine (*Transactions,* 1885, p. 323) but eleven cases of acute rheumatism under five years, none of which was younger than two. The assertion that the disease is rare under four or under two years is frequently met with.

Nothing can be more erroneous. The frequency of valvular diseases, mainly of the left side of the heart, in children of from four or five years to adolescence ought to suggest the frequency of rheumatism; for but few of them are due to scarlatina and very few to syphilis; almost all are secondary to rheumatism, than which there is no more frequent cause of cardiac disorder. They cannot be claimed as congenital, for the fact that very few of the fœtal diseases of the heart are found on the left side, and but a small number survive the first (or perhaps second) year, remains undisturbed. Nor is the number of rheumatic cases limited to those exhibiting cardiac symptoms; for though endocarditis is of more frequent occurrence—compared with the number of cases—in the rheumatism of children than in that of adults (in whom from ten to twenty per cent. contract a permanent organic lesion of the heart), still, there must be, and are, many cases of acute rheumatism which run their full course without terminating in heart disease. In order to ascertain this, the heart must be watched in every doubtful case. Endocarditis is sometimes the first symptom of acute rheumatism in children, and precedes every other, even in

* A. Jacobi, Acute Rheumatism in Infancy and Childhood, 1875, in a series of American clinical lectures, edited by E. C. Seguin, M.D., vol. i. No. 2.

apparently mild cases, and pericarditis and myocardial changes are not rare. When the slightest symptom of chorea minor shows itself, the heart should also be examined together with the joints, for there are cases in which chorea is not the final development of rheumatism and rheumatic endocarditis, but the very beginning of the disease, and then referable to a rheumatic affection of the spinal membranes or of the heart muscle.

All of these remarks I believe to be opportune because of the frequency of cases in which the persistent notion that rheumatism is a rare disease gives rise to an erroneous diagnosis—the ubiquitous " dentition," " worms," " malaria," and " colds"—and to false treatment. After all, a correct diagnosis is the foundation and *sine qua non* of sound therapeutics; thus I shall, in this neglected instance, add a few words on the subject of diagnosis, which is sometimes quite difficult.

Fever is a common symptom in small children; every physical disturbance raises their temperature. In acute rheumatism it is often but slightly elevated; it sometimes rises at irregular times, being now and then highest about noon. The swelling of the joints is apt to be very trifling and is often overlooked; the pain (either spontaneous or on pressure) may be very much less than that resulting from fatigue, rhachitis, syphilitic bone disease, colic, or otitis. Thus in every doubtful case of discomfort or pain the joints and heart should be examined for rheumatism. The diagnosis of acute articular rheumatism becomes quite difficult when but a single joint is affected, either temporarily or through the whole course of the attack, for a unilateral arthritis is very apt to be tuberculous or traumatic. Still, rheumatic monarthritis is observed principally in the hip- or knee-joint. Sometimes, after a week only or still later, the additional inflammation of other joints facilitates the recognition of the exact condition. Isolated inflammatory rheumatism also often fails to be recognized because of its being denominated " growing pain." The latter term dates from the medical nomenclature of past centuries, and ought to have been dropped long ago. What has been called by that name is of variable origin and nature. Sometimes it is fatigue only. It may be neurosis of a joint with or without an œdematous swelling. I have seen a number of such instances in children of both sexes, about the shoulder-, hip-, and knee-joints mostly. Another affection which has been classed under the heading of " growing pain" is rhachitical or other epiphysitis and congestive swelling of the intermediate cartilage of the long bones. It is of frequent occurrence, without a perceptible cause besides the physiological hyperæmia which is required for normal growth, and

liable to become pathological; it is often noticed in convalescence or recovery from infectious diseases, particularly scarlatina. Still, the large majority of attacks of "growing pain" mean rheumatism; it is the failure to appreciate this fact that constantly gives rise to mistakes in diagnosis and neglect in the administration of both preventive and curative measures.

That a rheumatic affection of one or more joints should not be mistaken for scurvy (joints hardly ever affected) or for poliomyelitis is self-understood.

Rheumatism of the cervical part of the vertebral column is apt to be very painful and attended by high fever, stiffness of the neck, retracted head, delirium, and sometimes vomiting. Some of these symptoms are those of cerebral meningitis, and errors in diagnosis are easily made. Stiffness of the dorsal part is not always osseous, but sometimes rheumatic (ligamentary and muscular apparatus).

There is no uniform cause or character of rheumatism. Staphylococcus aureus and pyogenic streptococci, mainly streptococcus citreus and diplococcus, have been met with. Their virulence is not always the same; its modification may explain the vehemence or the mildness of the attacks and the many varieties between a hardly perceptible pain and the worst symptoms of pyæmia. Does that mean that one or all of them are the origin and fountain of rheumatism, and that perhaps the latter is the result of many different infections by pyogenic cocci whose virulence is lessened? Besides, there are certainly cases of "rheumatism" which are not microbic; those connected with psoriasis seem to be neuropathic, those with erythema multiforme non-microbic, and the inflammations of joints occasionally caused by (Klebs-Löffler) diphtheria antitoxin are surely not so.

The essential character of rheumatism becomes still more dubious when we consider those cases of joint inflammation whose connection with known infectious diseases can be proven. They are called rheumatoid, and exhibit either pain or inflammation or suppuration. They follow typhoid fever, dysentery, parotitis, gonorrhœa, pneumonia, diphtheria, influenza, cerebro-spinal fever, scarlatina and other acute exanthemata, hemorrhagic diathesis, and catarrhal angina, also syphilis. Pharyngitis has long been known to be connected with rheumatism, or rather to precede it. It is assumed with more than mere probability that the coccus invasion which is the cause of what we call rheumatism takes place through the pharyngeal lymph-bodies, the separate follicles, and the tonsils. That is why there is no better preventive than the hygiene and treatment of the mouth and throat, from mere systematic cleanliness to resection of tonsils and removal

of adenoids. The contents of the joint were found to differ in gonorrhœa, pneumonia, diphtheria, and erysipelas; now and then the heart will be affected, mainly in scarlatina. In but few of them has salicylic acid the same effect as it displays in the majority (only) of genuine, independent, acute rheumatisms. In most of them antipyrin (with or without salicylates) acts better than salicylates alone. In syphilitic arthritis, however, it has no effect at all; iodides only are useful.

Altogether, the treatment of *acute articular rheumatism* has been quite unsatisfactory down to a modern time. A few of the indications are furnished by the actual or alleged causes of the disease. By some it has been believed to be endemic; it is certain that some localities have been known to harbor a great many cases at the same time. In these, a change of residence, if practicable, ought to be resorted to, provided the individual case is but one of a great many in the same neighborhood. Contagion has now and then been presumed to cause the spreading of the malady, but the number of observations of the kind is very limited indeed. The greatest possible care bestowed on those sick with infectious fevers will prove a powerful preventive of rheumatic fever. The blood has been found to be changed during the latter affection: the red cells and hæmoglobin are diminished, the white cells and fibrin increased. According to many writers, both chemists and physicians, the alkaline condition of the blood is less pronounced. This change, or the actual prevalence of acid in the blood, has also been either proved or assumed to exist in cachectic conditions of many kinds, in fevers, uræmia, leucocythæmia, diseases of the liver, in poisoning with acids, lead, and mercury, in pyæmia, typhoid fever, gout, and diabetes. In them, as in acute rheumatism also, lactic acid has been found in undue proportion. It is the same acid which has been found in over-exerted muscles; still, when introduced into the circulation, it never produced articular rheumatism. The diminution of the alkali of the blood would justify at once the administration, through the whole course of an acute rheumatism, of alkaline salts, and particularly potassium; the latter is greatly diminished, according to Beneke, who, besides its relative absence, looks upon the impairment of nerve-power and the accumulation of organic acids as the main factors in the pathogenesis of rheumatism.

Sudden changes of temperature are certainly among the causes of acute rheumatism. Cold and moist weather, moist houses, and exposure to wind and rain will bring it on. This effect may be immediate, and consists in the sudden suppression of the cutaneous circulation and elimination, or gives rise, by reflex action, to vasomotor or trophic disturbances in the joints. Particularly is that so in those who have

inherited a morbid disposition. Such an inheritance is not at all infrequent. I have seen acute rheumatism in several children of a rheumatic father or mother. The treatment of such cases must be mainly preventive. The tendency to be influenced by sudden changes of the surrounding temperature can be modified or removed by the systematic use of cold water. Children with a disposition to rheumatism should have a daily cold wash, sponge, or bath. The former is the mildest mode of application. They may be rubbed down with a wet sheet, and afterwards with a warmed dry and coarse bathing towel. Those who have been strengthened by this procedure, or such as are stronger, may be sponged, or use a shower-bath for a few seconds, or a cold bath. These will be well tolerated and prove useful when the surface, mainly of the extremities, becomes warm after moderate dry friction. For such children as feel chilly after these applications treatment may begin with tepid water and alcohol (4 or 6 to 1). I ought to add here that this treatment will accomplish its end best when throughout the rest of the day great care is used to protect the surface. A cold wash or bath, given to harden and strengthen, must be combined with warm clothing and bedding to protect. Nothing is more injurious than exposure of the surface to wind and rain. The bare knees and calves of the children of vain mothers are foolhardy provocations to the invasion of many serious diseases. Sea-bathing is a first-class roborant, except in the presence of heart disease.

The swollen and painful joints must be protected against the pressure of blankets or painful handling by raising the bedclothes, keeping the limbs in a basket of proper size (waste-paper basket), and covering them thickly with cotton. Well-covered splints add greatly to the comfort of the patient. When pain and swelling are unusually severe, the application of an ice-bag or ice-cloth is advisable. Very young or anæmic children do not bear them long. Cold water will then take the place of ice-water or ice. A wet bandage or pack round the affected joint is often borne well and relished. It ought to be changed every hour or half-hour. Very anæmic and neurotic patients prefer hot and dry applications, mainly in those cases in which the pain is the principal symptom complained of. To relieve the latter I cannot advise the subcutaneous injections of carbolic acid which have been recommended; in very severe cases I have been compelled to administer a few drops of a solution of morphine hypodermically. As a rule, however, morphine oleate or a mild solution (from two to four per cent.) of cocaine muriate on the skin, chloroform liniment brushed on, chloroform poured into the cotton surrounding the

joint and retained by oil silk, or a very mild galvanic current now and then, also the application of oil of wintergreen and of ointments containing ten or twenty per cent. of sodium salicylate will give some relief.

The swelling of the synovial membranes and ligaments in retarded convalescence or chronic cases taxes the patience of both the sick and the physician. Vesicatories kept on for half an hour only, and frequently repeated; the wet bandage or pack snugly applied so as to compress gently; compression by bandages or collodion; gentle massage; and the galvanic current daily applied find their indications in many and various cases. Iodine will come in for its share of usefulness. Besides the internal administration of the iodides (potassium or sodium, or both combined, in doses of from five to twenty grains daily [0.3 to 1.25]), the external applications will be found beneficial. The official ointment will act through the gentle handling and kneading necessitated by its use. Solutions of potassium iodide in glycerin will act better, but are inferior to the lanolin ointment referred to in a former chapter. Superior to all, however, is the application, twice daily, of one part of iodoform in from eight to fifteen of collodion or flexible collodion. It is brushed over the swollen part copiously, and allowed to dry while the limb is kept absolutely at rest for ten minutes. Only such scales as become detached spontaneously may be removed; otherwise the next application is made on top of the preceding ones. Very old cases, with chronic effusion into the joint, require aspiration and washing out. These manipulations have become safe in the hands of every physician who has learned the use of soap and of disinfectants on himself and his instruments since operative surgery availed itself of the immense progress made in pharmacological laboratories.

Endocarditis demands absolute rest, both of the organ and the body. Every exertion will prove injurious. Thus an occasional dose of opium or of a bromide, or of both combined, and the use of potassium iodide in daily doses of from one-half to one gramme, have a good effect. The application of an ice-bag to the cardiac region, or, when that proves too heavy, an ice-cloth, acts very favorably indeed. But not every murmur means endocarditis; it may be the result of muscular incompetency or irregular contraction only, and quite temporary; it is sometimes observed in cases of but moderate severity, and mainly combined, or alternating with, or preceding chorea minor, which now and then makes its appearance in the very earliest period of acute rheumatism. Both chorea and endocarditis can be mitigated or prevented by early attention. If every case of incipient rheumatism

were sent to bed, if no case of "growing pain" were allowed on the play-ground or at school, many a life-long ailment or early death would be avoided.

The temperature is rarely high, or rather there are a great many cases of articular rheumatism in infants and children in which the temperature is as little elevated as the rest of the symptoms are urgent. But there are such as have rectal temperatures of from 104° to 107° F. and more. It is in these that delirium and other cerebral symptoms, with paralytic respiration and collapse, may make their appearance, and that the most efficient antipyretics must be employed; among them the cold pack, as described in a former chapter, applied to the trunk and lower extremities as far down as the knees, is the readiest and most effective remedy. It is particularly indicated in cases complicated with endocarditis; it is in these that antipyrin and phenacetin will not always have a pleasant effect. All of them are inferior to sodium salicylate as regards antirheumatic and antipyretic action. A child of three years may take from six to ten grains (0.4 to 0.6) every two or three hours, for one or more days. This is the less dangerous the more the symptoms of overdoses are understood. When they appear (mainly the brain symptoms, tinnitus, stupor, paralytic or interrupted, sighing, respiration) ample time is given for the discontinuance of the drug; a single large dose for the night, of from ten to twenty-five grains (0.6 to 1.5), succeeds better, sometimes, than the many smaller ones. As a rule, sodium salicylate mitigates the symptoms of pain, swelling, and fever very soon. Many of the patients feel very much better after the lapse of a day; then the doses may be diminished or administered at longer intervals. Longer than from three to five days it ought not to be given; if no effect, or an insufficient one only, be obtained after that time, no further reliance need be placed on it. Then antipyrin, aspirin, from eight to twenty grains (0.5 to 1.25) daily, or phenacetin may accomplish what the salicylate failed in. In the same way salol, salicin, and cresotic and benzoic acids have been recommended. Lactophenin has proved unsatisfactory. Salipyrin in three or four daily doses of from four to ten grains (0.25 to 0.6) acted more favorably.

At the same time, particularly when there is a constant tendency on the part of the temperature to rise either permanently or periodically, quinine sulphate (or another preparation of the drug) may be administered in one or two doses of from three to eight grains (0.2 to 0.5) each. The most opportune time is the period of remission, which mostly takes place in the morning. Alkaline salts may be given with the other medicaments, alkaline mineral waters, such as Seltzer or

Vichy, or sodium bicarbonate, from a scruple to a drachm (1.0 to 4.0) daily, or potassium citrate or bitartrate, or one of the nitrates which have formerly been credited with almost a specific action. Vegetable acids have been warmly recommended, such as citric acid. They take the place of alkaline salts, inasmuch as they are eliminated as carbonates. Potassium and sodium iodides are esteemed very highly,—justly so, indeed,—particularly as the tendency to chronicity renders desirable the persistent action of a powerful absorbent. Of the other remedies which have been given for their alleged specific effect (colchicum, colchicin, veratrum, aconite), I have seen but little result in acute rheumatism of infancy and childhood. They, too, render better service in cases which have become or are fast becoming chronic.

During the attack of an acute or subacute articular rheumatism the diet should be strictly milk, farinaceous food, light vegetables, and fruit. Meat and alcoholic beverages are positively forbidden. Plenty of water.

Gonorrhœal articular rheumatism is not excessively rare among infants and children, though direct sexual intercourse be not frequent at that age. It is not confined to one or a few joints or to those of the lower extremities; it is mostly subacute; the effusion is liable to be excessive and apt to be purulent. The latter condition, being dangerous partly to the joint and partly through its tendency to infect the body, must be watched carefully; for it is often the beginning, or part, of a general pyæmia; in a few instances I have seen the eye destroyed by panophthalmitis in twenty-four hours, and the child died, after weeks of suffering, of the general infection. There are also cases of septic endocarditis. The cause is often what is easily taken for a common vaginal catarrh, but is gonorrhœa. The long time the latter may be concealed, unchanged in its contagiousness, within the vagina of the adult, and the facility of communicating it to the young by direct contact or mediate communication through towels, bedclothes, etc., yield a clue to certain otherwise unexplainable cases. In a small children's institution I saw a dozen cases at one time. The treatment of the diseased vagina has its own indications; that of the joint affected with gonorrhœal rheumatism must be more local than the average case. An aseptic puncture may be made for the purpose of ascertaining the contents of the synovial cavity. If there be pus, it must be removed and the cavity washed out, thoroughly disinfected, the limb rested on a splint and gently compressed; if serum in large quantity, puncture may become necessary when other treatment proves unavailing. Otherwise gentle but steady compression by bandages, with or without mercurial plaster underneath, or by iodoform

collodion, is indicated; at the same time the use of sodium salicylate and potassium and (or) sodium iodides must be continued a long time.

During and after an attack of acute articular rheumatism there will be noticed, occasionally, small neoplasms on tendons and the insertions of muscles, on fasciæ, and on periosteum, varying in size, numbers, and sensitiveness, which consist of young connective tissue with numerous cells, last from a few days to several months, and give rise to but little elevation of temperature. Sometimes they are the very last, or only remaining, symptoms of the disease; now and then a new endocarditis has been observed with them. This *nodulated rheumatism,* "rheumatismus nodosus," is very much more frequent in children than in adults. In the case of a boy of eight years the insertion of the occipital muscle was the principal seat of the nodules, dozens of which, from the size of a pea to that of a small hazel-nut, could early be distinguished. From syphilitic gummata, fibromata, gout, and cutaneous tubercles they can easily be discriminated. Special therapeutics for this form, besides what has been mentioned, there is none; but endocarditis is of frequent occurrence.

Peliosis rheumatica is the name of a peculiar form of more or less localized purpura. In some cases of rheumatism a large number of small subcutaneous and cutaneous hemorrhages appear mostly on the lower extremities and mainly round the joints. Now and then they are painful, but frequently not sensitive at all. In this they do not differ from common purpura. In a number of cases of peliosis the heart was not found affected, and the inference has often been drawn that peliosis is not "rheumatism" at all. Indeed, purpuric hemorrhages are often noticed in other infectious diseases (typhoid, measles, whooping-cough, pneumonia, Bright's disease, syphilis, mercurialism, pyæmia, etc., according to the number and virulence of cocci circulating in the lymph- and blood-currents) and not infrequently round the malleoli and the joints in general (maybe in consequence of the impediment to circulation resulting from the smaller amount of subcutaneous fat and consequent tension of the integument in those regions), and in a number of instances the accompanying articular pains of such constitutional diseases are best explained by the presence of hemorrhages inside. Still, peliosis will sometimes appear quite early in acute rheumatism; these are the cases which were classified as a specific variety, and that is why peliosis was asserted to be a specific rheumatic affection. If so, it requires antirheumatic treatment; but the structural condition of the walls of the blood-vessels (and insufficient innervation and the presence of specific bacilli?), which causes the hemorrhages, indicates the early administration of robo-

rants and cardiac stimulants through the whole course of the disease, and great caution in the doses and quantities of sodium salicylate, which has rather a disposition to increase the hemorrhagic tendency. Aspirin may take its place.

There are a great many varieties, or rather degrees, of peliosis, similarly to what we know to take place in purpura. According to whether the hemorrhage takes place near the surface or in the deeper layers of the tissue, both the color and the massiveness of the hemorrhage will differ. In some cases the result is an *erythema,* which has been called either *papulosum* or *nodosum,* from the differences in the results of inspection and palpation. It is observed in both severe and mild cases of articular rheumatism; it is somewhat raised above the level of the skin, sometimes deeply inserted and then circumscribed, and frequently found near the joints. In accordance with the indications furnished by rheumatismus nodosus and peliosis, no special therapeutics is required for this form.

Chronic articular rheumatism is rare in childhood. Moncorvo reports the case of a girl of two and a half years whose rheumatism began with an acute attack, became chronic, and was finally cured by the galvanic current administered for a long time in succession. The youngest case of mine, also a girl, was five years old. She was puny and feeble and her general nutrition defective. A number of the large and small joints, particularly of the hands, were affected, and the tumefactions of the ends of the bones were quite marked. There was neither an affection of the voluntary muscles nor of the heart, and no disease of any part of the nervous system, which Mitchell (1831) and Charcot (1868) found to be the cause of "arthropathic" swellings. The treatment is about the same as that resorted to in the same disease when met in the adult. Sodium salicylate should be given in those cases only which exhibit acute exacerbations. Colchicum, aconite, iodides will take its place, and will be required for a long period. Small doses of arsenous acid, from one-three-hundredth to one-five-hundredth of a grain (one-eighth to one-fifth of a milligramme) every two or three hours, will answer well. Prolonged warm, salt-water (cold or warm), and sulphur baths will improve many a case; so will galvanism and massage. Others will be benefited by dry heat of a high temperature, in bed or in an apparatus, which increases tissue metamorphosis to a remarkable extent, mainly the amount of uric acid. As external treatment a diluted tincture of iodine, iodoform ointment, iodoform collodion, or potassium iodide and lanolin ointment may render good service. Narcotics are seldom required. Good results are obtained by the protracted use of alkaline

waters. From what little I have seen of chronic rheumatism in children, and the many cases of the same disease in adults, I recommend strongly the use of large quantities of water, to which is added from a scruple to half a drachm (1.0 to 2.0) of potassium bicarbonate, as a daily dose; also lithium carbonate in daily doses of from four to ten grains (0.25 to 0.6). Our natural lithia waters contain too little lithia to have any effect except through the large amounts of water consumed.

Muscular rheumatism can be diagnosticated occasionally in very young children; in those from six to twelve years it is not quite rare. Its nature and symptoms do not differ from those in the adult. The neck, back, and shoulders are most frequently affected. The best preventive is the habitual use of cold water. Diaphoretics are not very useful. Narcotic and stimulating liniments find their own indications. Morphine oleate is of but little use; in a severe case I have injected a small dose of morphine with immediate and permanent effect. The interrupted current acts promptly in one or more sessions. Sodium salicylate, antipyrin, aspirin, and phenacetin have some effect, in proper doses and frequently repeated. Semmola's experience in a severe case of neuro-muscular rheumatism is worth remembering. The case was that of a woman of forty years, who suffered from stiffness and pain in a shoulder and right arm, with good passive motility of the joint. After the pain had lasted several months, massage, electricity, quinine, and salicylic acid having proved inefficient, the patient was relieved in a few days by a few subcutaneous doses of one-twelfth of a grain of pilocarpine.

It is in rare cases only that the rheumatic process in the muscle assumes the character of an inflammatory affection. Then there is, as in every myositis with a tendency to chronicity, a hyperplasia of the connective tissue between the fibrillæ, the muscle becomes hard and somewhat shorter, and its electrical irritability grows less or disappears; even the skin participates in the process. Such a case I once observed in a boy of twelve years. He was never entirely relieved, but greatly improved by massage, warm bathing, a mild continuous current, and the internal administration of hydrargyrum bichloride. The treatment was continued for more than a year. These cases appear to prove the identity or similarity of rheumatism, no matter whether in the joints or muscles (I. Adler and others).

21. *Influenza.*

Epidemic bronchitis (*influenza*) can be prevented only by avoiding contagion, which is even more difficult than it is to escape measles.

Its treatment depends a great deal on the variety; the catarrhal, gastric, and intestinal symptoms require early attention, for nervous exhaustion is imminent in every case, and many patients suffer more seriously from the sequelæ than from the original attack. Antipyretics cannot always be avoided. Phenacetin, antipyrin, and sodium salicylate, combined with a cardiac stimulant, may be thus employed, particularly when muscular pain is one of the prominent complaints. Quinine also finds its ready indication. Opiates are often required, either in small and frequent doses or in a single larger dose to secure sleep. Inhalations of steam, two per cent. of carbolic acid having been added to the water, have been highly recommended, but whatever adds to the bronchial irritation and produces cough should be avoided. Rest in bed is required long after apparent recovery, for collapse and nervous symptoms of many kinds are liable to appear during convalescence, and there is no case, though apparently ever so mild, that may not prove grave. Besides vomiting, diarrhœa, high temperature, great lassitude, and all the symptoms of catarrh and inflammation of the mucous membranes, complications with serious forms of pneumonia, sometimes catarrhal and croupous in combination, and pleurisy, of diseases of the heart and blood-vessels (thrombosis, phlebitis) and the sensory organs, and of the nervous system (mental disorders included) are frequent. Osteomyelitis and laryngeal and tracheal perichondritis are occasionally met with, also inflammations of joints, which are mostly intolerant of massage or compression. Nephritis is an early complication. Among the ocular symptoms conjunctivitis is frequent, keratitis and iritis are met with, iridochoroiditis and retinitis are not so frequent as acute glaucoma. Now and then atrophy of the optic nerve has been observed. Otitis media with mastoid abscess is not uncommon; hemorrhagic myringitis requires incision. Meningitis and pyæmia are among the sequelæ. Most frequent is utter exhaustion, which appears to be more than merely functional, and requires for weeks and months (years) the most careful and persistent roborant and stimulant measures.

22. *Pertussis.*

The mortality from *whooping-cough* in New York City is as great as that from typhoid fever. Twenty-five per cent. of all the cases under a year terminate fatally; five per cent. of all those between the first and fifth years, and one per cent. of all those occurring after the fifth. Its direct mortality, however, is not the only danger, for not infrequently chronic laryngitis, pneumonia, emphysema, dilatation of bronchi, and the result of hemorrhages which occur during the attacks

(convulsions, paralysis either general or local, blindness) impair the health of the patient for many years or a lifetime. Thus the tendency to allow whooping-cough to run its full course on the plea that it is a self-limited disease, or that every child must have his whooping-cough, is not justified.

The prevention of whooping-cough, which is a specific and contagious disease, is certainly not easy, for the reason that contagion may take place very suddenly, and through the first and second stages of the disease, both of which extend over a large number of weeks. Contagion may take place, whether or not the disease be occasioned by micro-organisms, by means of the exhaled air, or mucus, or the masses brought up by vomiting. Prevention means protection against the effects of all these factors.

As the disease is spread by contagion only, isolation is an absolute necessity, difficult though it be. In public institutions it is well-nigh impossible. Thus no patient ought to be admitted to, or allowed to remain in, a public school or a hotel inhabited by children. Children with whooping-cough must not even be permitted to congregate in large numbers, because the cases will become more severe by mutually affecting one another. In one point only isolation is more effective in whooping-cough than in other contagious diseases,—namely, that the disease does not appear to be carried by persons not thus affected.

The air must be kept pure, uniform, and moderately warm. The patient should be out as much as possible. No draught, however, must be permitted. Utensils must be kept clean and be disinfected, and the masses brought up by vomiting disinfected, destroyed, or removed. The mucous membranes should be kept in, or restored to, a healthy condition, particularly those of the mouth and respiratory organs. No injudicious exposure must be allowed. The digestive organs must be watched, the stomach must not be full at any time, the bowels kept regular, the food digestible.

So long as the microbic cause of the disease is not known (by different investigators different bacilli and cocci are charged with being its cause), and therefore no causal indication can be fulfilled, the objects of treatment are limited as follows: to relieve the severity and diminish the number of the attacks, to procure quiet nights, to stop the vomiting, to shorten the course of the disease, and to prevent detrimental consequences.

An important indication is that of treating a catarrhal or inflamed mucous membrane. It is quite possible that a sore mucous membrane only is capable of admitting the contagion of whooping-cough as it

mostly does that of other infectious diseases,—for instance, diphtheria. Besides, by attending to the mucous membranes in time, the occurrence of serious complications, such as pneumonia, may be prevented. Catarrh of the mouth and pharynx ought to be treated with doses of potassium chlorate of from half a grain to a grain (0.03 to 0.06) in a teaspoonful of water every hour, and a large number of expectorants find their ready indications in such cases. All of those which have a depressing effect should be avoided, particularly antimonials. Even ipecac should be given in small doses only. Alkaline waters have a beneficial effect. Ammonium muriate in doses of from half a grain to two grains (0.03 to 0.125) every hour or two hours will liquefy the viscid secretion of the bronchial mucous membrane. In a state of evaporation, as described in a former essay, it may be inhaled. The inhalation of other agents which have been recommended as expectorants may at the same time exhibit their germicidal action,—the vapors of benzol, of carbolic acid, and of cresolin; the reputation obtained by gas-works in the treatment of whooping-cough is thus readily explained.

The effect attributed to astringents in the treatment of whooping-cough is best explained by their action on the mucous membranes. Particularly alum and tannin have been so employed. Emetics have been recommended for the purpose of relieving the surfaces of sticky mucus difficult to remove. Copper or zinc sulphate, powdered ipecac, and turpeth mineral are the proper substances to be selected for that purpose.

Schliep has seen good effects of the use of the pneumatic chamber in whooping-cough. He kept the children with their mothers or attendants in compressed air. In some cases a few sessions of two hours each were sufficient to relieve the patients considerably. In a number of cases from twelve to twenty sessions were required. In all of them he claims decided effects, not only in the reduction of the number and severity of the attacks, but also in the duration of the disease. The explanation of the good effects is looked for as well in the increased amount of oxygen inhaled as in the diminution of the hyperæmia of the mucous membrane. I believe that the plan is a good one, particularly if it can be combined with the inhalation of turpentine.

Caillé (*Arch. Ped.*, August, 1892) says that ozone inhalations have a very distinct curative effect as regards the duration and severity of the disease.

Cases exhibiting a severe degree of pharyngitis and laryngeal hyperæmia, particularly in children who have suffered a long time

from chronic inflammatory affections of these parts, will do well, so far as the local symptoms are concerned, under the use of the tincture of pimpinella saxifraga; half a drachm (2.0), mixed with water and glycerin, distributed over the twenty-four hours will be the proper dose for a child of from two to three years.

Local treatment has been resorted to by many. The pharynx has been treated locally with a solution of quinine (Hagenbach), a two-per-cent. solution of resorcin (Moncorvo), a one-per-mille solution of mercuric bichloride, a one- or two-per-cent. solution of silver nitrate, a five-per-cent. solution of cocaine hydrochlorate, or a four- or six-per-cent. solution of potassium bromide. Applications of quinine mixed with sodium bicarbonate in different proportions, of mild solutions of salicylic acid, and of powdered sulphur have also been made directly to the larynx. Inhalations of sulphurous acid have been resorted to, besides those enumerated above, and extolled as highly as any which have been mentioned. If they prove anything, they and the great number of remedies recommended for the same purpose show the difficulty encountered in the treatment of whooping-cough, and the confidence of the practitioner in the patience and submission of his wards. Michael treats whooping-cough as a neurosis, with the same means he employs against other neuroses attributable (or attributed) to nasal irritation. He asserts that seventy-five per cent. of his cases of whooping-cough have done well when exposed to the influence of quinine, potassium bromide, benzol, tannin, boracic acid, salicylic acid, iodoform, cocaine, sodium bicarbonate, or prepared chalk applied to the mucous membrane of the nares.

The internal administration of chloral hydrate, or croton chloral hydrate, was recommended by Lorey in 1879. The daily doses ranged from eight to fifteen grains (0.5 to 1.0). In all cases the attacks became less severe within a short time, but the disease itself was not shortened. Kennedy expresses himself very enthusiastically in regard to the effect of the remedy, which is given by itself or combined with potassium bromide. To procure an occasional good night, a single dose of from six to twelve (0.4 to 0.75) grains has rendered me good service.

Rest and sleep should be enforced. W. W. Johnston's (*Arch. Ped.*, April, 1895) advice to keep children with whooping-cough in bed is good. In that way isolation, rest, and equable temperature are secured, and the results of the feebleness and dilatation of the heart are avoided.

The inhalation of chloroform or, according to some, of ether can

be recommended in those cases in which convulsions have either occurred during severe attacks, or in which the interruption of the circulation is such that cerebral hemorrhage or convulsions are to be feared. In the case of a very young infant I have administered chloroform regularly for every new attack during the course of a number of days in succession for that very purpose, with beneficial result. Bromoform was recommended by Stepp, in three or four daily doses of from one to four drops, to be given in sweetened water or in mucilage.

Quinine has been used both internally and externally by a number of authors of good repute. It was first recommended by Binz. Rossbach credits the drug with the power of relieving increased reflex irritability; Binz, however, attributes to it an antizymotic action. He gives as many decigrammes daily as the child has years, so that a child of five years takes eight grains of quinine a day. He expects to find an improvement after two or three days, inasmuch as the attacks are said to become by that time shorter and less severe. When it cannot be given internally, he administers it in suppositories or in injections. When the sulphate or hydrochlorate is not tolerated, the neutral quinine tannate is selected instead, with this proviso, however, that, the latter salt being much weaker than the former, it must be administered in doses from two to three times as large. It has the advantage of being tasteless. In our own country it is particularly Forchheimer who advocates quinine. He reported ninety-seven cases as having been benefited by its administration. Euquinine may take the place of quinine in the same doses.

Antipyrin has been recommended for whooping-cough, since 1886. by Demuth, Sonnenberger, Moncorvo, Guaita, Wendt, and many others, as almost a specific. Like all the other chemical relatives of chinolin, it destroys parasites outside the organism. It has been claimed, or presumed, to display the same effect internally. Whether that is true remains to be seen. At all events, it is a powerful nervine. It is asserted that it can be given with the same beneficial result in the beginning of the disease and in its most severe stage, and that the latter will terminate favorably in from four to five weeks after the beginning of the treatment. The dose is from a grain and a half to two grains (0.1 to 0.125) three or four times a day for every year of the patient, with an occasional large dose for the night.

Tussol, the amygdalate of antipyrin, is given in the same doses as antipyrin. As H. Rehn recommends it quite highly, it should be tried. It must not be given in milk, nor in close proximity to it.

Of all the almost countless medicines advised against whooping-cough I prize belladonna most highly. I have always returned to it since 1861, when I published my experience with it (*Amer. Med. Monthly*), after having discontinued it for the purpose of trying one after the other of the many remedies recommended during these forty-one years.

The result obtained by me has generally been this: that a well-developed case of whooping-cough, after the diagnosis was made certain, would last for only three or five weeks longer, instead of running through its full course of months and quarters of a year. The effect is mostly not a sudden one. Many cases in which belladonna is given from the commencement may become worse for a short time, then remain at their height for some days or a week, and gradually improve in both the character and frequency of the attacks. In others the effect is perceptible from the first days after its administration, the cases soon assuming a more favorable aspect.

Infants of six or eight months of age affected with whooping-cough require a sixth of a grain (0.01) of either the root or the alcoholic extract three times a day; children of three or four years tolerate three doses, each of half a grain (0.03). These doses appear to be very large in proportion to those tolerated by adults, but it is a fact which can easily be verified, that the effect of belladonna on the pupil and brain is hardly ever perceptible in children from these or smaller doses. The succession of belladonna symptoms in children differs, moreover, altogether from that in adults; the erythematous and flushed appearance of the face and neck, sometimes even of the whole surface, is the first symptom in infantile age; whereas it is seldom observed in adults, or in cases of thorough poisoning only. Some of the old authors advised the administration of belladonna to such an extent as to produce the first symptoms of poisoning; others, however, objected to this practice as dangerous. I, for my part, soon found that those children suffering from whooping-cough who exhibited general erythema from an apparent overdose recovered soon, while others, in whom no such symptom was observed, remained sick for a long time; and continued experience has proved that the occurrence of this symptom is absolutely necessary for the full remedial effect. To obtain control of whooping-cough, the remedy must be given in a dose sufficient to produce erythema, or at least a flushed condition of the face, and, as it were, feverish appearance after every dose of belladonna. Thus the dose is to be gradually increased until this result is obtained. It is a remarkable fact that very young infants may take proportionately large doses; at all events, I do not

remember a single case in which less than half a grain was taken in the course of a day. The prescriptions I have been in the habit of ordering are very simple ones. I either give the medicament as a powder, or have the extract dissolved and sweetened according to circumstances, or give it as a powder mixed with sugar of milk.

The administration of belladonna alone is indicated in such cases of whooping-cough as are not complicated with inflammatory affections of the respiratory organs. The latter take the lead in complicated cases as well in treatment as in the nature and gravity of the symptoms. This is so certain that, whenever a pneumonia coincides with or follows whooping-cough, the peculiar sound of the cough of the latter will disappear, and return only when the inflammation begins to subside. As this is, moreover, the more dangerous of the two, it requires attention before the other. As to bronchial and laryngeal catarrh, the former especially is a very common symptom in whooping-cough. When it is slight, it may be considered as unimportant; when, however, it gives rise to fever or dyspnœa, it constitutes a further indication to interfere.

The preparations mentioned above need not be the only ones to be relied on. The tincture of belladonna is a convenient remedy, inasmuch as the dose can be readily and gradually increased. A baby of two years may take three daily doses, the first of which may be six drops. If the flush be perceptible within twenty or thirty minutes, that is the dose; if not, the number of drops must be increased to obtain the effect which is demanded after every dose. After a few days larger doses are required; there is no case but demands at least twice the amount of the original dose of belladonna within ten or twelve days, or before the disease disappears. Atropine sulphate may take the place of belladonna. A child of two years will probably begin with the five-hundredth of a grain, to be given three times daily, and increased according to the rules stated above.

Opium is spoken of favorably by a great many. I cannot recommend it for anything like regular administration, but it certainly has a good effect in procuring fair nights when given in a single dose. A grain of Dover's powder given to a child of two years, at bedtime, will, at all events, have the result of procuring sleep. In a number of cases the combination of opium and belladonna acts quite well. The antagonistic action claimed for these two drugs is not such as to interfere with their sedative properties.

It is self-understood that the treatment is the same in those cases of pertussis in which the characteristic cough is less marked than attacks of sneezing or suffocation by spasm of the glottis.

VI

Diseases of the Nervous System

1. *General Indications.*

THE great indication in the treatment of all *diseases of the nervous system* attended by symptoms of irritation is absolute protection against external disturbances. This is attained by equable climate, uniform temperature of the room, rest in bed, exclusion of light and noise, comfortably warm clothing, warm bathing, warm applications and fomentations, and by the removal of anything and everything annoying and jarring. Therefore, children sick with nervous diseases must not be excited by unnecessary constraint or coercion, their medicines ought to be given in a palatable form, and vesicatories and other distressing applications avoided, if possible. Symptomatic treatment is perhaps more indicated than in the same class of ailments among adults. Pain and sleeplessness lead to speedy exhaustion. Nothing is more common and more dangerous than the prejudiced refusal to relieve pain by opiates and sleeplessness by properly selected hypnotics. It is particularly in those cases which are mostly, or entirely, of a reflex nature that a symptomatic treatment ought to accompany that of the causal indications. It is ludicrous as well as criminal to withhold chloroform when an eclamptic attack results from an intestinal irritation, or an antispasmodic when a cough is caused by stomach, ear, or nose. A convulsion may at any minute cause apoplexy, paralysis, idiocy, or epilepsy.

Many symptoms may be relieved by the position of the head when they point either to hyperæmia or to anæmia of the cranial contents. The former is benefited by a position approaching the vertical, the latter is relieved by a horizontal one. Not infrequently the former requires derivants (purgatives) and cold, the latter stimulants and warm applications.

In conditions of depression, debility, and paralysis the treatment should be stimulant, exciting, and roborant. In such cases the electric current is frequently employed, and is, to a certain extent, useful. Massage has a beneficial effect not only on the periphery, but by its general action on innervation and circulation, by its effect on the muscles, and also by its direct influence in increasing the relative cir-

culation of the red blood-cells (John K. Mitchell).* Strychnine stimulates (while curare depresses) the reflex and vasomotor centres. Silver nitrate appears to exert a favorable influence in spinal paralysis; muscarine, physostigmine, and nicotine in paralytic conditions of the unstriped muscular fibres.

The interrupted electrical (faradic) current is an excitant—stimulant—of the nervous system, both locally and generally. For the latter effect general faradization has been practised, both through large electrodes and in the bath, to great advantage, according to many who have a right to claim a large experience. The generally stimulant effect does not, however, disprove the fact that, like the galvanic, the faradic bath is capable, particularly when the fine wire coil is used, of reducing undue sensitiveness. The action of the galvanic current is believed to show itself in different ways. It is stimulant and excitant, and (directly, or when interrupted by reversing), mainly when the brush is employed, produces pain, contraction, and consecutive dilatation of blood-vessels. It is electro-tonic, and thereby produces changes in the irritability of the tissues; it is chemical, and thereby decomposes fluids; and it is cataphoric, and thereby transfers solutions through badly conducting tissues. To the two poles different properties are attributed. It is the positive pole (anode) which is credited with a tranquillizing effect in inflammations and neuralgias (less in tic and hemicrania than in supraorbital, occipital, intercostal, lumbar, and sciatic neuralgias); the negative (cathode) is known to influence old inflammatory processes, cicatrices, and indurations. Still, there is no doubt in my mind as to the exaggerated character of the expectations once cherished in regard to the effects to be obtained

* General massage (with dry hands) of the whole nude body, of extremities, neck, and trunk, lasting from fifteen to thirty minutes, is indicated in anæmia, chlorosis, tedious convalescence, chronic rheumatism, and neurasthenia. To reach the muscles some force should be used, but no violence, which is liable to cause capillary hemorrhages. Acute pain, local inflammations, and the presence of pus are contraindications. I have seen a good many cases of a chronic or an undiscovered peritonitis aggravated into an acute attack by reckless manipulation. Unless the physician has full control over the doings of a professional masseur and ample confidence in his skill, he should do the massage himself or employ a professional man who has selected massage as a specialty. The circulation of blood and lymph is best stimulated by massage of the whole length of the muscles. The lymph-ducts run along the intrafibrillar connective tissue. By compressing and emptying them and the blood-vessels from the peripheral ends in the direction of the centre of circulation a new supply is furnished and the general nutrition improved. Locally it acts well in recent injuries, contusions, and distortions, in subacute and chronic inflammations of joints, in neuroses, contractures, arthritis deformans, and arthritic muscular atrophy (Hoffa).

by both electricity and galvanism. The difficulty of reaching a coveted spot through tissues of different conducting powers is always great; the accumulation of fat is a powerful obstacle to the transmission of the current, and its amount cannot be calculated. This is so true that even for purposes of diagnosis the subcutaneous fat of babies and of many women offers a serious impediment. Besides, different morbid conditions and different periods of life interfere with the estimation of the effect of the current. In what has been called the reaction of degeneration both the faradic and the galvanic irritability of the nerves are diminished, and while the galvanic excitability of the muscles is preserved, the excitability by the faradic current is lowered. In the very young,—the baby under six weeks,—as general reflex irritability is quite low,* comparatively strong electrical influences are required to obtain effects. At all events, the action of the different currents is, to some extent, not measurable, controllable, or certain. The time during which both the faradic and the galvanic currents were considered far-reaching and omnipotent remedies has long gone by. Indeed, there are those, particularly among neurological specialists, who, while maintaining that the currents are great aids for diagnostic purposes, yet reject their claims as curative agents. Years ago Meltzer—in a paper read before the Association of American Physicians—proved the total absence of efficacy on the part of the electrical current when applied to the mucous membrane of the stomach and the intestines.

Franklinism, once the only recognized electrical remedy, has rapidly regained a standing among electrical methods. But neither the common disruptive discharges used in locomotor ataxia nor W. J. Morton's "static induced currents," obtained by adding condensers to the static machine, will find many applications among children affected with diseases of the nervous system.

The effect of the electrical and the galvanic currents is perhaps best exhibited in cases of peripheral nervous affections. *Paralysis of the facial nerve* and of the *brachial plexus,* both not infrequent after difficult or clumsy, rarely after easy, deliveries, when the female pelvis is narrow, the shoulders of the fœtus large, or the head deflected, are among those in which the current is frequently used; its effect is mostly very slow, sometimes not very satisfactory. Par-

* According to Soltmann and many followers, the irritability of peripheral nerves is small in the newly-born; it increases until he is six weeks old; at that time it equals that of the adult. The muscular reaction is slow, like that of a fatigued animal.

ticularly in cases of facial paralysis in which the reaction of degeneration has already been established it leaves much to be desired. The paralysis of the brachial plexus of the newly-born, as it depends on stretching, laceration, or hemorrhage, and is sometimes complicated with injuries to one or more of the joints of the upper extremity, —in the lower joints the affection is rarely observed,—allows a doubtful prognosis only. It concerns mostly the fifth, sixth, and seventh lower cervical nerves, which form the posterior cords of the brachial plexus. In that case the deltoid, biceps, brachialis internus, coracobrachialis, infraspinatus, and sometimes the exterior muscles of the hand are affected. When the lesion is deep-seated the whole extremity is paralyzed and will be shortened and atrophic. Some of the cases, however, are distinctly the results of an interstitial inflammation and consecutive hyperplasia of the connective tissue of the nerve-fibres. In such, no matter whether on the basis of syphilis or not, the interstitial hypertrophy should be fought with mercurials or iodides, or both. The same must be said of *polyneuritis,*—such as follows infectious diseases, with its pain and increasing paralysis and degeneration, together with intact bladder and pupils,—in which rest, sodium salicylate, and, later, arsenic and strychnine yield better results than does the current. Nor is it more effective in *hemicrania,* no matter whether it be the result of congenital disposition, or complicated with hysteria and epilepsy, or dependent on anæmia, hypermetropia, dyspepsia, overwork, or confined air. In all these conditions the correction of the causes, a convex glass, country air, shortening of school hours, cold-water treatment, arsenic, iron, and aconitine, with an occasional dose of a bromide, will yield better results.

To complete what I have to say on the subject of the remedial influence of electricity and galvanism, I may as well speak here of their employment in the peculiar changes of the muscles which are known under the headings of *muscular atrophy, progressive juvenile muscular dystrophy,* and *pseudo-hypertrophy.* All of these names are applied to abnormal conditions whose coarse anatomical changes are better understood than their causes. So long as these are unknown we cannot help admitting that therapeutical experiments, such as those with thymus gland in pseudo-hypertrophy, be they ever so tentative, are justified. In a certain percentage, indeed in the vast majority (exactly as in Thomsen's *congenital myotonia*), the alteration is in the beginning strictly local or confined to muscular tissue; in others there can hardly be a doubt as to the cerebral origin of the muscular anomaly. In all of them electricity and galvanism have been extensively used, together with massage, bathing, etc., but in

no case have their effects been noteworthy. The best results have been obtained through systematic exercise and training of the muscles. As in many other cases in which the original cause (or change?) is inflammatory, and exhibits itself in proliferation of cellular interstitial tissue (no matter what its final result is destined to be), mercury, mostly the bichloride,—administered patiently and watched carefully,—appears to have given me better results. At least, the progress seemed to be slower and intermissions of the morbid process more distinct and prolonged.

2. *Operations.*

Operations on the skull and brain are among the prides of modern operative surgery. Escapes from death on the table are more numerous than formerly, and recoveries from diseases formerly fatal, because permitted to die without an operation, are not unheard of. Craniotomy has been performed for injuries, intra- and extra-dural hemorrhages, hydrocephalus, softening, tumors and cysts, Jacksonian epilepsy, athetosis, chronic contractures, certain mental diseases, otherwise incurable headaches, old cicatrices, and abscesses. Infants and children come in for their share, mainly with abscesses, hemorrhages, hydrocephalus, Jacksonian epilepsy, and premature ossification of the cranial bones and fontanelles, with epilepsy and idiocy among its results. So far as craniotomy and craniectomy are concerned in cases of *microcephalus* or *idiocy*, no other surgeon has met with the favorable results alleged to have been obtained by Lannelongue. Guided by thirty-three cases of American surgeons,—fourteen of which died soon, while nineteen only recovered from the operation, and very few showed any improvement,—I treated of the subject in my address before the Eleventh International Medical Congress at Rome, April, 1894,* and arrived at the following conclusions: that congenital idiocy is the result of many different forms of arrest of development (of blood-vessels, cortex, island of Reil, hemispheres), of inflammations (meninges, encephalon, with softening or sclerosis), of thrombosis, and of hemorrhage; that it is a frequent result of microcephalus, which, as a rule, is not dependent on premature ossification of the bones and fontanelles, but in the large majority of cases on arrest of development of some parts of the brain, mostly connected with long-continued patency of the fontanelles; that, therefore, operations undertaken to widen the cranial cavity are of no use, for a brain which did not grow before the cranium closed will

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* "Non nocere," New York Medical Record, May 19, 1894.

not grow afterwards, and absent or defective parts will not develop; that even cases with a clear history of premature ossification are not, or very doubtfully, benefited; that, finally, the operation undertaken for the purpose of enlarging the cranial cavity has the opposite effect, as is proved by the experience of Van der Veer and Hun, also by a case reported and drawn by Bourneville, and, finally, by the skull, belonging to B. Sachs, of a child operated upon twice in the course of sixty-seven days by A. Gerster. It exhibits a mass of hard tissue proliferating into the cranial cavity along the whole wound made in the first operation. I trust, therefore, that the days of uncalled-for craniotomy and craniectomy are numbered. Bourneville (*Prog. Méd.*, 1897, p. 390) favors craniectomy for idiocy in cases of trauma, abscess, or tumor only. W. W. Keen (*Jour. Nervous and Mental Dis.*, February, 1898) reported eighteen cases of children, from twelve months to six and a half years old. Five died of the operation, six were slightly improved. His contraindications are: a fair-sized head, microcephalus, or age beyond seven years.

Starr collected, in 1889, a total of 270 *brain tumors* in children. Of these 152 were tubercles, 37 gliomata, 34 sarcomata, 5 gliosarcomata, 30 echinococci, cysticerci, and cysts, 10 carcinomata, and 2 gummata. The carcinomata were mostly secondary, the gliomata and sarcomata primary. Forty of the two hundred and seventy were superficial, and in sixteen of the forty their localities could be distinctly diagnosticated. Therefore, trephining and operations on the substance of the brain for tumors will never be numerous. Their diagnosis is not always easily made, and that of the locality affected is beset, for the present, with still more difficulty. Gliomata are rarely near the surface; solitary tubercles are sometimes found in the gray substance of the brain, but more frequently in the corpora striata or thalami optici. In many more instances an operation will be required because of tumors originating in the cranium or its periosteum and encroaching upon the brain; they are mostly sarcomata, fibro-sarcomata, or osteomata. One of the last mentioned I have removed. A cyst of the dura mater, resulting from hemorrhage, was successfully removed in the service of Dr. Henry Hun, at Albany, followed by marked improvement of the child's idiocy and convulsibility.

Starr is rather favorably inclined towards trepanation in a number of cerebral diseases; it is true that those which promise no success from medical treatment cannot lose by surgical interference. In such cases of hemorrhage as permit of a localized diagnosis, though that between an extra- and an intradural situation may be impossible

in many instances, he favors it. His advice of tentative interference with "microcephalus" I do not look upon favorably. *Abscesses,* unless they be the results of pulmonary gangrene, typhoid fever, or pyæmia,—if their location can be determined and is accessible,—are to be operated upon; the opening must be sufficiently large to permit of examination, and draining should be both extensive and prolonged until granulation and complete recovery take place. Tumors are not often the subjects of operation in children. It is true that many are met with in infancy and childhood; according to Gowers, two-thirds of all the cases of intracranial tumors occur in the first two decades of life. But those occurring in early life are mostly found in the cerebellum, the basal ganglia, capsula interna, corpora quadrigemina, pedunculi, pons, and medulla oblongata, rarely in the fourth ventricle; very few such will ever be accessible to an operation.

No case of obscure brain disease, and no suspicion of brain tumor, should be dismissed without the consideration of the possibility of its *syphilitic* origin. Gummata will occur, endarteritis is frequent. In these cases mercury and iodides, internally and subcutaneously, in ample doses, and continued a long time, are in order. Otherwise, nothing is left but symptomatic treatment: morphine, hyoscine, chloral, bromides, purgatives, hot foot-baths. Lumbar punctures appear to do no good; indeed, have done harm and resulted in sudden death when made in the presence of brain tumor.

3. *Inflammatory and Exudative Processes. Arrests of Development.*

The simplest form of *cerebral meningitis* is that which results from insolation and mental emotions and exertions. Frights (especially protracted fears) and overstudy are frequent causes. So is trauma, which, however, is liable to produce the purulent form. In pneumonia, particularly of the upper lobes, it is not uncommon; less frequent in typhoid fever, more so in the septic diseases of the newly-born, where, however, it is liable to form part of the general pyæmic condition. With the exception of the latter, in which death is certain, an antiphlogistic course of treatment is indicated here, if anywhere. The hair should be cropped short; the head must rest on a cool pillow and be placed high. Calomel at first in purgative, later in smaller doses. As the mercurial treatment is to be continued, a solution of potassic chlorate may be applied frequently to the gums and mouth. The heat of the head and the local inflammation must be fought by cautious cold applications, according to the directions given formerly (p. 94), and by leeches applied to the nasal septum or to the mas-

toid processes, also by cupping to the neck and shoulders; coma by cold affusions to the head and hot bathing, with or without mustard, of the rest of the body. Great restlessness, sleeplessness, and general excitability demand warm bathing, bromides in generous doses, from one to ten grammes (fifteen to one hundred and fifty grains) a day, chloral, and codeine. After the first invasion and the period of high fever have been successfully dealt with by calomel and a few large, afterwards moderate, doses of digitalis, the time for potassium iodide (from one to five grammes daily) has arrived, also for vesicatories to the neck and behind the ears. In regard to the latter, however, it is always well to be careful, for cantharides are the sworn enemies of the kidneys. The iodides must be continued a long time. Of the roborants to be given during convalescence, iron ought to be the last one selected. Lumbar puncture will be discussed shortly.

It is not always easy to diagnosticate between a fully-developed meningitis and a *hyperæmia* resulting from similar causes,—viz., overexertion, emotion, insolation, and the continued effect of overheating and stimulating diet. The continuation of the treatment depends on the persistence of the symptoms. Quite frequently a warm or hot mustard-bath, with temporary applications of ice to the head, repeated hot foot-baths, sinapisms to the neck, an erect posture in bed, a calomel purgative (with or without local depletion), and occasional counter-irritation by derivant enemata (vinegar one, water five to six) will suffice. The *passive hyperæmia,* however, complicated with and depending on general and local *cerebral anæmia* (occasionally even *thrombosis* of small vessels) and that which is caused by the rapid inanition produced by the different forms of acute and exhausting intestinal discharges require an altogether different treatment. In place of the antiphlogistic treatment, stimulation is indicated. Still, caffeine and alcohol are to be avoided during the worst stage; camphor, ammonium carbonate, and musk will answer better. Food and medicines are to be regulated by the requirements of follicular or other enteritis, and water must be supplied in ample quantities. When, however, there is vomiting and when diarrhœa is persistent, neither the stomach nor the rectum will accept it. In these cases the only salvation may be in copious (pint or quart) subcutaneous infusions of warm and sterilized salt-water solution (water one thousand, table salt six to seven, with or without sodium carbonate ten to twelve).

Thromboses from other causes are treated on the same principles. Debility and paralysis require such stimulants and irritants as the brain will tolerate. *Embolisms,* with their secondary conditions of irritation and inflammation, should be treated according to the rules

detailed above, and will require ice, purgatives, warm bathing, and iodides, with or without bromides. The resultant paralysis demands massage, electricity, strychnine, and mineral baths such as St. Catherine or Kreuznach. Chronic remnants of an inflammatory disorder, no matter from what cause, may be benefited, even after a long time, by a protracted course of treatment with potassium iodide, or with mercurials, or both together, or alternating.

Ergot is useless in these cases of intracranial hyperæmia; it does not have the favorable effect which often follows its use in similar changes in the spinal canal.

Polioencephalitis is either fœtal, or congenital, or postnatal. Its results are cysts, cicatrices, softening, atrophy, sclerosis, or porencephalia; its causes, sickness or syphilis of the pregnant mother; in the child, usually from one to four years old, syphilis or infectious diseases, such as influenza, measles, or scarlatina; its symptoms, hemiplegic (sometimes diplegic or paraplegic) paralysis with secondary contractures, more of the upper than the lower extremities, increased reflexes, and unilateral atrophy of the maxillæ, forehead, or face. The acute attack requires rest, ice to the head, leeching, calomel, perhaps chloral hydrate and chloroform; the chronic condition, mercurials and iodides, massage, passive and active exercise, orthopædic treatment, inclusive of tenotomy; and those cases which result in idiocy or epilepsy, careful training and treatment in proper institutions.

In connection with this *spastic hemiplegia* should be mentioned *congenital spastic muscular contraction* (Little's disease). It is the result either of a fœtal arrest of development or of inflammation, possibly sometimes contracted during a protracted labor. The lower extremities suffer more than the upper, sometimes immediately after birth; they rotate inward; the body, hips, and knees are stiff; the walk is equinus; the sphincters always, intelligence sometimes, intact; the muscles not hard during rest, but stiffened when being used. Improvement is possible, but only with persistent and patient exercise and training and absorbent treatment.

Tubercular meningitis is not always fatal, though the diagnosis permit of no doubt. The latter, however, is mostly made at an advanced stage when the prognosis is already very ominous. Biedert had an opportunity to make an autopsy on a patient treated for tubercular meningitis, death resulting from another disease. He found old meningeal tubercles. Still, many of the recoveries reported—mainly for the purpose of proving the efficacy of specific treatments (tartar emetic and iodoform ointments and those more modern)—are of doubtful character. I have also seen recoveries from what I diag-

nosticated as tubercular meningitis. One died afterwards of necrosis of the cranial bones, occasioned by my tartar emetic ointment. Another case, that recovered thirty years ago, is still alive in an insane asylum; he has never been normal, mentally, since I discharged him "cured." From what little I have said it is evident that a preventive treatment only may be expected to do good, if anything will. Infants and children of scrofulous or tuberculous families should be brought up with unusual care, mainly when there was (or is) a case of tubercular meningitis in the family. Congestion of the brain, caused by feather pillows, exposure to the sun, hot rooms, coffee, tea, and alcohol, or physical and mental overexertion, must be guarded against. Trauma may become the proximate cause; infectious fevers, such as measles, influenza, and pneumonia, also whooping-cough, require great care. Constipation must be overcome. Eczema and other eruptions of the surface should be slowly healed, but they must be healed. Their presence is a constant source of danger, both by reason of the opportunities afforded for a direct invasion of microbes and of the irritation and swelling of neighboring lymph-bodies. These, when found, must be removed by internal treatment, massage, ointments (green soap, iodide-lanolin mixtures), or enucleation. Nasal catarrh should immediately be relieved; adenoid growths in the nasopharynx either regularly irrigated or, when they are large, removed. Their persistence is a cause of "scrofulous glands" and, possibly, of secondary tuberculosis; also of direct invasion of germs through the patent orifices of the lymph-vessels at the base of the cranium and the extradural tissue. The best general preventive treatment of infants and children with a predisposition to tubercular meningitis, rendered probable by hereditary taint and by suspicious symptoms, consists, in my opinion, in the regulation of the diet and hygiene: animal food mostly, daily cool or cold bathing with vigorous friction, open windows, exercise, cod-liver oil during the cool and cold months, arsenic in regular small doses, and pure guaiacol (or guaiacol carbonate) for many months in succession through a course of years, besides attention to the nares and adenoid growths.

When the disease is fully recognized, constipation must be overcome; the first drug to be used for that purpose should be, or contain, calomel. It may be repeated from time to time, provided the regular use of potassium iodide does not contraindicate it for chemical reasons. The latter ought to be given in large doses through (nearly) the whole duration of the illness. Tubercular meningitis both permits and demands large doses,—from one to three drachms (five to twelve grammes) daily. Mercury is indicated. Calomel and

potassium iodide being incompatible, the bichloride should be given, or mercurial ointments used instead. Cardiac stimulants may be employed to advantage from the beginning, the circulation being defective on account of the undue irritation of the pneumogastric nerve. Strophanthus (and strychnine in very small doses) appears to act better than digitalis. Caffeine and alcohol must be carefully avoided. Chloral will act well when headache is severe and a tendency to convulsions exhibits itself. To combat the latter the inhalation of chloroform cannot be avoided; nor morphine altogether, when the pain is excessive. Antipyretics are not indicated in the beginning, when the temperature is low, except in the infant, with its tendency to high temperatures in the beginning; during the last few days, when, in the vast majority of cases occurring between the second and seventh years of life, it rises previous to death, they are useless. With tartar emetic ointments applied on the closely shaved head I have had ample experience, and shall not employ them again. My experience with iodoform ointments (1 to 5 or 10) is but small, and my confidence in their efficacy still smaller. Vesicatories may do harm by annoying and irritating the patients; I expect more derivative action from keeping the bowels open and the body sufficiently covered with clothing. Leeches are seldom useful, except when conjunctival injection and local heat of the head become apparent at an early date. Otherwise, symptomatic treatment is all that can be advised. Unusually severe vomiting in the beginning may require ice pills and mild doses of an opiate, or cocaine, perhaps tincture of iodine in one-quarter- to one-half-drop doses, or arsenous acid, one-three-hundredth to one-five-hundredth grain (one-fifth to one-eighth milligramme), from four to ten times a day. Ice applications are useless, for the temperature is low before the last stage sets in, the local hyperæmia mostly passive, and the tolerance of ice in small children easily exhausted.

To what extent the operative treatment by trephining and drainage will prove successful remains to be seen. There are but few cases of tubercular meningitis not complicated with general miliary tuberculosis; thus the prognosis of operative interference is not at all promising. Besides, the cranial cannot be compared with the peritoneal cavity, which is believed to be favorably influenced by the performance of a laparotomy. Peritoneal tuberculosis is very apt to be isolated and uncomplicated, its secreting surface of a different character, and drainage easier. Still, trephining and drainage have been performed. Sins committed aseptically are readily forgiven. Since Quincke (1891), lumbar puncture, mostly between the third and fourth lumbar vertebræ, has resulted in facilitating a diagnosis in many in-

stances and in temporarily relieving some symptoms,—those of congestion, œdema, pressure, coma,—but rarely aided in accomplishing a cure.

In order to obtain any cerebro-spinal liquor from the cranial cavity, lumbar puncture should withdraw from ten to fifteen cubic centimetres. The total amount should not often exceed twenty or thirty at any one time. None may be obtained when the needle does not reach the spinal canal, or is obstructed by fibrin, or is caught between the nerve-fibres of the cauda equina, or when the connection between the ventricles and the cerebral and spinal subarachnoid spaces has been disturbed by exudative processes. The normal liquor, also that obtained in many pathological conditions, is clear, of 1007 specific gravity, and contains from 0.2 to 0.5 per mille albumin. One per mille albumin in the fluid means inflammation. Sugar is sometimes found in connection with tumors. In simple *serous meningitis,* in chronic hydrocephalus, in that connected with pneumonia and other infectious diseases, also with uncomplicated tumors, the liquor is clear, in cerebro-spinal meningitis it is turbid, somewhat purulent, and contains pneumococci and meningococci, in many cases (by no means all) of abscess and of cerebro-spinal meningitis pus and streptococci and staphylococci, in tubercular meningitis mostly bacilli, in apoplexies and hemorrhagic pachymeningitis blood. Kiliani and G. W. Jacoby found blood when the diagnosis of spinal hemorrhage had been made.

Puncture, which should never amount to an aspiration because of the pain in back, head, and neck which is caused by it (Fürbringer), not always successful even as a means of diagnosis, has not yet given much satisfaction from the view of therapeutics. It gives some relief in meningitis, headaches (inclusive of the headache of chlorosis), delirium, and hyperæsthesia, but these symptoms are liable to return. I am, however, so certain of having interrupted the course of cerebral inflammations and improved their sympoms temporarily, that I trust I shall see recoveries like those that have been obtained during the last few years. (Cerebro-spinal meningitis, Kohts, Netter.) In a few cases of cerebral lead symptoms, and in those connected with chlorosis, it is said to have given relief. Lenhartz improved a case of cerebral œdema connected with traumatic injury. H. Barth reported lately a case of tubercular meningitis (diagnosis by lumbar puncture) which recovered. The patient was two and three-quarters years old. Eight leeches in eight days. Altogether, it is to be hoped that we are standing in the vestibule of a new therapeutical achievement.

General paresis ("periencephalitis" and other changes; in a case

of John Thomson and D. A. Welsh—*Br. Med. Jour.,* April 1, 1899—atrophied frontal and parietal convolutions, patches of congestion and induration in the white substance, dilatation of the fourth ventricle, and granulating ependymitis of the lateral and fourth ventricles) forms no exception to the rule that the pathological changes occurring in the brains of adults are also found in children. Paresis is, however, rare. In a few cases there seemed to be an hereditary disposition as in other cerebral alterations leading to chronic intellectual disorders. The vast majority of cases are of syphilitic origin, and a thorough antisyphilitic treatment ought to result favorably now and then.

The prognosis in, and the results of treatment of, *chronic hydrocephalus* depend on its nature. When it is congenital, no matter whether internal or external, whether the result of a fœtal inflammation (of brain-substance, meninges, plexus, or ependyma of ventricles), or of obstruction by a tumor, or of an arrest of development, the morbid processes leading to it are so serious as to render the outcome of treatment—though it do not prove fatal—very problematic. Substantial changes of the original brain-substance cannot be remedied by the removal of fluid. Nor is it probable, or rather possible, that the cerebral atrophy produced by permanent intracerebral pressure can be overcome by attempts at relieving hydrocephalus. The chances are better when chronic hydrocephalus is the result of a postnatal meningitis occurring after trauma, whooping-cough, or acute infections. But even in these cases, while the recoveries—I mean anatomical recoveries—from the secondary effusion are more numerous, the inflammatory alterations both in meninges and brain are such as either to predispose to future meningitis or to so alter both the physical and mental functions of the cranial contents as to render the result either very doubtful or far from desirable. Our prisons and lunatic and idiot asylums tell the tales. The chances of hydrocephalic patients are best when the disease is the result of chronic hyperæmia,—for instance, in craniotabes. Such children, with a slight amount of hydrocephalic effusion resulting from the hyperæmia of rhachitis, are always apt to get entirely well under proper antirhachitical treatment (fresh air, animal food, phosphorus, iron, etc.), and even large amounts of fluids are absorbable, with restitution of the brain and its functions, in a certain percentage of cases.

After all, it is evident that iodides, mercurials, vesicatories, diaphoretics, diuretics, and purgatives are useless in congenital hydrocephalus. In the other forms the diagnostic and therapeutical skill

of the practitioner will make the required selection, so far as indicated. Should the head grow rapidly, the prognosis is bad. In these cases even compression will do but little, inasmuch as compression of the increasing fluid, unless it can be removed, will also compress the brain. In less progressive cases the application of rubber bandages or caps, also adhesive straps round and over the shaved skull, may do some good. They should not be omitted in those cases which are being punctured, provided the cranium is still compressible. Indeed, in almost all the cases on which it was performed the children were quite young and no ossification of the sutures had taken place. Therefore, the case successfully operated upon by Rehn, of Frankfort, Germany (with repeated punctures),—that of a girl of twelve years, presented (alive) before the German Congress for Internal Medicine of 1886,—may be considered very exceptional. Cases which require trephining before drainage can be established hold out no hope, because the skull and brain cannot close in upon the emptied cavity.

Punctures of the hydrocephalic cranium were made in antiquity, but, like many other experiences of Hippocrates, were forgotten. It was not until this century that observations of recoveries were made after the intracranial fluids had found a spontaneous or traumatic outlet. Höfling published a case (1828) of recovery from hydrocephalus after a complicated fracture of the frontal bones and a discharge extending over days; Greatgood (1828) one after an injury produced by a nail; Haase (1818) one of spontaneous perforation. Huguenin collected six cases of recovery after a discharge through the nose (or ear) had been established. Punctures have been made in great numbers; many more, certainly, than have reached the eyes of the medical public. It can, however, easily be understood that very probably not a single case of recovery has taken place that has not been published. Indeed, the publications were mostly made very soon—too soon—after the operation or operations were performed. Thus, when Beely collected twenty-seven cases of recovery after puncture (two of which were combined with tincture of iodine injections), he expressly stated that only eight of them had been under observation a year or more. Altogether, it may be more human than, unfortunately, scientific to pride oneself on one's results, particularly when these results boast of benefit to mankind. Thus, Conquest reports "ten cures" out of nineteen cases operated upon by himself. Charles West, than whom there was no critic more learned, wise, and incorruptible, collected sixty-five cases with (alleged) "sixteen recoveries," which he, however, reduced to three or perhaps five. Battersby came to the conclusion that probably there was one recovery

in fourteen cases on which the operation was performed. But from my previous remarks, referring to the severity of the original lesion and to the results of the fluid present either outside or inside the brain, it is easily understood that I cannot look upon the result of the operation as anything like so favorable as is claimed. Still, there are many cases in which (when they are postnatal) it must not be omitted, together with general treatment. I have made a number of lumbar punctures for the same purpose, with visible effects on the distended fontanelles and sutures, but without a cure, and have come to the conclusion from a good many cases that if a puncture is to be made without the injection of iodine, the lumbar puncture should be preferred. It can be repeated as often as the cranial puncture, with very much less danger of consecutive oozing. Among the remedies I value most highly here, or wherever tissue-building is a main object, is phosphorus. It may be alternated or combined with iodides, digitalis, iron, or arsenic, according to circumstances; also with antisyphilitic treatment in all cases in which, from complicating symptoms or the history of the father (or family), hereditary syphilis with its vascular degenerations can be presumed to be the cause of the hydrocephalic effusion.

The cranial puncture should be made over the large fontanelle, about one centimetre or more (half an inch) from the median line; vertical when the lateral ventricle is to be reached, oblique when the hydrocephalus is external. It is best not to remove much fluid the first time: from twenty to twenty-five cubic centimetres (five to six drachms) will suffice. As a rule, there is but little reaction, and the operation may be repeated within a few days or a week. During the operation and after it compression must be made to prevent hyperæmia, hemorrhage, and rapid re-effusion. In cases of external hydrocephalus a mild injection of iodine with potassium iodide and water ("Lugol"), or Morton's fluid (consisting of iodine one part, potassium iodide three parts, glycerin forty-eight parts), may be made to suppress secretion. It will take very numerous observations, however, during many future years to determine to what extent all these attempts at suppressing secretion and at facilitating meningeal adhesions and reproduction of brain are to be considered valuable in the interest of families or of mankind in general. When the percentage of albumin contained in the aspirated fluid increases after every operation, the prognosis is bad.

N. M. Hunter, of Union Springs, Alabama, published in *Pediatrics*, August 15, 1902, the report of an operation on internal hydrocephalus which proved successful and looks very promising. By

the closing of the foramen of Magendie and all channels connecting the ventricles and the subarachnoid and subdural spaces, brought about by pressure from within and original lesions, the pia and dura were found dry. Now his operation consists in the introduction of one or more strands of fine catgut into each of the ventricles, landing them in the subdural space, and closing the dura and the external flaps. In this way the absorption of the fluid in the subdural sac and a complete recovery were accomplished. This operation will naturally be more appropriate and radically helpful whenever the brain has not suffered too much by pressure and atrophy. Postnatal hydrocephalus offers a better prognosis than the fœtal form.

A number of chronic degenerations of the brain, both general and local, are the result of inflammatory processes. If they be prenatal, the prognosis is very bad; if acquired after birth, the nearer the beginning of the treatment to their starting the better the possible result. Such conditions are *disseminated sclerosis,* with its increasing bodily and mental failure, nystagmus, and death under the symptoms of deep sopor, also the congenital form of infantile spastic hemiplegia, Little's disease (p. 276), *infantile spastic hemiplegia* depending on *polioencephalitis,* and *bulbar paralysis.* The general indications for treatment are the same. In acute exacerbations, depletion, ice, and laxatives will be required. *Bulbar paralysis,* acute cases of which I have seen twice as the result of hemorrhage, with ptosis, accelerated pulse, rapidly increasing facial paralysis, also paralysis of extremities and of respiration, until death closed the scene within a day, may often demand a local application of ice to the nape of the neck. The chronic condition, with fibrillar twitchings, electrical changes, and absence of reflexes, requires the different forms of electrical and galvanic treatment, iodides, mercurials, and warm bathing. In all such cases the indications are pronounced enough, but the results mostly negative. It is only chronic cases that permit the treatment with iodides and mercury. Syphilis should never be lost sight of as a possible cause.

Meningocele (a hernial sac with liquid contents only) and *encephalocele* (hernia of the brain-substance) are but rarely amenable to a successful treatment. When they are small, the protruding contents may be retained by a properly fitting appliance of lead or leather or rubber, until the abnormal aperture has had time to close. This process may be accelerated by the administration of phosphorus (ol. phosphoratum or elixir phosphori) in three daily doses of one-fourth of a milligramme each (one-three-hundredth grain). When larger and irreducible, the tumefaction has been caught in a clamp

and punctured, or removed altogether. In some cases the clamp was allowed to remain, in others it was removed; in the latter the wound was sutured. Modern surgical journals report favorable cases of operations performed not only on meningocele, but also on encephalocele. The complication with hydrocephalus impairs the prognosis. Similar treatment has been resorted to in a few cases of *meningocele spuria,* which results under an intact scalp from fissures of the cranium to which in infancy the dura mater is tightly adherent, induced by forceps operation, by fall or some other trauma, by caries, or by syphilis.

There are complications of a grave nature. When the brain is injured down to a lateral ventricle the gap may become permanent and cause porencephalia. Rhachitis and the interposition of brain-substance between the fractured bone prevent spontaneous recovery. Indeed, it appears that the fracture never heals spontaneously; practically, the fissure may close by the interposition of the thickened membranes and aponeurosis, together with diminution of the cerebro-spinal liquor. Such an apparent recovery may, however, not always be a blessing, for epilepsy and metastatic meningitis have been observed afterwards. Recent cases may be treated by the elevation of depressed bone and bone suture. In incipient spontaneous improvement (in fact, in stationary cases also) the tumefaction should be protected by a pad. Iodine injections have been made into the cavity, which contains cerebro-spinal liquor only, with occasional success; and in a few cases of epilepsy and of rhachitical hydrocephalus, complicating the condition, the lateral ventricles were drained.

4. *Psychical Diseases.*

Psychical diseases have been believed to be rare in infants and children. The statistics published by lunatic asylums and by specialists are meant to prove that. These statistics are correct, but the conclusions drawn from them are not. Every practitioner knows better. *Suicide* is on the increase. *Dementia* and *mania* are by no means rare at any period of infancy and childhood; *melancholia,* often without delusions and with suicidal tendency, and similar conditions of depression are not quite so frequent; they are more generally found before and about puberty. The public institutions do not contain such patients. A perverse, demented, or even maniacal child is managed and prevented from doing harm to itself or to others, at home and by the family, better than an adult, and it is there that numbers of such patients can be observed. The same forms of mental disease occurring in the adult are seen in the young. Besides those which have been mentioned, we meet with *moral insanity* (often characterized merely

as motor and psychical restlessness, or incorrigible conduct), *monomania, epileptic* and *circular dementia,* even *paresis* and *delirium tremens.* More frequent than either or all of them are *idiocy* and *cretinism,* the former of which is a not rare termination of mental anomaly in the adult, while in the young it is among the first appearances of aberration, though, indeed, but the result of ever so many different anatomical changes. Here also heredity is one of the factors. A peculiar form of amaurotic *family idiocy,* almost exclusively observed in Hebrew families (thus far mostly Russian), always fatal, and associated with a characteristic condition of the macula lutea terminating in optic atrophy, with early blindness, was described by Tay and B. Sachs. Some varieties I have discussed above, also the possibilities of treating them medicinally or by surgical procedures (p. 272). Cretinism has some well-understood anatomical peculiarities or causes; prominent among them are the shortening of the cranial base by premature ossification of the occipito-sphenoidal synchondrosis and (it appears principally) the absence or degeneration of the thyroid gland. Thus, the cretinism of the fœtus and infant and the myxœdema of the adult are among the results of the same anomaly.

My object in enumerating most of the possible causes of mental disorders in the young is principally to show that the preventive treatment should be considered more reliable than the curative. Heredity plays an important *rôle,* so does inebriety and all other forms of psychical aberration or serious nervous disorders of parents; for instance, epilepsy, diabetes. To what extent matrimony between relatives contributes to mental disease in the offspring is by no means proven. I cannot, from theoretical reasoning and from practical experience, admit that two healthy persons, be they ever so nearly related, will for that reason have a diseased child. But to what extent the state of the future will interfere with the marriages of insane and epileptic people, as also with those of carcinomatous or tuberculous patients, provided our therapeutics continues to be as unsatisfactory as hitherto, remains to be seen. It is natural, however, that the rapid favorable changes of the last few years in our therapeutics, both internal and external, should increase our hopes in regard to great results.

Diseases of the fœtus, mostly of inflammatory character,—meningitis, encephalitis, chronic hydrocephalus, eclampsia,—predispose to mental disorders. So does syphilis of the brain. During birth, prolonged labor or undue pressure by pelvis or forceps invites hemorrhage with its results. Spontaneous hemorrhages are the more common and the more dangerous the younger the infant. Congestions

and inflammation of the meninges or of the brain are frequent in the infant and child. Their causes are rhachitis of the cranium, insolation, hot stoves and bed-pillows, tumors, stimulants, such as coffee, tea, and alcohol, falls and blows, congenital or acquired diseases of the heart, and microbic infections. Disorders of the ears are frequent, and affections of the nose not unheard-of causes of intracranial disease. Infectious diseases, such as typhoid, scarlatina, erysipelas, rheumatism, influenza, are known to be direct causes of mental disturbance in the young. The removal of intestinal worms has ended a psychical disorder. I have known overexertion at school to result in mental aberration, which terminated either in recovery or in death from exhaustion or meningitis. The period of puberty, with its sudden changes, creates a predisposition, and excessive masturbation may cause derangement. Bad habits, bad training, and congenital migraine add oil to the fire.

This cursory enumeration of causes gives plenty of food for thought. The conscientious family physician with a number of infants and children under his charge has a great responsibility. His cares ought to begin with conception. Many a case of infant meningitis (hydrocephalus) can be prevented by timely attention to the anæmic or syphilitic pregnant mother. Labor must not be permitted to last too long; asphyxia in the newly-born must be immediately attended to, and strict care should be taken of the diet and hygiene of the baby. Errors in this respect are not punished immediately; and though some babies thrive, or appear to thrive, while mistakes are being constantly made, in others the foundations are being slowly laid for ill health and serious disease, both physical and mental. That heart and ears ought to be attended to in time, and persistently, is self-understood; but procrastination—waiting for better times and "second dentition" and "puberty"—is too common an occurrence. Perhaps the greatest negligence on the part of medical men is exhibited in regard to mental overwork. Our schools have become hot-houses in which scoliosis, near-sightedness, anæmia, neurasthenia, chlorosis, and cerebral exhaustion and disease are being bred in incredible numbers. If the children are sent to school at six or seven years of age, it should not be forgotten that their brains cannot endure constant work without exhaustion and injury. Between the sixth and ninth years persistent exertion, the teaching unit, should not last more than twenty or twenty-five minutes of every hour, between the ninth and twelfth years thirty or thirty-five, after the twelfth year forty minutes. For the first class two or three, for the second three or four, for the third four or five hours are all that should be enforced. Short learning units

permit earnest work and progress, long ones cause drudging labor and dangerous fatigue. The apparent offset to this mental overwork—gymnastic or "calisthenic" exercise in the same building, as part of the curriculum—adds to the general exhaustion. It is time that the medical profession looked into the increasing degeneration of the people resulting from this overstraining of the young brain, ninety per cent. of the growth of which is not attained until the seventh year, and the full growth not reached before the fourteenth or seventeenth. Physicians should no longer be afraid of the charge of going into politics. If they do not wish to be "politicians," let them be something better, —statesmen.

The general remarks made on the first pages of this article will suffice for both the general and causal treatment. Serious and unmanageable cases belong to an institution. Conditions of excitement, besides proper hygienic and dietetic treatment, require rest in bed, warm bathing (not hot), and plenty of sleep, which may safely be procured by opiates (extractum opii, codeine), or hyoscine, chloral, sulphonal, amylene hydrate, notwithstanding the reports of individual cases of overdoses or idiosyncrasies.

In the treatment of psychical disorders it is easy to do too little or too much. As long as our lunatic asylums are (were?) only more or less genteel prisons, and wherever the "superintendents" are custodians rather than physicians, where records are kept slovenly, and no autopsies made, nothing whatever is (was?) done to relieve the physical basis of intellectual disorders. Whenever that is sought for, and found with more or less certainty, the indications for treatment are self-evident. Overdoing, however, is as bad as underdoing. Hypnotism should not play a prominent part in the therapeutics of the nervous system. Its utility is doubtful and its dangers as great as those connected with all sorts of psychological experiments generally. Autosuggestion is very active in neurasthenic and hysterical persons, also in the young, who, when approaching puberty, even when in average health, are imaginative, unreasoning, credulous, and impulsive (Hurd).

Mild forms of temporary mental aberration are the night-terrors (*pavor nocturnus*). They are mostly (not always) met with in delicate, pale, scrofulous, or rhachitical children, with neuropathic tendencies somewhere in the family. Like attacks of genuine dementia or mania, they are not remembered by the patients. But few of them are attended by fever; many result from or are connected with digestive disorders, nasal polypi, adenoid growths, hypertrophied tonsils, and other causes of dyspnœa like asthma or rheumatic endocarditis.

These should be attended to. Heavy meals must be avoided, also emotions, frights, ghost-stories, and exciting games; the attacks are often connected with reminiscences. The bowels should be kept relaxed. A dose of quinine or potassium bromide at bedtime and a well-aired and cool bedroom, not absolutely dark, are good preventives.

5. *Spinal Inflammations and Arrests of Development.*

The general rules for the treatment of diseases of the organs contained in the *spinal canal* are almost identical with those detailed in reference to the brain and meninges. With the exception of rare cases of pseudoplasm, the changes occurring in the spinal cord and its meninges depend on anomalies of the circulation, or on some form of inflammatory process, either in an acute or a chronic state. To the latter class belong the final and persistent lesions of *spinal pachymeningitis* and *leptomeningitis, transverse myelitis, poliomyelitis, spastic spinal paralysis* (the spinal form of what was described as cerebral spastic hemiplegia), *lateral* and *amyotrophic lateral sclerosis, paramyoclonus,* and *tabes* (hereditary or acquired). *Multiple disseminated sclerosis,* with its, at first, slight tremor in voluntary movements, which may be the only symptom for years, and is followed by nystagmus, optic atrophy, scanning speech, and tendon-jerks, appears to me mostly localized in the spinal cord in children. Before entering upon a course of treatment, it is of the greatest importance to study the etiology of an individual case; a disease of the bone, or tuberculosis, or syphilis must be known before it can be effectually treated. The latter is very frequent, in the newly-born also, with supination of forearms or complete paralysis of one or both upper extremities or of the muscles of the neck. Nor is it superfluous to omit the exact diagnosis of those ailments which are at present supposed to be of an infectious nature and of bacteric origin, such as *Landry's paralysis* and *poliomyelitis;* for the time may come, even during our lives, when an extensive anti-infectious, antibacteric, antitoxic treatment or preventive immunization will be among the modern therapeutics of many apparently unmanageable diseases. Even *acute myelitis,* though many cases are directly connected (in the adult) with alcohol or tobacco, is certainly dependent on gonorrhœa, syphilis, tuberculosis, and the acute (mostly streptococcic) diseases such as angina or influenza and typhoid fever. Some are hemorrhagic, with a tendency to spread upward or laterally.

In every case of acute disease of the spinal cord or its meninges (*hemorrhage, hyperæmia, spinal meningitis*) absolute rest is required. But the patient, to avoid overheating and hypostasis, must not be kept

on his back constantly or most of the time, and not on feather-beds or pillows. Quilts covered with linen or cotton sheets, air-mattresses, or water-beds are often absolute necessities. When the acute disease can be localized, as mostly it can, cold water, ice-water, the ice-bag, with now and then an ether spray, or local depletion by cups or leeches is indicated. Vesicatories or the tincture of iodine ought to be avoided in this stage because of their irritating and annoying effects. Purgatives are required on general principles,—calomel (and) or salines. Now and then a mustard bath, quite hot, will act well as a derivant. The indications for digitalis (or other heart regulators and invigorators) are frequent; direct antipyretics are seldom required. Quinine acts better here than in diseases of the brain, in which it appears to give rise to occasional congestions. To influence the spinal circulation in acute and subacute diseases, ergot (useless in cerebral diseases) holds a high rank; the fluid extract may be given in doses amounting for the day to from one to eight or ten grammes in the beginning, later less, according to age. Its indication does not cease until the stage of chronicity, with anæmia, contraction, and incipient atrophy of the blood-vessels. Potassium iodide is indicated early on account of its influence on the circulation, and later for its absorbent effect. The difficulty in handling very old cases is due to the permanency of the local lesions which result from the solidification and cicatrization of the new cell proliferations. Nor are the difficulties in this respect any less, with the exception of some syphilitic cases, in regard to mercury. The sooner and the more persistently these remedies are employed, either internally or externally, either simultaneously or alternatively, the better will be their gradual effect. The bugbear of salivation is no longer feared since it has become more widely known that the younger the patient the better will he bear mercury. Galvanism and the electromagnetic current are used on general principles, as mentioned above. Neither should be employed at an early stage. The former requires large electrodes, well salted, to reach the cord; the direction of the current does not appear to make much, if any, difference. Sessions of from six to ten minutes, the current being inverted once or twice during that time, once or twice daily, are all that is demanded. The interrupted current is employed later to stimulate the muscular action, and should be used locally with small or more generally with large electrodes, or in the bath. Anæsthesia may require the application of the metal brush. Warm bathing is often attended by very good effects, due to its influence on circulation and the surface temperature. A bath may last minutes or hours; the latter mainly in secondary contractures, which may also require tenotomies. In these cases hot sand-

baths have been used extensively in Europe, particularly where the fear of water has not yet begun to wane from the minds of the masses. Their usefulness consists mainly in the invariability of their temperature, which requires less attention and watching than a warm-water bath. In chronic cases ointments have been extensively used. Still, very few substances can be rubbed through the epidermis and cutis; indeed, hardly any except potassium iodide (in glycerin, better still in lanolin) and mercury (ointment and oleate). Their application to the spinal column is of no advantage; it is better to select the usual places where the skin is thin and the lymphatics are near and numerous,—viz., the inner aspect of the extremities. Over the spine the actual cautery has also been found beneficial, together with the mineral springs containing salts and iodine (St. Catherine, Kreuznach, Oeynhausen, Nauheim).

In many, both of the acute and the chronic cases, a symptomatic treatment cannot be avoided. Pain must be lulled. Now and then the anode (positive pole) of a mild galvanic current will have some such effect; sometimes the local application of chloroform ointments or chloroform vapor in cotton, an ether spray, a menthol stick, or menthol in a ten-per-cent. alcoholic solution will do good. If not, hyoscine, chloral hydrate, croton chloral hydrate, opiates (internally or subcutaneously), or hot fomentations are required; for there is no greater enemy of the sick than pain, and no greater bliss and gain than rest. Other symptomatic treatment may be required for the motory and trophic paralyses resulting from a number of spinal-cord diseases, such as paralysis of the bladder, of the intestines, of the sphincters, and bed-sores. The latter are very ominous, and the ointments of bismuth, or tannin, or balsam of Peru, or fuchsin 1, lanolin 80, vaseline 20, though they be indicated and locally useful, will not defer very long the final termination. Paralysis of the bladder is said to be benefited by local internal electrization; it is benefited by ice-cold injections; its secondary cystitis is certainly improved by plain or medicated warm irrigation. Paralytic constipation requires physostigma, massage, and regular enemata. All of these forms of chronic paralysis will be more benefited by the subcutaneous than by the internal administration of strychnine sulphate.

Suspension has been practised for several years in some of the chronic diseases of the spinal cord, mainly in *tabes,* which, fortunately, is rare among children. That fad may again become fashionable in another generation. Operative stretching of nerves is occasionally useful in *contractures* depending on cicatrization, as also in some neuralgias of adults.

While the symptoms of tabes dorsalis in children are rather identical with those observed in the adult (ataxia appears late, often after disorders of the bladder, absence of patellar reflex, and paræsthesia have existed for some time), *hereditary ataxia* (of Friedreich, a combined disease of the gray and white substances of the posterior and lateral cords) differs in this, that it may be seen in several members of the same family, has no defects of sensation, vision, and sphincters, and rarely of intelligence, and that ataxia of the lower and very soon afterwards of the upper extremities is an early symptom. Antisyphilitic treatment, galvanism, hydrotherapy, massage, and persistent active and passive exercise should be relied on.

Acute poliomyelitis (spinal, essential, "dental" (!), infantile paralysis), as the initial stage may differ both in its onset and in its symptoms, may require different measures at first. Some cases exhibit a high fever, great excitement and prostration, even cerebral symptoms. The majority, however, come on suddenly, without fever and without premonitory symptoms. These differences become explainable by the differences of etiological findings. The causative atrophy of the ganglia of the anterior horns is not primary, but in the first instance the result of vascular inflammation with proliferation of round cells and hemorrhages. All of these are, however, secondary and of an infectious nature like that of multiple neuritis. No specific bacteria have been found, but meningococcus and other cocci, a large spleen, hemorrhages on the pleura, swelled intestinal follicles and Peyer's plaques, proving infectious character, and complications with pneumonia, enteritis, polyneuritis, rheumatism, endocarditis, abscess of the knee, and angina. W. Pasteur observed seven children in one family within ten days; all of them had fever and headache, three paralytic symptoms, two transitory disturbances of nerve equilibrium, one typical poliomyelitis, one more cerebral, the others more peripheral symptoms, one angina. Endemics and epidemics have been described in fair numbers, leaving no doubt as to the infectious nature of the disease. According to Axel Johannessen (Festschrift in honor of Abraham Jacobi, 1900), Colmer (*Amer. Jour. Med. Sci.*, 1843) reported a case of paralysis in a baby of one year which he observed in 1841 in the parish of West Feliciana, Louisiana. The parents told him of eight or ten other cases of the same disease that had occurred within a few miles during the last three or four months. The former class requires antipyretics and the necessary attention to cerebral and other urgent symptoms; much more can hardly be done, because in most cases of this class the diagnosis will probably not be made at first, with the exception of those in which it is assured by local pain

and paralysis. These latter are the cases in which local applications of ice may prove beneficial.

Every case, whether feverish or afebrile, requires absolute rest. The few which are suspected of originating in rheumatism, or those which are complicated with peripheral neuritis, should be treated by salicylates, and locally by warm applications or fomentations. All the rest will do better with cold applications—ice-water, ice-bag, cold water—continued for some time, but with interruptions. Depletion by means of leeches or by cupping is often indicated, particularly in such cases as exhibit local pain. I feel certain that a purgative in the beginning (calomel, salines) will do good; so will ergot; the equivalent of from one to three grammes or more may be given daily, either as extract of ergot or as fluid extract of ergot. It may be accompanied by a few drops of the tincture of belladonna. As early as possible—that is, as soon as the necessity of absolute rest will permit of inunctions being made—mercurial ointment (on the first day or days the oleate) may be used, and the internal administration of potassium iodide commenced at once. Both may be continued—particularly the latter—for several weeks; the dose should be smaller than in cerebral meningitis, from half a gramme to one gramme daily being sufficient. Tincture of iodine modified by the addition of alcohol, or sinapisms frequently applied for a few minutes at a time, may be used with advantage.

The rapid improvement during the first week after the onset of the disease, and the slow convalescence of the few months before the residual (mostly local) paralysis becomes final, having been established, the indications for treatment will change. Congestion and dilatation of blood-vessels are followed by anæmia and contraction, and in place of belladonna and ergot, strychnine must be given; at first, perhaps, internally. It may be beneficial when so administered, but hypodermically it will act better. I cannot agree with Gowers, who asserts that it is probably "never either necessary or desirable to give it by hypodermic injection in this disease." On the contrary, many cases that had been treated with strychnine internally for months to no purpose gradually improved to a certain extent under daily, or three weekly, subcutaneous injections of from one to two milligrammes of strychnine sulphate. Still, a complete recovery I never saw. Several times a day, for weeks in succession, the cold shower-bath applied one or two minutes to the back, followed by lively friction, will contribute to the stimulation of the spinal circulation.

The rapid waste of the paralyzed muscles requires local stimulation. Frictions with oil, vaseline, alcohol and water, tepid water, or hot

water must be employed several times a day. When the surface circulation is still fair, cold water may be preferable. Passive movement must take the place of active exercise when the latter is impossible. The faradic current will stimulate and may improve whatever there is left of contractility. Should it become totally inactive, the reversed galvanic current may take its place for the purpose of exercising the muscles. Otherwise the galvanic continuous current is eminently the nerve and blood-vessel stimulant, and must be used daily to keep up the circulation and thereby the nutrition of the degenerating tissues. It is best applied through large electrodes, and should be made to ascend and descend alternatively. Sessions of from six to ten minutes, one or two every day, are sufficient, but they must be continued a long time. I know that limbs which had remained unchanged in their atrophy and uselessness for years improved under patient galvanic handling, when persisted in for a long time.

Mechanical appliances will prove useful. The arm must be so supported as to render the slipping out of the socket of the paralyzed humerus an impossibility. The rare cases of dorsal paralysis require a jacket or a properly fitting corset. The paralyzed (mostly extensor) muscles of the lower extremities demand elastic bands, so as to counteract the contraction of the antagonistic flexors and thus to facilitate walking. Meanwhile the remedial agents mentioned before must be continued. Strychnine will always do good, and phosphorus will act both as a nerve stimulant and as a tissue-builder. It may be given to a child a year old in doses of from half a milligramme (half a teaspoonful of the elixir of phosphorus of the United States Pharmacopœia) to three-fourths of a milligramme daily. To expect an improvement of nutrition by ligating the paralyzed limb is a grave mistake. That procedure will tumefy, but not nourish, the constricted part.

Consecutive club-foot requires the employment of proper orthopædic apparatuses at as early a time as is judicious, to prevent an unnecessary degree of anæmia, atrophy, and shortening. To avoid the necessity of such mechanical aids, operations are performed, which will be discussed in Chapter XIII.

Circumcision has been performed on children affected with poliomyelitis, without any justification either in theory or in practice.

The varieties of *hydrorrhachis* (*spina bifida*) depend on the more or less extensive arrests of development and their secondary changes. Like the differences between meningocele and encephalocele on the head of the newly-born, we must discriminate between a meningocele and a myelocele over the lower part of the nervous centre. The treat-

ment, which should not be commenced until the diagnosis from dermoid or from teratoma is assured, differs accordingly. In more advanced years I have seen spinæ bifidæ, in the lumbar and in the cervical regions, whose connection with the spinal canal, originally narrow, was totally obstructed, so that their removal caused no difficulty whatever. Cases accompanied by malformations, contractures, or paralyses of the lower extremities do not respond favorably to treatment. Those rare ones which are complicated with superjacent tumors (mostly lipomata) or with hypertrichosis (very rare) must be carefully watched, for careless operations on what was considered uncomplicated pseudoplasms have proved fatal. Such as are of central origin,—myelocele,—in which accordingly the posterior columns with the nerve-roots spread over the interior of the sac, give a grave prognosis. Spontaneous bursting of the sac must be guarded against, for much loss of cerebro-spinal liquor is apt to terminate fatally in a very short time. Puncture may be resorted to and repeated, a fine needle being used. After each puncture pressure ought to be applied to prevent rapid filling up. A few cases—small ones of simple meningocele—have been known to get well in this way. Or, after the puncture, iodine may be injected. Morton's formula—iodine 1 part, potassic iodide 3 parts, and glycerin 48 parts—has been very felicitous in his hands and in mine. Favorable cases have been successfully treated by the clamp, suturing, and gentle compression, and bad cases by extirpation of the sac and utilization of the periosteum of the patient. Robson transplanted that of a rabbit in 1883. Modern surgery has been fairly successful in a number of cases. Even paralysis was claimed to be no contraindication, for it was believed to be sometimes the result of pressure by liquid only. I never saw such a case. But as bad cases of spina bifida are sometimes complicated with other anatomical lesions, asymmetry of the body, stigmata of ears and teeth, besides the local hypertrichosis alluded to above, the difficulties grow in proportion.

6. *The Nerves.*

Neuritis may be communicated from inflammations of the neighboring tissues, but most cases occurring in infancy and childhood are the degenerative processes of peripheral nerves in infectious diseases, mostly in diphtheria, but also in scarlatina, typhoid, measles, etc. *Polyneuritis* itself sometimes assumes the character of an infectious fever, with enlarged spleen, nephritis, and high temperatures. Absolute rest in bed, warm fomentations and prolonged baths, sodium salicylate in daily doses of from ten to thirty grains (0.6 to 2.0), arsenic in different forms (Fowler's solution one to five drops daily),

antipyrin, chloral hydrate at bedtime, the galvanic current, and roborant diet without stimulants are indicated. Neuritis resulting in or complicated with cutaneous eruptions will be discussed in Chapter XI.

Neuromata (neuro-fibromata) are, it appears, always congenital, in many cases hereditary, mostly numerous, now and then painless, but sometimes very painful. They belong to the same class with cutaneous fibromata, plexiform neuromata, certain forms of elephantiasis, and certain pigment nævi. The treatment should be directed against the pain. The only radical cure is by extirpation (W. W. Keen and William G. Spiller in Festschrift).

Peripheral paralysis is not infrequently noticed in a facial nerve, rarely from rheumatic or central causes; often as the result of otitis, caries of the petrous bone, parotitis, or extensive lymphadenitis. The former requires sodium salicylate, antipyrin; rarely pilocarpine, which is not well borne by the young, and should be given in emergencies only; the latter has a doubtful, sometimes a bad, prognosis, and requires the treatment of the cause. I once saw paralysis of the serratus muscle after a severe strain in whooping-cough, evidently the result of a lesion of the long thoracic nerve.

7. *Neuroses of Central or Local Origin.*

The treatment of *eclampsia* depends on its etiology. Repeated attacks may be the results of identical causes,—for instance, feverishness, intestinal disturbances, and emotions,—but they suggest the existence of epilepsy. Indeed, a single eclamptic attack cannot be distinguished from an isolated epileptic seizure. According to the various causes to which eclamptic convulsions may be due, the best preventives are regulation of the diet and of the bowels; the removal of worms and lice; the withholding of alcohol, of the milk of an alcoholic mother, coffee, tea, and improper foods; and the watching of every kind of fever, from a simple catarrh to an inflammatory or infectious disease. In households where there are babies known to be subject to eclampsia the clinical thermometer is indispensable. Catarrhal fever, intermittent fever, pneumonia, otitis, meningitis, and acute eruptive diseases are often ushered in by a convulsion. Tight bandaging, renal calculus, and splinters in the skin are to be suspected when no other cause is readily found. A normal dentition never produces a convulsion, and "difficult dentition" as a cause of a convulsion is among the affections which are as rare as they are too readily diagnosticated.* The habit of lancing the gums (with its

* See my Dentition and its Derangements, New York, 1862.

bad influence on gums and teeth, and the possibility of microbic invasion), to which many practitioners are still addicted, proves the frequent absence of diagnoses and the readiness with which tribute is paid to the prejudices of past centuries and to those of the female population. Cranial and encephalic rhachitis, with or without laryngismus stridulus, is often attended by convulsions, and requires antirhachitical treatment.

The habit of regularly administering bromides to infants who have convulsions is a bad one. As a regular medication they ought to be reserved for epilepsy. The attack demands the removal of the cause. Irrigation of the stomach, or an emetic; irrigation of the bowels with water, soap and water, oil, turpentine, assafœtida; a purgative (calomel with or without an antifermentative, such as resorcin or salol, followed or not by castor oil); the proper use of a warm bath; a cold pack frequently repeated, with ice to the head and heat to the feet; the timely administration—in an urgent case antipyrin under the skin—of an antipyretic; chloral hydrate internally or by the rectum; inhalations of chloroform to shorten the attack,—all suggest themselves as most promising in certain cases. Chloroform ought not to be omitted, for at any moment a violent convulsion may occasion a cerebral hemorrhage with its dire effects on life, or body, or mind. Sinapisms to the neck and to the extremities have often been recommended, but, besides the possible after-effect of annoying and irritating the infant suffering from a vulnerable nervous system, they cannot be expected to have much or sufficient derivative action. To quiet the irritability persisting after an attack, chloral hydrate with or without a bromide, or repeated small doses of codeine or extract of opium, or the camphorated tincture of opium may be administered.

The causes of *chorea minor*—St. Vitus's dance—are either anatomical changes (some of them improvable, some incurable) or functional disturbances; perhaps also microbic toxins. Dubler and Meyer found a staphylococcus which Maragliano claims as pyogenes, Pianese a bacillus. That may explain its occurrence after scarlatina, measles, or influenza not complicated with rheumatism, and the frequent coincidence or complication of chorea with rheumatism. These two have often been taken to be coördinate effects of the same cause (toxic). This much is certain, that while rheumatic fever is often followed by chorea minor, the latter sometimes precedes the former by days. Therefore the treatment should vary according to the etiology, but hardly a case will do well without attention to the functional treatment. Indeed, some forms of the latter are almost of a specific character. Prevention is indicated when the patient is of a neurotic constitution; the

descendant of a neurotic family; when suffering from digestive or genito-urinary disorders (masturbation); when accustomed to alcohol in more than medicinal doses; or when he has rheumatism or heart disease. Capillary embolisms and hemorrhages, cysts, tubercles, and exudative changes in the nerve-centres, particularly the brain, also in the anterior horns of the cord and the commissures, also in the white substance generally, are not subject to preventive measures. The same holds good in any cerebral lesion located near the pyramidal tracts,—viz., in the cortex, in the internal capsule, or in the basal ganglia. Demme observed a case depending on a fissure of the anus; it admitted of direct treatment; Soltmann a chorea of the left side after traumatic depression of the right parietal bone; others report cases depending on shrinking cicatrices and on neuritis. I have observed a marked case of acute chorea which was caused by spinal meningitis of the cervical portion. In this case ice, local depletion, purgatives, and ergot were the successful remedies. (Seguin's "Clinical Lectures," vol. i., 1872, second lecture.) In the *American Journal of the Medical Sciences,* April, 1886, and in the "Festschrift zum 70sten Geburtstag von Professor Henoch," Berlin, 1890, I published observations of partly local, partly general chorea which depended on nasal reflexes due to catarrhal and inflammatory changes and to polypi. The symptoms were mainly facial grimaces, winking, drawing the mouth to one side, and shrugging the shoulders. They are identical with what has been described as "habit spasm" by Mitchell and Osler (4th ed., p. 1088), or "tic," the worst instances of which have been observed as peculiar forms of sudden muscular contractures, jumping, genuflexion, stooping, etc. In all these cases the treatment and cure of diseases of the nose and nasopharyngeal cavity are demanded preliminarily to the successful treatment of St. Vitus's dance.

When heart disease or a tendency to acute articular rheumatism is the cause, preventives share largely in the success of the treatment. The hygiene must be strict and medicinal attention to the cardiac ailment close. The rheumatic child must be anxiously watched; pain, be it ever so slight, requires rest in bed for one or two days at least and tentative doses of sodium salicylate. Helminthes must be expelled.

Neurotic children, frequently with urine that contains phosphates in large quantities and has a specific gravity exhibiting the widest differences, should not be overworked; the school sessions must be short. Cool or cold washes, with friction, and systematic, but simple and brief, gymnastics in the open air, not in a close school-room, will strengthen them. The period of convalescence from any incidental dis-

ease must be passed in bed, which should be placed, if possible, near an open window. Anæmia must be carefully watched and treated. The patient should not be allowed intercourse with neurotic, or hysterical, or choreic, or epileptic, or even merely violent children; for some of the worst cases of chorea are those produced by fright. Headaches of a simply neuralgic or ocular origin must be attended to; the latter usually require glasses, sometimes the protracted use of strychnine, but no misdirected and unauthorized operations when there is no disturbance of muscular accommodation; in the former aconitine will often prove helpful.

A patient sick with chorea minor must be kept quiet in body and mind, particularly when the case is a relapse, or caused by imitation. Bad cases will not get well, unless confined to bed in a quiet room, with no visitors or excitement, with but a single person present to entertain or read to them, with a warm, protracted bath daily, and with ample sleep. Very bad cases must be kept sleeping eighteen out of twenty-four hours by means of mild opiates or chloral hydrate with or without bromides. Sometimes large doses are necessary, but the effect *must* be obtained. I have met with cases in which an occasional inhalation of chloroform was also required. Meanwhile, the symptomatic measures adapted to the average case should be attended to.

The best symptomatic remedy is arsenic, in the form of liquor potassii arsenitis or sodii arsenatis. Three doses are to be given daily, much diluted, after meals. When the eyes or the intestines begin to give trouble, or when a serious cutaneous eruption makes its appearance, or should the urine show albumin and casts, it is time to intermit. The doses must be increased slowly but persistently, according to the rule detailed on page 120. The original dose can be doubled or quadrupled; indeed, can be increased almost indefinitely. The cause of failure on the part of arsenic is generally its insufficient dose. Monobromated camphor in daily doses of from four to ten grains (0.25 to 0.6) will act well when arsenic cannot be, or is not, given. Aspirin appears to have good effects in three daily doses of from eight to fifteen grains (0.5 to 1.0), when given uninterruptedly for weeks, or with occasional interruptions. Antipyrin is successful in many cases.

Of other remedies, silver nitrate may be mentioned; it is of less service here than in some other ailments of the nervous system. Zinc oxide or zinc valerianate may be tried, if arsenic happen to be omitted. The galvanic current, warmly recommended by Benedict, has not satisfied me. Sulphur bathing, either natural or artificial,

is adapted to cases consequent on rheumatism; it is indicated as after-treatment, as are also rational gymnastics and general roboration.*

Tetany means tonic paroxysmal (for minutes or days) flexions of the carpal joint, the thumb turned into the hand, the fingers adjacent to one another (obstetrical hand), also stiffness of neck, frequently equinus position of foot, with increased (motory and galvanic rather than sensitive and faradic) electrical irritability (Erb), with attacks caused by compression of vasomotor brachial plexus and below the knee (Trousseau), and mostly also spasm of upper lip and alæ nasi through pressure below the zygomatic arch in front of the ramus mandibularis (Chvostek). It has been observed in different disturbances of the general health, after gastro-intestinal disorders and during the presence of worms, in convalescence from acute and chronic (particularly infectious) diseases, after sudden exposures to changing temperatures, in chronic malaria, after injuries to the head, as the result of emotional irritation, or as a consequence of the abuse of alcohol. The fact of the occurrence of tetany after total extirpation of the thyroid gland may lead in future to a correct diagnosis of many cases of tetany in children and to a regular, accurate examination of the thyroid gland. It is sometimes absent, or hypertrophied, or in an abnormal condition. The majority of cases are connected with rhachitis, mostly with its cranial (and encephalic) variety and its laryngismus stridulus. It is often found during cold springs, endemically, sometimes epidemically. The several causes enumerated above explain the occasional difficulty of a satisfactory etiological diagnosis, but suggest the preventive and curative treatment. Pilocarpine has been mentioned as the successful remedy in a case which was probably caused by exposure. Gastro-intestinal disturbances (with or without autoinfection, accompanied by fever and by indican or acetone in the urine) demand proper medicinal and hygienic treatment, occasional purgatives, and intestinal antisepsis with resorcin, naphtalin, or salol. Tetany after infectious diseases and during convalescence generally requires rest in bed, good air, copious (perhaps forcible) alimentation, and roborants. A *very mild* galvanic current, prolonged warm (not hot) bathing, bromides, chloral at night, and small doses of codeine in older children will be required according to

* *Huntingdon's chorea,* a chronic meningo-encephalitis with atrophy of convolutions (first described in Philad. Rep., 1872) is an hereditary chronic progressive process not observed in children, which is liable to terminate in dementia after many years. It is characterized by incoördinate movements of the hands, face, and, gradually, also of the lower extremities.

the severity of the cases; they will get well after weeks or months. A roborant and antirhachitical treatment with cod-liver oil, iron, strychnine in small doses, phosphorus, systematic exercise, and gentle hydrotherapeutic measures will restore the general health. The treatment with thyroid gland has not proved a great success in the average case.*

Catalepsy is quite rare in children. I have seen but three well-marked cases, one of which, a boy of thirteen, landed finally in a lunatic asylum. It is intimately related to hysteria and epilepsy, and often attended by psychical disorders. Both its prognosis and its treatment are dependent on the causes, among which fright, masturbation, chlorosis, malaria, helminthiasis, epilepsy, and melancholia have been enumerated. Thus, depletion, diaphoretics, emetics, nervines, anthelmintics, and electricity have been recommended. In most cases medicines are less effective than is attention to general hygiene, both physical and mental. In this respect it shares the fate and prognosis of *hysteria,* of which it may be considered one of the manifestations, the existence of which among children has been more extensively observed and studied since its nature, particularly in connection with masturbation, was discussed by me in 1875 (*Amer. Jour. Obst. and Dis. of Women and Children*). Hirschel and Fleisch observed catalepsy after intermittent fever, and Glas noted the case of a boy of five years who had an attack of catalepsy (instead of a chill), followed by perspiration. In these cases quinine and arsenic take the place of other treatment, with better success.

Another, though rare, symptom of hysteria is *chorea major,* which differs from chorea minor in the occasional appearance of paroxysms of coördinate spasms with psychopathic prodromi and (frequently) termination. Altogether, *hysteria* occurs with all the symptoms met with in adults. It is not confined to the female sex in children any more than it is in adults, and exhibits the same debility and irritability of the nervous system in general and of emotions, reflexes, imaginations, and will in particular. Such children are by no means always anæmic. Hyperæsthesia (more frequent than anæsthesia), paræsthesia, localized paralysis (muscles of deglutition, first branch

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* Tetany should not be mistaken for a persistent muscular contracture of the extremities, mainly the distal ends, which may last many weeks and months. The latter has no interruptions, affects the thumb more than the fingers (with the characteristic (obstetrical) shape of tetany), appears mostly in the early weeks of life, has none of the facial symptoms of tetany, is not connected with rhachitis, and is not amenable to antirhachitical treatment. It depends sometimes on intestinal disorders, but mostly on some affection of the central nervous system, and should be treated accordingly.

of facial nerve, ptosis), paraplegia, strabismus, spinal and other neuralgias, hoarse croupous cough and hiccough, general convulsions, incoördinate choreic movements, tachycardia, and palpitations are among the symptoms. The lack of mental and emotional equilibrium is an early feature. That is why it is found endemic in schools and other institutions; why also the original moral incompetency may (mainly about puberty) degenerate into moral insanity, neurasthenia, melancholia, even mania. Vasomotor disturbances may cause "hysterical fever" with very high temperatures (from 105° to 108° F.), which usually rise suddenly, last but a short time mostly, and, when attended by no proportionate increase of the pulse, betray their origin at once. It is found in psychopathic families as the result of mental strain, in badly ventilated schools, and depending on undue ambition, masturbation, diseases of the ovary, and emotions. Hysteria in a child means, unfortunately, in most cases, hysteria for life. Still, training and education are capable of accomplishing a great deal in strengthening will and character and independence of thought. Such children are better off among strangers than at home. School sessions ought to be regular but short; work in the open air, housework, gymnastics, and hydrotherapy, with general roborants, are indicated and prove successful.

Athetosis, that peculiar form of localized (ends of upper extremities mostly) pronating, supinating, flexing, and extending spasm, can hardly be improved when congenital. Now and then it accompanies polioencephalitis or cerebral tumors or follows infectious fevers. Improvement is reported to have followed the use of arsenic, bromides, and galvanism.

Most cases of *epilepsy* are observed in, or date from, infancy and childhood. In no disease is hereditary influence, not only direct but lateral, and that of other neuroses and of alcoholism more marked; the state of the future will have to see to it that epileptic persons are not placed in a condition to raise progeny equally cursed. Epileptic mothers must not nurse their babies. The child known to be epileptic must be trained very carefully, both physically and mentally. Alcohol and other stimulants, physical and mental exertions, and sudden emotions must be avoided. The hygiene of the skin and of the bowels requires particular care; the use of cold water (habitual washing and friction) is imperative; constipation must not be permitted. Feeding with gruesome nursery stories, tight dressing, and early schooling, also horseback exercise and swimming, are forbidden. In the interest both of the patient and of his schoolmates a public school should not be attended. The child ought to be instructed and trained

with a view of preparing him for his future calling, which must not overstrain body or mind, must not be sedentary, nor should it confine him, if avoidable, to the limits and influences of city life and air.

The diet must be non-stimulant in every way. Dark meats must be avoided conscientiously, white meats allowed in small quantities. Chlorides, including sodium chloride, have been advised against. It has even been proposed to bake bread with sodium bromide in place of the chloride, and to give eggs without salt. Milk, fruit, vegetables, eggs, and bread are appropriate.

No case of epilepsy should remain without treatment. It is true that there are now and then spontaneous recoveries; even hereditary cases may get better or well; remissions are frequent; intervening acute diseases and many operations have frequently a favorable effect. On the other hand, Gerhardt saw a relapse after an intermission of twenty years. But the knowledge of these facts must not tempt us to procrastinate medicinal and hygienic interference, or to hold out a hope of recovery at the period of "second dentition," of "puberty," or of "marriage."

The best methods of treatment are always either specific or local. Symptomatic treatment may prove very successful with the aid of all-healing nature, but it is always a makeshift. The ideal indications for the cure of epilepsy ought to be—nay, must be—causal; its proximate seat is in the cerebral cortex, but its actual origin in anatomical lesions, mostly, of different localities. Thus, epilepsy may be cerebral, it may be the result of persistently abnormal circulation, or it may be of a reflex nature. A (brachial) "Jacksonian" epilepsy cured by the removal of a foreign body from the ear was reported by Monflier. A few cases have been traced to nasal irritation and relieved by operations on the nares. All sorts of cerebral tumors, solid or cystic, the results of previous encephalitis and meningitis from insolation, otitis, or otherwise; arrests of cerebral development; premature ossification of one, some, or all of the cranial sutures and fontanelles; cerebral exhaustion from masturbation or premature venery; diseases of the heart with secondary venous obstruction; congestion from other causes (in a case of Gerhardt, enlargement of the thyroid); the influence of prolonged use of alcohol or ergot; the sluggish brain circulation attending constipation and the general toxæmia of intestinal autoinfection; external irritations such as tumors, cicatrices, foreign bodies, and the reflex excitement produced by carious teeth, Schneiderian hypertrophy, and nasal and naso-pharyngeal growths; vesical and renal calculi; helminthes, from tænia to oxyuris; in older children delayed menstruation, are so many different causes of epilepsy. It is,

therefore, only the most painstaking examination of all the organs and the whole surface of the body which gives a promise of finding the cause of the disease as well as the indications for rational causal treatment.

Arrests of cerebral development are not amenable to treatment; the method of dealing with the chronic results of cerebral and meningeal inflammations, also the possible value of operations on prematurely ossified skulls, have been previously discussed. Most of the operations on the cranium undertaken for the purpose of healing epilepsy have not been successful, and the most enthusiastic promoters of such operations have rescinded their favorable opinions. Thus, the American Neurological Association, in a discussion which was mainly carried on by Sachs, Mills, Putnam, and P. C. Knapp, expressed itself very reservedly on this topic. But there is no doubt as to an occasional success, nor can there be any as to the feasibility of removing tumors from the surface of the cortex, or of opening and removing cysts and the results of new or old hæmatomata. B. Sachs and A. Gerster (*Am. Jour. Med. Sci.*, October, 1896) came to the following conclusions. An operation is permissible in traumatic epilepsy when the case is not over one or two years old. When there is a depression of bone, the operation is indicated at a later period, but should not be delayed. Trephining alone is sometimes sufficient. If the disease is of short duration, a part of the cortex may be excised. The complication with cerebral infantile paralysis, if the case be recent, is no contraindication to the operation. It must not be performed in epilepsy of long duration. Still, the human body not being a machine manufactured wholesale on a uniform last, and medicine not being mathematics, the indications both for medical and surgical interference are neither geometrically exact nor are they gospel. For these reasons mistakes are always liable to occur. Jacksonian epilepsy will not always exhibit, at operations or at autopsies, the local lesions boldly diagnosticated. Aye, recoveries may not be obtained, though no error be committed; for, indeed, habitual convulsions may be so firmly established that even the removal of their original source is no longer an efficient cure. But the insufficiency of medicinal treatment may be such as sometimes to necessitate or permit surgical interference as a possible last resort. Some surgeons are very optimistic in regard to the operation mainly for Jacksonian epilepsy. Braun (*Deutsche Zeitsch. f. Chir.*, vol. xlviii., 1898) claims many recoveries or improvements; for instance, after the removal of bone splinters. "The operation should commence at the location of the injury; if that be without a result, the motor centre,

the situation of which was first determined by the electrical current, should be removed to a depth of five millimetres. The operation may be performed after years have passed since the injury, though a shorter period is desirable." In non-traumatic Jacksonian epilepsy, however, Matthiolin reported 24.7 per cent. fatal cases in all operations. Equally unfavorable is the opinion of Chipault, who saw no favorable results of trephining in the same class of cases. The causes of death after these operations have been recorded as follows: meningitis, sepsis, prolapse of brain, hemorrhage, escape of cerebro-spinal liquor, collapse, pneumonia, and pulmonary œdema. In connection with this subject I mention the resection of both cervical sympathetics and the upper and middle cervical ganglia. The verdict is: "not dangerous," but inefficient.

It is particularly in cases produced by reflex from cicatrices and nasal irritation that local treatment, excision, cauterization, and the removal of polypi and adenoid growths have their signal, though rare, triumphs. The eyes have been accused—"eye-strain"—of producing epilepsy, and hence have been submitted to operations. My remarks on that subject, as connected with chorea, I can but repeat here. As regards local treatment, we have also to consider the effect on the genital organs when they are the cause of epilepsy. There is no doubt as to the occasional efficacy of digitalis, lupulin, or camphor in such cases. In others a chemical effect is aimed at; thus, in epilepsy from chronic lead poisoning, sulphur baths and sulphur and potassium iodide internally have exhibited good results.

If the approach of an attack be perceived, the patient ought to lie down on a low couch; the inhalation of amyl nitrite, if in time, has warded off many seizures; its effect must not go beyond the first deep flush. If an aura rises from an extremity, a stout ligature around the limb may also act as a preventive, provided there is a palpable irritant—for instance, a scar—from which the irritation may arise. Otherwise it is very much more probable that the aura which precedes the attack is "a sensory manifestation of an irritation the focus of which is within the cranium, with no proof that the process is starting as a 'discharge' in the motor area, but rather is equally explicable as an intracranial excitation referred to the periphery in the same fashion that irritation of a sensory nerve anywhere along its course is also referred to its periphery" (William H. Thompson in Festschrift in honor of Abraham Jacobi). When the seizure cannot be prevented, it should not be interfered with; no hands must be forcibly opened, no convulsive jerking meddled with; but the patient must be protected against biting his tongue or otherwise hurt-

ing himself. Among the drugs recommended for epilepsy every narcotic and antispasmodic has had its day. Valerian, pæonia, and artemisia were once highly thought of; so was belladonna, and later atropine, with its paralyzing influence on blood-vessels. Curare was praised for its effect on the muscles. Copper sulphate has been recommended. Silver nitrate, in doses of not more than one or two centigrammes daily (one-sixth or one-third grain), best in pills, may be continued, with intermissions, for a long time, and is credited with cures. It ought not, however, to be administered more than a month in succession, lest the skin show its effect. Twice in my life have I thus succeeded in producing argyria. Zinc has proved serviceable: the oxide, the valerianate (from twenty-five to fifty centigrammes daily), and the sulphate. The latter I have made much use of, beginning with three centigrammes (one-half grain) three times daily for an adult (a child in proportion), in increasing doses. Four grammes (one drachm) are dissolved in one pint of water, the first dose being a teaspoonful for an adult, ten or twenty drops for a child, the second the same dose plus one drop, the third the same dose plus two drops, and so on until after twenty days the double dose, after forty days the treble dose is reached. It takes a long time for tolerance to become exhausted; should this happen, a small reduction of the dose is all that is required.

Kocher (*Arch. kl. Chir.*, vol. lix.) observes that traumata, even without cicatrices and adhesions, cause epilepsy by mere increasing tension. That is why after trephining the dura mater should be divided or a piece excised. Increased tension is a direct cause of epilepsy, whether congenital, or through inflammation, or tumor, or traumatic alteration. In fact, every disturbance of the circulation may cause epilepsy; therefore it may follow extensive defects in the cranium; for "the intracranial circulation is arranged for a closed cranial capsule." Consequently, Kocher advises strongly to reduce the tension which causes or increases irritation by medication.

To reduce the irritability of the cortex and the general convulsibility, and of the peripheral sensory apparatus, and thus in the course of time to cure epilepsy, the main reliance is on the bromides. I have not been able to convince myself of the injuriousness of the potassium salt. A belief in its harmful action has been the cause of the substitution of the sodium, or a mixture of the potassium, sodium, and ammonium salts. Whichever plan is followed, there are certain rules which are paramount. The remedy must be given for years; it must not be interrupted unless there have been no seizures for years, except for very good reasons (excessive acne, paresis, sopor, head-

ache, and perhaps the intervention of acute diseases). The doses must be sufficient; a child of two years may take three or four grammes (forty-five or sixty grains) daily. It is best to give a large dose at bedtime, perhaps half of the daily amount; in this way the cerebral symptoms of overdosing are most readily avoided. When they appear the dose may be reduced, but, except in rare instances, the remedy should not be stopped altogether. Perhaps the strontium or lithium salt may take its place for a time, but I cannot say that either has impressed me with the superiority which has been claimed for them. The addition of moderate doses of digitalis has often appeared to me to reduce the drowsiness brought on by protracted large doses. Arsenic in small but regular doses will lessen the tendency to acne.

I cannot say that bromides are badly tolerated in the evening, rather the contrary; still, it is stated that they have a disagreeable effect. In that case a sufficient dose of amylene hydrate or of chloral hydrate to produce sleep should take their place. Weber, of Dahldorf, precedes his bromide treatment with a regular course of amylene hydrate; on the other hand, there are those who condemn its use altogether because of injurious effects which they say they have observed (Jastrowitz, Jolly).

Flechsig combines the sodium bromide treatment with that of opium. His two or three daily doses of the latter, for adults, are from five to ten or twenty-five or thirty-five centigrammes each (five-sixths to six grains). Large doses cannot, however, be given except in well-supervised institutions. After six weeks it is suddenly discontinued and replaced by 7.5 grammes daily (two drachms) of the bromide. After this treatment has been continued two months the daily dose is reduced to two grammes. Only when fright or other emotions were the proximate causes the two remedies were combined early. Flechsig predicts no direct effect, but only a preparatory action of the opiate. Indeed, during the opium treatment there was no relief; but in combination with sodium bromide, cases which had lasted decades were improved. Radcliffe, however (according to Gowers, *Lancet,* 1880, p. 552), found opium effective in some cases. Gowers saw but rarely any good effects from bromides and opium combined, but believes in the usefulness of small subcutaneous doses of morphine when attacks reappear often and violently. He frequently combines bromides with digitalis, Bechterew with adonis, Moeli combines or alternates with atropine. Chloral hydrate was urged by Seguin in enemata, either by itself or in combination. The latest journal reports on the Flechsig treatment are very contradictory.

From Charles A. Dana I learned the use of urethan, which was recommended by Demme in the eclampsia of children, in epilepsy. I have seen it stop epileptic convulsions (fifty every day, severe and mild) within a few days, not to return for more than half a year, when the child died from causes not connected with her epilepsy. The doses amounted to from two to three grammes (half a drachm to two scruples) a day, sometimes refracted; sometimes a large dose was given at bedtime.

Pasteur observed that in a patient under treatment for hydrophobia the epileptic attacks ceased (as they do cease after operations of any kind, strong emotions, or acute diseases). For this reason Charcot suggested systematic injections of rabic virus for the purpose of relieving or curing epilepsy. Gibier imitated the process and reported good results. Pierre Marie goes so far—a good deal too far—as to believe that "idiopathic epilepsy," which he asserts to be frequent, is of infectious origin in almost every case, is therefore preventable, and ought to be treated and cured with microbic toxin (*Semaine Médicale,* 1892, p. 283).

The number of epileptics is so large, and the influence of the disease upon the intellectual, moral, and physical condition of the individual, as well as upon the state and mankind, so wide-spread, as to be alarming. The subject has finally roused the anxiety of philanthropists to a great extent. Country settlements of epileptics have been established in Europe, with beneficial results. As a result of combined efforts the following resolution was passed at a meeting of the American Neurological Association:

"That it is the unanimous sense of the American Neurological Association that the proper care of the epileptic class, so long delayed, be urged upon the public, upon State authorities, and especially upon all interested in the care of the sick and defective poor, whereby they may be retired from asylums and almshouses, and may receive the required care in such separate establishments as their deplorable situations demand."

The Craig Colony for Epileptics, at Sonyea, in Livingston County, New York, has published its eighth annual report. The world *is* moving.

Salaam spasm (*spasmus nutans*), a peculiar affection of muscles of the neck, either the sterno-cleido-mastoid and trapezius, which are controlled by the accessory nerve, or the rectus anterior capitis, longus colli, and the scaleni. Bad cases may show contraction of the levator anguli scapulæ, deltoid, biceps, and diaphragm, also the glottis. Nystagmus, noticed when there are cortical disturbances which may

lead to epilepsy, must receive the treatment proper for its causes. As a predisposing cause rhachitis is pre-eminent. Perhaps the encephalic changes of rhachitis are in many instances the main cause of the spasm. The age of the patients (from four to twelve months) is still the age of unsteady eyes and waggling movements of the head. Insufficient light in the dwelling gives rise to eye-strain and consequent exhaustion of the cerebral centres. The spasm often sets in during the weakness of convalescence and nearly always during the excitable period of teething. There was also sometimes the history of a blow on the head, which means a fright (John Thomson in Festschrift in honor of A. Jacobi, 1900). In some cases there were intestinal disorders.

Rotatory spasms, combined or not with squinting, nystagmus, and mental disturbances, *saltatory, sneezing, yawning, snapping, spitting, hissing spasms,* should be treated according to their origin. Most of them are symptoms of hysteria. Many of the patients are thoroughly anæmic. There are indications for potassium bromide, the positive pole of the galvanic current upon the convulsive muscle (sterno-cleido-mastoid (or) and trapezius), also massage and antirhachitical treatment; besides the closest attention to diet and hygiene.

Stammering is pre-eminently a disease of the nervous system, and is probably caused by a diseased condition or insufficient tone of the cerebral cortex, with lack of equilibrium, exhibited in some by choleric temperament, in others by cowardice, together with disturbance of will-power and an absence of coördination of respiration and the muscles of the larynx and mouth. In some it is the result of nervous talkativeness, fidgetiness, and flightiness on the part of parents or attendants; in some of imitation not checked at the proper time. Strengthening of mind and body is the main indication. Training, cold water, and exercise will fortify the character; bromides may for a time relieve irritability. Coördination of innervation and muscle may be achieved by loud and slow speaking and by reading, reciting, and singing. Self-confidence must be encouraged in every way. Among strangers and in institutions established for the purpose, with good air and food, and plenty of exercise with forcible excursions of the diaphragm, such patients are mostly benefited, not infrequently in a short time. Local affections of the respiratory tract must be attended to, adenoid vegetations of the naso-pharynx removed, and other anomalies of the nares, provided they interfere with respiration, corrected.

VII

Diseases of the Digestive Organs

A. The Mouth.

1. *Frænum of the Upper Lip.*

The upper lip is retracted and remains short, and the mouth is kept open when the *frænum of the upper lip* is short and hard. It should be incised and loosened.

2. *Harelip and Fissure of the Palate.*

Harelip should undergo an operation, unless there be a strong contraindication, on the first day, or at all events early in life. The difficulty of nursing is, in part, obviated by the successful closure of the cleft in the upper lip, and the sooner the deformity is removed the better are the chances for a correct position of the future teeth, for articulation, and for the shaping of the upper lip and nose.

Fissure of the palate requires an erect posture during feeding. A plastic operation to close a fissure of the palate is indicated when the alveolar processes are not too steep and the tissues sufficiently normal and copious to permit a complete occlusion. At the same time the patient should enjoy general good health and be intelligent enough to aid in the operation. Before the sixth or seventh year of life the latter cannot be expected. The early periods of infancy are not favorable times for the operation, but a vital indication is furnished by the necessity of sufficient feeding and the danger of bronchitis and pneumonia resulting from the easy access of cold or contaminated air. If the operation can be performed before the child speaks, the prognosis in regard to articulation is very much better. Still, insufficient strength, whooping-cough, bronchitis, etc., are powerful contraindications.

3. *Tumors in the Oral Cavity.*

An *adenoma* of the *parotid* was noticed in a nursling by Erös. *Fibroma* occurs in the periosteum, *enchondroma* and *osteoma* in the lower jaw, *sarcoma* (epulis) in the alveolar process, where it mostly originates in the periosteum. They should be removed soon. The first (of the very few cases on record) congenital *sarcoma of the tongue* I reported in 1869 (*Journ. Obst. and Dis. of Women and*

Children). It was removed by the galvano-cautery. Biedert ("Lehrb. d. Kind.," 11th ed., 1894, p. 168) reports the case of a girl of ten years with *sarcoma,* which commenced in a *tonsil* and extended over all the neighboring organs. When she seemed to be almost moribund she was taken with erysipelas and got well. The report was made eight years after her recovery, which took place with considerable cicatrization. The case holds out great hopes for Coley's treatment of sarcoma by means of the serum prepared from the streptococcus of erysipelas and the bacillus prodigiosus.

4. *Ranula.*

The sublingual glands are sometimes seen as gentle elevations when the tongue is normally raised. Some acini of one or both glands, however, may undergo cystic degeneration and form cysts of any size up to that of a pigeon's egg. The same sort of cystic tumors are formed in the obstructed Rivinian duct and in the lymph-ducts between the genio-hyoid muscles, very rarely in the ductus lingualis or its ramifications. When they impede nursing, deglutition, or respiration, they should be removed. As the walls are very thin (mostly), enucleation is not practicable; the simple incision is rather useless because it will soon close up; the introduction of a silk-thread seton may favor suppuration and sepsis; the removal of a fairly large part of the visible wall, which is then turned in and sutured, with subsequent application of carbolic acid or of the silver nitrate stick (with immediate application of salt solution afterwards), gives the best results. Cysts formed by congenital obstruction of the Whartonian duct should not be called ranula. Dermoids and degenerations of the submaxillary glands, also lymphangiomata, are met with that should not be mistaken for ranula.

Concretions in the efferent ducts of the sublingual and the submaxillary glands can usually be expelled by gentle pressure. If not, a short incision will free them.

5. *Milia. Epithelial Pearls.*

Along and near the raphe of the palate of the newly-born and nursling there are (sometimes numerous) hard, yellowish-white conglomerates of small size. Now and then they rise above the level of the surface. They are usually (not cystic, not comedones) accumulations of epithelia in the small vacuoles of the mucous membrane. Mostly they disappear spontaneously; sometimes, under the influence of injury and microbes, they ulcerate. Pus is occasionally seen. I have observed perforations of the palate. In that condition they are

sensitive or painful, interfere with nursing and nutrition, and are the starting-points of thrush or of still more serious infectious diseases. Then, but then only, a daily application of a solution of silver nitrate (1 to 50 or 500), mild when only the surface is ulcerating, and frequent brushing (not rubbing) with a solution of potassium chlorate or of sodium biborate (1 to 30 or 40) will be all that is required.

The perforation alluded to is very exceptional. *Syphilitic* and *diphtheritic* (rare) *perforations* furnish their own indications both for local and general treatment.

6. *Stomatitis.*

The *catarrhal* form, mostly with inflammation of the gums (*gingivitis*), results from uncleanliness (retention of food in the mouth), from constant sucking on fingers and nipples, or is observed in connection with nasal catarrh, glossitis, pharyngitis, gastro-enteritis, peritonitis, or the exanthematic acute eruptions. This mild form demands cleanliness, drinking of cool water (mainly after every feeding), cooler temperature of the food, unless it be breast-milk, and washing either with potassium chlorate or borax solutions. In those cases in which the mucous membranes and the tongue are dry, a solution of silver nitrate (1 to 500 or 2000) should be brushed on once a day.

The *follicular* form, in which vesicles are found over the mucous membranes, tongue, and pharynx (not the gums), with a tendency to rupture, is very painful, is often attended by high temperatures, and interferes with swallowing; it should be treated, besides locally, with potassium chlorate, eight grains (0.5) in five ounces (150.0) of water and glycerin (10 or 15 to 1), a teaspoonful to be taken every half-hour, and no water to be given immediately after, so as to secure the local with the general effect.

The *ulcerous* variety (*stomacace*) originates in the gums of children between two and eight years of age. It affects the lower (more frequently than the upper) incisors and canines on injured epithelium, after careless cleansing and washing, sucking of soiled fingers (cocci, etc.), and the milk of cows affected with foot-and-mouth disease. Frühwald claims to have found a bacillus not met with in the healthy mouth, also cocci; Bernheim, a bacillus and a spirochæte. The tissue becomes hyperæmic, bluish, and undergoes a rapid parenchymatous disintegration, looks white, is soft, breaks down, loosens the teeth, and attacks the adjoining angle of the mouth and cheeks, which undergo the same destruction. There are copious salivation, offensive odor, and sometimes extensive necrosis of bones. As it is mainly observed after measles (most frequently) or pneumonia and infectious diseases

generally, often in rhachitical and scrofulous children, and in nurseries and foundling asylums of the old (?) style, feeding (which is often resisted), tonics, and stimulants are urgently indicated. Internally, potassium chlorate as in the follicular form, in doses not larger, but more frequent. Most cases do not require anything besides, with the exception, perhaps, of the local application, a few times a day, of potassium permanganate solutions (1 to 250 or 500) or of an attenuated tincture of iodine. Bad cases terminate in extensive destruction of an angle of the mouth and adjoining cheek. Secondary noma is rare.

The *aphthous* variety, with yellowish or gray spherical and flat fibrinous deposits between the epithelium and the tissue of the mucous membrane, sometimes complicated with small hemorrhages, may become dangerous when grave, and may interfere with swallowing. When there is a tendency to superficial ulceration, silver nitrate in water (1 to 50) may be gently applied once daily. Other treatment has been outlined above. Chronic neurotic stomatitis will be discussed in Chapter XI.

Hemorrhagic stomatitis is observed in scurvy, in diphtheria, and in other infectious diseases; the *diphtheritic* form in diphtheria; the *syphilitic,* with its circumscribed whitish or grayish condylomata and other symptoms, in nose, larynx, skin, or bones, in syphilis. The treatment of these local manifestations has been discussed in other chapters. *Mercurial* stomatitis is rarely seen in infants and children, the less so the younger they are. When it does occur, potassium chlorate internally, in small and frequent doses, and as a mouth-wash (1 to 30), is as good a curative as it is a preventive.

All of these forms of stomatitis have a marked influence on the lymph-bodies of the neighborhood, mostly below the lower jaw, but also those of the cheek. These are located on the lower jaw, on the upper jaw, behind the angle of the lower jaw, and near the orifice of the Stenonian duct. As a rule, their tumefaction will disappear with the reduction of the symptoms of the stomatitis which caused them.

7. *"Bednar's Aphthæ."*

They are not aphthæ, but flat and more or less extensive ulcerations, resulting from atrophy of and injury to the epithelium and mucous membrane of the alveolar processes and the palate of the very young (first month), also around the epithelial pearls near the raphe. In the newly-born a moderate physiological desquamation takes place on all the integuments, both skin and muous membranes. Thus, normally, the epithelium is thrown off. The oral mucous mem-

brane is very thin, over the posterior alveolar process it is very tense, and mostly so about the insertion of the pterygo-mandibular ligament. There, while the mouth of the newly-born is kept open, the mucous membrane becomes quite pale. A slight stomatitis, a moderate ill-nutrition, and careless and rough handling of the mouth of the baby cause abrasions and ulcerations, which may be quite small or extend over square inches. They are dangerous to the same degree as they interfere with nursing or feeding and facilitate the invasion of microbes, which are numerous, but accidental, either saprophytes or pathogenic. These may cause an infectious disease. Thrush is a frequent sequela. The above etiological remarks preach the sermon of prevention. Look after your nurses, their finger-nails, and the material they shove into the babies' mouths. Silver nitrate (1 to 250 or 1000) in one daily application, and gentle brushing with boracic acid (1 to 30 or 50), or with sodium biborate, will mostly suffice. If a stronger disinfectant be required, potassium permanganate (1 to 200 or 500) is preferable. Much crying on the part of the baby is injurious by the stretching of the mucous membrane of the posterior lower alveolar processes. After each meal a few teaspoonfuls of water should be given to clear the mouth of food remnants.

8. *Thrush.*

Membranous stomatitis is very frequent and popularly known as thrush (muguet). The postnatal desquamation of the epithelium, the open mouth which allows the constant passage of air and microbes, the narrow nares which add to that predisposition, uncleanliness, retention of food in the mouth, excess of sugar in the food, and previous pneumonia or infectious disease, which adds to the hyperæmia of the oral cavity, facilitates the deposit of oidium (no healthy epithelium permits it), which, with streptococci and staphylococci, detritus, a little fibrin, and foreign remnants, form deposits, granulations, and membranes mainly on surfaces covered with pavement epithelium (mouth, tonsils). Oidium is also found in the intertrigo of the nates, occasionally even in the cranial cavity; its gonidia are met with in the gastro-intestinal tract, where they cause gastritis and enteritis, atrophy, and possibly death. It is therefore necessary to treat thrush early. The membranes can almost always be scraped off easily. A solution of boric acid (three or four per cent.), of sodium biborate (two or three per cent.), or of potassium permanganate (one-half to one per cent.) should be applied five or six times daily. A daily application of silver nitrate (1 to 500) is useful after the membranes have been removed. Internally, as gastro-intestinal complications are fre-

quent, resorcin and bismuth may be administered (bismuth subcarbonate one gramme = grs. 15, resorcin twenty-five to forty centigrammes = grs. 4 to 6, water fifty grammes, glycerin ten, a teaspoonful every two hours).

9. *Noma.*

Phlegmonous gangrene of the cheek, sometimes originating in the gums, is commonly known as *noma.* It is of unknown cause (neuropathic, microbic, thrombotic?); at all events, no bacillus has as yet been identified as its cause or regular attendant, with the exception of the endemic described by G. Bloomer and A. Macfarlane in the *Amer. Journ. Med. Sci.,* November, 1901. Leptothrix was found in each of their sixteen cases (mouth, vulva, rectum, alone or in combination). As isolation stopped it, contagion is probable (by soap? towels?). The worst complication was pneumonia, the best remedy the thermo-cautery. It is mostly observed after measles, typhoid fever, scarlatina, or other infectious diseases, or after reckless mercurialization. The same process, under the same circumstances, may be observed about the vulva, anus, and other parts. It never occurs in the healthy child. During the process the blood-vessels, nerves, and Stenonian duct may take part in the disintegration, or remain intact; when the blood is not coagulated in the vessels, a case may die, while apparently getting better, of a hemorrhage which in the septic condition of the patient need not be large. The mortality is high, more than seventy-five per cent. The hard, black node grows fast, the fearfully fetid ulceration destroys soft parts, teeth, bones, and finally life, unless the process be stopped. The actual cautery (electro-, thermo-cautery) employed once or more is most effective, also fuming nitric or sulphuric acid, or a ten-per-cent. solution of zinc chloride; when it has stopped, potassium permanganate (1 to 100) or the dioxide may be applied, or tincture of iodine, or formalin (1 to 15 or 30). The strongest stimulants in large doses—alcoholic beverages, musk, and strychnine —should be given. As it is mostly seen after infectious diseases, etc., we should learn the lesson of not relying too much on the lazy nihilism of thoughtless " expectant" methods.

10. *Sublingual Adenitis.*

The inflammation of the sublingual gland (sometimes connected with parotitis) is mostly seen in the puerperal infections of the newly-born, but also in after-years. It may heal, but requires early incision to relieve the pus, and frequent disinfection with potassium permanganate (1 to 200 or 500 water). The abscess may become very large

if the surrounding cellular tissue participates in the suppuration. The incision should be large, and disinfection very careful.

11. *Parotitis.*

The endemic and epidemic varieties were treated of on page 220. If the Stenonian duct be obstructed by simple or mercurial or ulcerous stomatitis, or by diphtheritic deposits, the gland will swell and become inflamed. Cold applications, gentle massage with green soap, or with a potassium iodide lanolin ointment, will succeed, unless there be suppuration. In this case an incision is required. A metastatic form of parotitis, with numerous cocci in the pus, may be observed in variola, typhoid fever, scarlatina, and anæmia. Warm fomentations, large incision, and thorough disinfection are demanded.

12. *Difficult Dentition.*

Dentition is a physiological process; before a tooth protrudes the gums above it are slowly absorbed so as to show a slight depression, with no hyperæmia. Some time previously the gums are raised and more or less hyperæmic. The only perceptible symptom is the eagerness of the baby to bite. Increased salivation has nothing to do with dentition, but with the increased function of the salivary glands, which, like the growth of the teeth, of the head, and of the brain, is the result of the physiological hyperæmia of that part of the body connected with the large size of the carotid arteries. When the gums are abnormal, hard, tense, perhaps under the influence of a stomatitis, there may be a slight fever, hot head, sleeplessness which is improved by taking the baby up (head elevated), even some muscular twitching; for at that time of life excitability is great and inhibition insufficient. Diarrhœa is not a result of the normal teething process. This extends over the fœtal and infant periods; what is often called so is only its termination. One or two decigrammes of a bromide may be given (one and one-half or three grains) once or often, and the mouth should be washed with cool water. The long period of dentition is also the time of many disorders and diseases, which are not always easily diagnosticated and may tempt the practitioner to suggest or accept the diagnosis of difficult teething. Lancing the gums, which, with calomel, used to be the every-day treatment of infants at the time of teething, has lost most of its charms. There are, fortunately, practitioners who prefer making a diagnosis of the real condition of the ailing baby, and that and its improvement or cure comprise the main treatment I recommend for "difficult dentition."

Great care, however, should be taken of the teeth. They should be washed after every meal and rubbed off. Caries grows very rapidly; the loss of a tooth results in narrowing the place for the permanent tooth that is to follow, perhaps after years only; extraction should be resorted to only for painful pulpitis or for purulent osteo-periostitis. In rare cases a temporary tooth should be removed when it prevents the permanent from protruding.

13. *Dental Ulceration. Riga's Disease.*

When there are but two lower incisors, and they the only teeth present, the tongue is irritated by contact and friction; that is, as is readily understood, particularly frequent in whooping-cough. In this way the dental ulceration is caused. When the irritation lasts long, and results in a secondary inflammation with hyperplasia of the tissue, the tongue adjoining the frænulum is not only discolored, grayish, and slightly granulating, but exhibits a slight excrescence, with a somewhat irregular surface and of marked density. Fibroma has been met with. That is what is called Riga's disease by Fede and Concetti, who say it is very rare in Rome, but very common and often grave in some parts of Southern Italy. Infants with vulnerable tissues are most apt to be affected; moreover, the sore surface, being very much exposed, may become a breeding-place for pathogenic microbes and their toxins; diphtheria, sepsis, cachexia are thus engendered. The name is an unnecessary addition to our nomenclature. According to the condition of the surface, it may be moistened frequently with a solution of potassium chlorate, or of borax, or of potassium permanganate, or of the dioxide, or be cauterized with the solid stick of silver nitrate once every two days, or the actual cautery. The ulceration or tumor is almost certain to disappear when a few more teeth make their appearance in the lower jaw. Mild cases may get well without any treatment. Bad cases will improve with recovery from accompanying atrophy or cachexia.

B. The Tongue.

1. *Congenital Anomalies.*

They are more or less amenable to surgical treatment. The *bifid tongue* (arrest of development, consisting in the non-juncture of the two halves of the first branchial arch) may thus be improved. I removed a *sarcoma* with the galvanto-cautery (p. 309). *Lipoma* is mostly located on the tip of the tongue; is quite small, or reaches the size of a hen's egg; is sometimes pedunculated, and interferes with

nursing and nutrition. It should be extirpated, as also *dermoids* and *cystic hygromata.* The latter may also be injected with an irritant fluid (Lugol's solution, alcohol); *lymphangioma* may be punctured with the actual cautery in different places. The latter is one of the forms of *macroglossia;* its other variety is muscular; it is mainly this latter which enlarges the tongue in every direction, makes it protrude and excoriate, and dislodges the teeth. It has been reduced by the écraseur and by ignipuncture. A wedge-shaped piece may be excised and the flaps joined. Hypertrophy of the tongue accompanying any of the varieties of cretinism requires the prolonged use of thyroid. *Adhesion* of the tongue to the floor of the mouth (*ankyloglossia*), when in the rare form of extensive epithelial cohesion, is easily relieved by gentle traction, or separated by means of a blunt probe; when caused by the shortness and extensive insertion of the frænum, it requires an incision by scissors. It is better to make a superficial incision only than to cause a hemorrhage which is stopped with difficulty. The affection does not interfere with nursing, so that the little operation is not urgent. A further contraindication to making a long incision into the frænum is the possibility of rendering the tongue too movable, and thus facilitating *aspiration of the tongue,* which may prove fatal. In that condition the lower lip is drawn in and the tongue backward so as to prevent respiration. In a few cases it was observed in whooping-cough and laryngospasm; in the majority its original cause was obstruction of the nose by coryza, or congenital narrowness of the nostrils, or a swelled floor of the mouth. Insufficient innervation of the tongue has also been charged with occasioning its aspiration. The treatment of the difficulty depends on its etiology.

2. *Glossitis.*

Superficial changes of the tongue (*erythema, catarrh*) participate frequently in the same alterations of stomatitis, pharyngitis, infectious diseases, and digestive disorders. The latter do not influence the tongue, however, so much as they do in adults. These superficial alterations require no treatment. Very little, if any, is required in the peculiar changes of the epithelium, which is thrown off in the shape of smaller or larger islands and accumulated so as to form whitish and elevated edges round the bare spots (*geographical tongue*). It is only bad cases that require treatment. Lactic acid in solution has been recommended. I prefer silver nitrate once daily (1 to 500). A similar solution (1 to 1000) I recommend on the smooth red tongue with or without *fissures;* it is mainly the latter which should be touched by the medicine. A mouth-wash of

potassium chlorate and the internal administration of the same are beneficial in all of these conditions, alone or in combination with the above; also in most *ulcerations,* those caused by carious teeth, or in the attacks of epilepsy. The ulcerations caused by overdoses of mercury and accompanying *gingivitis* and salivation require frequent and small doses of potassium chlorate; for a child of two years one gramme (fifteen grains) daily. The acute inflammation of the tongue (*acute glossitis*), however, should not have to wait for the slow effect of any treatment. Its rapid swelling and intense redness, with a tendency to suppuration, demand a deep and long incision rather than a mere scarification of the surface.

C. The Throat.

1. *Pharyngitis, including Amygdalitis (Tonsillitis), Hemorrhage.*

It is met with in many varieties,—catarrhal, phlegmonous, erysipelatous, lacunar, follicular, and parenchymatous. All the diseases of the mouth may descend into the pharynx. The *catarrhal* inflammation of the pharynx is, however, apt to be more serious; fever, dysphagia, even convulsions, are noticed, besides annoying or dangerous complications with nasal diseases. Exposure, dry (furnace) air, or exertion (screaming) may bring it on. Nasal irrigations of warm (90° F.) saline solution relieve the naso-pharynx and the pharynx of accumulations of mucus. Gargles are not so reliable (p. 76) as applications of ice-cloths or of ice-bags, potassium chlorate as advised above, with small doses of tincture of belladonna, also an astringent spray for docile older children. *Tonsils,* when acutely swollen, are relieved by a scarification made at an early period. In that way chronicity may be avoided, with its constant liability to admit microbic infection and to cause the development of adenoid vegetations. The lacunæ (crypts) of the tonsils, as they do not recede into the tonsillar tissue, but are mere surface depressions, are the seat of a superficial process partly parasitic and partly irritative. Lacunar amygdalitis is rare in infants, more common later; its fever is high or not; glandular swellings of the neighborhood are quite common (Koplik in Festschrift). The deposits—sometimes large enough to form membranes—are made up of epithelium, erythrocytes, leucocytes, detritus, bacilli, and cocci, or, instead of the latter, in rare cases, leptothrix. This latter form was first described by B. Fraenkel in 1873 and Emil Gruening in 1882, and lately by Alois Epstein (Festschrift, 1900), who gives the interesting history of the affection (Gruening is not mentioned). It is not at all a disease of adults, as

Boulay supposed. The deposits are widely disseminated over the tonsil, distant from one another, firmly adhering, persistent, not surrounded by an inflamed surface, pale and dry, and easily distinguished from follicular deposits and membranes by their appearance, course, and microscopical structure. Loose deposits may be scraped off, and the sore surface (in docile children) touched with concentrated carbolic acid, or silver nitrate either solid or in strong solution, or mitigated tincture of iodine, or Lugol's solution. Potassium chlorate in frequent small doses internally.

Follicular amygdalitis, the process being in the depths of the follicles, is liable to cause more general symptoms. High fever, pain, headache, even convulsions are very common. Epithelia, detritus, and a great variety of microbes form the tufts rising out of the follicles and the membranes in which a number of tufts coalesce.

Parenchymatous inflammation of the tonsils shares the character and symptoms of phlegmonous pharyngitis in general, sometimes to an unusual degree. It results from or follows the (catarrhal or) follicular variety. Being caused by the latter, it is at first circumscribed, the abscess originating in a single follicle. That is why it is mostly on one side only, but may occur once or twice a year until all the follicles are destroyed by suppuration. An early incision should be made and followed by disinfectant gargles or medicine (potassium chlorate).

The abscesses of *phlegmonous* phargyngitis may be found anywhere, without a trace, perhaps, of a microbic cause. Some are found in the submucous tissue, some hidden behind a tonsil. They require an early incision. *Erysipelas* of the pharynx has no tendency to suppuration, but to considerable swelling, which may be so intense as to demand tracheotomy. If intubation be possible, it should be preferred. Ice applications; ice-pills. Baginsky recommends a five-per-cent. ichthyol vaseline ointment.

The *chronic* form of *parenchymatous amygdalitis* is sometimes congenital (often hereditary), otherwise the result of repeated acute processes. Scrofula predisposes. In five per cent. of a large number of examinations the swelled tonsils were tubercular; in them tuberculosis is either primary or secondary to pulmonary or other tuberculosis (even the miliary acute form). Neighboring lymph-bodies may become infected from them; less so, it appears, the follicular glands of the base of the tongue. Mouth-breathing, vertigo, nocturnal (morning) cough, dyspnœa, incontinence of urine, night-terrors, ear affections, mental hebetude, rheumatic affections, and insufficient development of the chest are symptoms or consequences. The chronically

enlarged mass cannot be influenced by medication or astringent applications. It is useless to tamper with caustics of any kind. Resection is the only quick relief, to be followed, mainly during epidemics of diphtheria, by disinfectant washes or medicines. If the anterior arch of the soft palate is adhering to the tonsils, it must be loosened first to avoid hemorrhage. For the same reason the tonsil should not be drawn out too much, nor the instrument unduly pressed in. If this occur (the tonsillar artery has large branches in the capsule), the readiest means to suppress it is digital compression inside. If the operation be objected to, the galvano-cautery (after anæsthesia by cocaine) may take its place.

Follicles which remain open and permit a probe to enter a centimetre and more are the causes of constant annoyances, new deposits, microbic invasions, etc. They ought to be burned out with the electro-cautery or ripped open with a rectangular hook suggested by Moritz Schmidt and improved by Gleitsmann, who sharpens one of the edges.

Hemorrhages from the pharynx are not very infrequent, mild or grave. The treatment should be indicated by the causes; nasal and naso-pharyngeal and pulmonary bleeding may be mistaken for pharyngeal. Pharyngeal catarrh, varicosities of the posterior aspect of the uvula, and varices of the base of the tongue and the lingual tonsil are occasionally met with. A foreign body or an attack of whooping-cough may burst blood-vessels; hæmophilia, scurvy, and leucocythæmia may predispose to bleeding. In infectious fevers, mainly in diphtheria, mild (or grave) nasal and pharyngeal hemorrhages may occur. Greenhow on Diphtheria, 1860, p. 209, relates: "Mr. Williams had a fatal case in which the patient died apparently from the profuse discharge of bloody sanies resembling claret from the throat, amounting to two pints per day." Similar cases we saw often during grave epidemics thirty and more years ago. Operation on a tonsil may cause it, primarily or secondarily. Primary or secondary hemorrhages after incision or rupture of blood-vessels are not rare. Ulcerations of syphilis are not often found in children. Septic ulcerations are frequent, and usually give rise to small bleedings. When large blood-vessels are eroded, hemorrhage may prove fatal. I have known the internal carotid to bleed four times during several days in a child of four years until she died. The artery should have been ligated.

2. *Retro- and Latero-Pharyngeal Abscess.*

The lymph-nodes of the posterior wall of the pharynx drain the tonsils; the deep facial glands the orbit, jaw, pharynx, and middle

ear; the superior deep cervical glands the cranium, larynx, thyroid, and pharynx. The rapid growth and intense hyperæmia of all the parts concerned during the first year of life, the frequency of stomatitis, pharyngitis, and rhinitis, also otitis, and the activity of the lymph-system at that period explain the frequency of retro-pharyngeal abscess in the second half of the first year. After the completion of the second year it is rare; after that the importance of the lymph-bodies of that region diminishes from year to year. In the adult the lateral pharyngeal lymph-bodies exist, but they are small; a number of small accessory lymph-bodies alongside the pharynx apparently become atrophied. Cases depending on genuine caseous tuberculosis of lymph-nodes are very rare; those resulting from caries of a vertebra, which sometimes runs a protracted course without any symptoms, not frequent. After all, Koplik (*N. Y. Med. Journ.*, April 4, 1896) justly declines to accept the existence and name of idiopathic abscess; he, Neumann, and others found strepto- and staphylococci in all; indeed, nothing should be called idiopathic the cause of which is primarily located in another organ, or at a distance, though in the same class of tissue. The worst cases are those developed out of scarlatinous pharyngitis or during erysipelas (rare) or measles, also typhoid and influenza; they have a tendency to become gangrenous and to descend into the mediastinum, or to be, on the basis of uniform infection, complicated with pneumonia or suppurative pleurisy. That is so principally when the small lymph-bodies situated in the succulent tissue between the pharynx and the prevertebral muscle are affected. It is these abscesses that perforate behind the pharynx and œsophagus and have a tendency to descend. The diagnosis is secured by dyspnœic, interrupted, snoring respiration, stiff neck (often held back and sideways), difficult deglutition, tinny voice, which will not be forgotten if once heard, frequently by the occurrence of a lateral swelling which can be seen outside, and by the presence of a posterior or lateral swelling which can more often be felt than seen. The symptoms are mostly urgent, sudden deaths not uncommon, and the abscess should be opened when felt or even indistinctly felt to fluctuate. No anæsthesia. Hard swellings (in rare cases syphilitic) should not be incised. The finger should never be permitted to burst an abscess, though ever so soft; for, the pharyngeal space being narrow (the larynx, as shown by Symington, is higher by one vertebra in a child than in an adult), pus, which is usually quite copious, may be forced into the larynx. The abscess may be opened in most cases by a hard silver probe or director, which is run in quickly and made to tear a long opening, in others with a bistoury covered to nearly its

point with adhesive plaster, or, better, with a covered knife which is withdrawn at once and the sheath of which is used to enlarge the opening. Immediately after the incision the head of the patient should be thrown forward and gentle pressure employed laterally. There is rarely any hemorrhage; if there be, ice may be forced into the mouth; or ice-water injected into it forcibly, a single moment, will contract by reflex the small bleeding vessels. A gauze tampon is rarely required. A sponge with a solution of antipyrin (from ten to forty per cent.) will seldom be required. If the opening is large enough, a second incision will not often be necessary. When the tonsils are, and always have been, large, it has become necessary to begin the operation with the resection of a tonsil. In all cases in which the lateral swelling is large and fluctuating, or where the abscess is due to vertebral disease or to scarlatinous or other sepsis, it is best to incise laterally behind the sterno-cleido-mastoid muscle when the abscess is below the larynx, in front of that muscle when the abscess is above it, and to disinfect and drain. This method should not be followed except in the cases indicated, or when the mouth cannot be opened (contraction of the masseters), or when the presence of the abscess is diagnosticated, but its location such as not to be reached by an incision from inside. The after-treatment is like that of phlegmonous pharyngitis generally.

The diagnosis from a hæmatoma or from an angiomatous tumor, both of which are rare, should not be missed; for a mistaken diagnosis may cause death. Dangerous hemorrhages may take place from a branch of the pharyngeal artery when the anterior palate is injured in a resection of the tonsil, or from a branch of the external maxillary artery when a peritonsillar or latero-pharyngeal abscess is incised far away to the right or to the left. Septic abscesses may also lead to the spontaneous perforation of a large artery. Four hemorrhages took place within six days, the last of which proved fatal, in a case of latero-pharyngeal abscess which resulted from what appeared to be a mild case of a streptococcus pharyngitis. The autopsy revealed a large opening in the right internal carotid, which should have been ligated to save the child (p. 320).

3. *Adenoid Vegetations.*

They were first described by W. Meyer, of Copenhagen, in 1870, and their influence on articulation, hearing, intellectual development, and the countenance recorded. They are lymphoid swellings in great numbers, sometimes covering the whole pharyngeal roof, sometimes accumulated in one large mass (Luschka's "pharyngeal ton-

sil"), or in two masses with a groove between them. They cause or are dependent on or connected with catarrh of the nose, the lachrymal sac and conjunctiva, and the pharynx; give rise to occasional bleeding, headache, cerebral congestion, irritability, cough, parched mouth, thirst, with much drinking and consequent polyuria, laryngitis, otitis, sometimes facial erysipelas, retard intellectual development, and produce the expression of stupidity common to all mouth-breathers. As the normal nose and naso-pharynx are full of microbes, adenoid vegetations have been studied in reference to them. Streptococci, staphylococci, and pneumococci have been found on them, also leptothrix. Dieulafoy found tubercle bacilli in very many, and was disposed to claim the vegetations as tubercular; Gourc, however, not once in two hundred and thirteen cases, in thirty of which tuberculosis could be found in other organs. Dieulafoy's assumption is one of the many instances of the dangers, not of close investigation, but of premature conclusions based upon the mere presence of actual or alleged characteristic microbes. Still, the surface on and near adenoids is never normal, microbic invasions are facilitated, the connection between the lymph-ducts and blood-vessels of the base of the cranium and the intracranial space is very direct, and many a meningitis would not exist if there were no adenoids. The same microbes have been found in both. Contraction of the nose, pointed arching of the palate, and dental deviations with shortened and low inferior maxilla, ill-shaped, particularly pigeon-breast, also scoliosis, even funnel chest, are as much the results of adenoid vegetations as of original rhachitis or other (congenital) anomalies. F. Huber (Festschrift, 1900) reports that, "in a few cases of empyema in mouth-breathers, curetting of the naso-pharynx, by favoring pulmonary expansion through improvement in the breathing, caused the obliteration of a small cavity or sinus, thereby avoiding a secondary operation upon the costal walls. In the same way, the associated lateral curvature rapidly disappeared when nasal respiration was established." He also emphasizes that "the teeth show a tendency to early decay, particularly the molars; in some cases stomatitis and gingivitis occur, persisting until the growths are removed." Habitual cold washing and friction of the whole body contribute to regulate the circulation and relieve local hyperæmia. Nasal irrigations with salt water, boracic acid solutions, etc., while relieving the obstruction and catarrh of the naso-pharynx, are capable of reducing congestion and sometimes render an operation superfluous. The latter, however, is preferable in almost every instance when the adenoids are not quite small, and just as important as the removal of intractable swelled lymph-bodies

from the neck. As the vegetations often spread over a large surface, instruments like Gottstein's, which remove the prominences from a large area, are best. Delstauche's modification of that instrument, which consists in the addition of two sharp hooks bent downward, is a good one and applicable to larger tumors which can be caught. The small ones should be rubbed off with Gottstein's scraper. The instrument should not be too large and not be carried sideways, in order not to injure the cartilaginous edge of the Eustachian tube. The operation should not be performed during an infectious fever, particularly not during an attack of diphtheria, for fear of further invasion through the sore surface; it is still more objectionable here than it is on the tonsils, which may require resection to facilitate respiration in an occasional bad case of diphtheria. During or immediately after the operation the head should hang down to avoid bleeding into the air-passages. Bleeding will stop spontaneously, or by a brief compression with the finger, or an application of a sponge dipped in ice-water. If there be more, the pressing on of a sponge dipped in a twenty- or forty-per-cent. solution of antipyrin in water is advisable. The operation requires anæsthesia in very bad cases only, but should be followed by a day's rest.

The connection of enuresis with adenoids will be discussed in Chapter IX.

4. *Congenital Fistula.*

It is caused by the incompleteness of the closure of the second branchial arch. It begins near the sterno-cleido muscle and terminates in the pharynx. Here it is either open (complete fistula) or not (incomplete). If open inside and closed in the middle, it forms a *diverticulum. Cystic hygromata,* unless they be lymphangiomata or deep-seated atheromatous cysts, result from closure outside and inside while the centre remains open. Multilocular cysts may be the result of multiple and partial closure, perhaps by the rapidly proliferating epithelia separated from one another by copious lymph-tissue. The *thyroglossal duct* begins to undergo atrophy at the fifth week and is obliterated by the eighth, its upper extremity being permanently indicated by the foramen cæcum on the dorsum of the tongue. The fistula of the duct, when it does not close, is always in the median line, between the hyoid bone and the sternum, and lined with ciliated columnar epithelium (in the lingual portion squamous). It moves with the hyoid bone. Injections of iodine have been made to close the fistula, and good results have been observed. Total extirpation is by far preferable.

D. The Œsophagus.

Diseases of the mouth and pharynx descend into the œsophagus: catarrh, thrush, leptothrix, diphtheria. Injury by carbolic acid requires oil, also sodium sulphate in solution; by acids: chalk, sodium bicarbonate, soap; by lye: fruit-juice, vinegar; by hot water: ice or ice-water and cold applications. The symptomatic treatment requires opiates.

Stricture may be congenital (Demme). Such a case, complicated with communication between the œsophagus and the trachea, was operated upon by Helferich with fatal result. Cases of complete *atresia,* with that of the anus, of the mitral and other orifices, are on record. Stricture follows injuries (mechanical or chemical) after months or sometimes years. Above the stricture a diverticulum is apt to form, with the usual symptoms. Mechanical dilatation should be very gentle and gradual to avoid perforation; no metal instruments should be used. Gastrostomy, with or without dilatation or divulsion from below upward, is performed to facilitate both nutrition and dilatation from below. Hjort reports that he opened a stricture in a boy of fourteen years by electrolysis in two sessions, the negative pole of from ten to fifteen elements being introduced.

Foreign bodies should be extracted, if possible, according to the methods taught for adults. If that be impossible because of size or shape, they should be forced down into the stomach. If that fails, œsophagotomy is indicated. Of the one hundred and twenty cases of œsophagotomy collected by Fischer, four were under two years, eleven from two to ten, four from ten to fifteen years, altogether with a mortality of thirty-three per cent., due more to delay, and consequent sepsis, than to the operation. Gerster saved a boy of two years, in spite of deep ulceration caused by the foreign body, and a girl of nine years; Alexandroff, a boy of two years and nine months.*

Periœsophageal abscess may result from descending retro- or latero-pharyngeal abscess. Diseases of the vertebræ (the œsophagus being in close contact with the cervical portion of the spine), of glands, pleura, and pericardium, also foreign bodies will cause it. Glands may be found tumefied, the larynx dislodged, and a soft swelling may be felt in the fauces. If it be within reach, an early incision should be made.

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* F. Karewski, Die Chirurg. Krankh. d. Kind., 1894, p. 367.

E. The Stomach.

1. *General Nosology. Dyspepsia.*

The indications for the therapeutics of the stomach, both dietetic and medicinal, are by no means simple and clear in every individual case; for it is difficult to make an exact diagnosis of the anatomical condition of the surface and the tissue of the organ because of the frequent combination of various conditions. Indeed, the boundary line between a simple functional dyspepsia and a gastric catarrh is perhaps never made out clearly. The epithelium of the mucous membrane does not belong to it exclusively, but spreads in the contiguity of the tissue into the muciparous and the peptic glands. Thus the inflammatory condition of the surface becomes at once a "parenchymatous" affection, though it be possible that an uncomplicated catarrh and an uncomplicated inflammation should exist. This, however, will last but a short time, and unless a gastric catarrh, or a dyspepsia, or an intestinal irritation—for the intestine shares the peculiar anatomical condition of the epithelium of the stomach —be relieved at once, the merely functional or superficial disorder becomes organic and deep-seated. These changes may refer either to the tissue or to the secretion. Inflammatory thickening, erosions, ulcerations, or (Moncorvo) dilatation of the stomach will be observed in a great many instances. The secretions become abnormal. The normal hydrochloric acid of the gastric juice is almost invariably diminished; now and then a case will be found, but in older children only, in which it is increased in quantity; still, as a rule, it is wanting or but scantily supplied. Lactic acid, however, is produced in much larger quantities than the first stage of normal digestion requires, and with it acetic, butyric, and the rest of the fat acids. With this variety of changes the indications for treatment go hand-in-hand; others are suggested by the multitude of etiological factors. The direct paralyzing influence of heat, the immediate effect of irritant and bulky ingesta, and the poisonous action of bacteria introduced in food and rapidly multiplying render the intelligent and effective treatment of many of the cases which occur in the practice of every medical man a matter of great difficulty and responsibility. Nothing is more common, but less appropriate, than routine treatment directed against a variety of cases.

The importance of diet in all questions connected with the pathology of the digestive organs justifies the repetition, in this place, of a few main points the elaboration of which may be found in the first chapter of this book.

The principal cause of the diseased conditions of the digestive organs of the young is to be sought for in improper food. Not even mother's milk will always agree with the baby; cow's milk cannot possibly take its place as a legitimate and satisfactory substitute. Much less reliance can be placed on manufactured or home-made mixtures of unequal composition and doubtful quality. Children of more advanced years resemble adults in this, that they are endowed with more resistance to damaging influences; but the infant and young child are in constant danger of losing their physiological equilibrium by slight changes in feeding or by the deterioration of foods. The readiness with which milk, which is indispensable as a food, will decompose, acidulate, and become indigestible renders the greatest attention a necessity in the interest of prevention. The difficulties are very great; that is why it happens that an otherwise objectionable food (permissible so long as nothing absolutely good can be had),—that is, condensed milk,—when properly preserved and delivered daily at the dwellings of the poor, is preferable to food of a suspicious character. Attention must first be directed to the differences between cow's and woman's milk. The former contains more casein, usually a little less fat, sugar, and sodium chloride. Besides, the caseins of cow's and woman's milk differ both chemically and physiologically. That has always been so, and will be so, though a recent journal article declares the fact—or its assertion—a "bugbear." The former is less digestible, and its amount in the food given an infant must not be larger than one per cent., rather smaller. On the other hand, a large percentage (from nine to twelve) of fat is contained in every normal defecation of an infant fed on breast-milk; thus care should be taken not to exceed the quantity of fat contained in infant food when artificial feeding is resorted to. That is important because the fat of cow's milk differs both chemically and microscopically from that of woman's milk. Indeed, to what extent fat administered in excess, and indiscriminately, is apt to produce diarrhœa is best illustrated by the "fat diarrhœa" which has been a frequent topic for discussion in medical journals. Water, salt, and sugar must be furnished the infant in sufficient quantities. (See Chapter I.)

Water is often wanting in infants' and children's food, and its absence is the cause of dyspepsia and of anatomical changes in the digestive organs. Its *rôle* in the organism is very manifold. Besides its influence on general metamorphosis, it is required to assist in pepsin digestion. In artificial digestion, albumin is liable to remain unchanged until large quantities of acidulated water have been supplied. Peptones, even in the stomach, require water to facilitate their

solution and absorption. The immediate relief felt from a draught of water taken during the precordial heaviness and discomfort experienced after a hearty meal is a matter of daily experience. Infants and children—mainly the former—receive too little water. Whenever they are thirsty, both in winter and in summer, they are given milk,—that is, food; and many a case of dyspepsia, with its results, could be obviated by adding plenty of water to the food. Excess of water, if under ordinary circumstances there is such a thing, is attended by less inconvenience or danger, for it is readily absorbed and eliminated in the conditions it meets in the stomach, which holds salt and sugar.

Sodium chloride ought to be added to most foods of infants and children. For instance, vegetable diet contains more potassium and less sodium than all the varieties of milk, and milk of herbivores more potassium than that of carnivores. Thus, cat's milk contains sodium 1 to potassium 0.76, woman's milk 1 to 1.13 or even 4.4, and sheep's and cow's milk 1 to 5.6. The amount of salt contained in woman's milk depends greatly on the presence of salt in her food. Therefore, many a defective milk can be remedied by the mother or wet-nurse by adding salt to her food. Particularly is this necessary in dyspepsia and gastric catarrh in the baby, one of the main symptoms of which is the presence of large and hard curds in the masses brought up by vomiting or evacuated by the rectum. The addition of sodium chloride to milk impedes or delays the solid curdling by rennet,—a physiological fact which explains the usefulness of salt in every kind of infant food; for in vegetables, and mainly in farinacea, the disproportion of potassium and sodium is still more evident than in milks.

Souring of milk is prevented by boiling, mainly through the expulsion of a large quantity (three per cent.) of gases (carbonic acid, nitrogen, and oxygen) contained in the milk when it leaves the udder, and by the destruction of parasitic growths. That is why I have always advised to boil the milk destined for the use of a baby as soon as obtained, fill it hot into bottles, containing from three to six ounces, up to the corks, close them tightly, and preserve them inverted in a cool place. Whenever a meal is to be prepared, the milk thus preserved should be heated again up to or near the boiling point,—preferably in a water-bath. That process should be repeated perhaps several times a day; while one bottle is being heated, the others may undergo the same procedure, for every boiling interrupts the beginning of lactic acid or other decomposition. The sterilization (or pasteurization) of milk in Soxhlet's apparatus is a still better pro-

cedure. Milk properly sterilized will keep one or more days, but for general use among those who cannot obtain (or pay for) the patented apparatus my method will suffice under ordinary circumstances and for people with the most ordinary intellect.

A certain amount of starch is digested at the very earliest age, for saliva is secreted at that time. Its effect persists in the stomach so long as the hydrochloric acid in the gastric secretion does not exceed 0.06 per cent.; within the first half-hour of the digestive process there is none at all, but organic (mainly lactic) acid only. Thus, though starch pass the oral cavity rather quickly, it will still undergo its change into dextrin in the stomach. In many abnormal conditions this digestive change lasts a still longer time; for instance, in fevers, in severe gastric catarrh, and in dilatation of the stomach. These are the conditions in which farinaceous foods are best tolerated, for the reasons that the diastatic effect of the saliva is not disturbed, and that albuminoids cannot be digested because of the absence of hydrochloric acid (and pepsin). In all normal and many morbid conditions amylaceous foods, when present in certain quantities, have additional functions. Besides being nutritious in its own way, starch serves to dilute cow's milk, to reduce the percentage of casein in the mixture, to prevent the latter from coagulating in large masses, and thus to render it more digestible. The reasons why I prefer in most instances either barley or oatmeal, and in others gum-arabic or gelatin, and do not recommend (p. 327) condensed milk, etc., have been given above.* (See Chapter I.)

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* F. A. Hoffmann, in Lectures on General Therapeutics, Leipsic, 2d ed., 1888, p. 223, says in connection with the rules on infant feeding annually published by the New York Health Department, which he copies, "Unless woman's milk can be had there is a great danger in the probability that the sensitive intestinal tract be supplied with injurious material; for such is the very best cow's milk in the cases of very young infants, because the mixture of its constituents differs greatly from that in woman's milk, and its casein is less digestible. Both physicians and manufacturers have tried to compound substitutes for woman's milk, but those only the composition of which is known should be noticed by scientific men and recommended. Another requisite is this, that such a food must be within the means and understanding of everybody, and that a certain supervision be possible. Jacobi's treatise in Gerhardt's Manual of Pediatrics will be found satisfactory by all those who desire to inform themselves on all that is known. From my own experience, I confirm his recommendations to dilute milk with barley- or oatmeal-water. At present the hope has been expressed that all this may be replaced by the sterilization of milk, but in practice there will be many impediments and obstacles. Sterilization can have but one result,—viz., to

From what I have said I draw the conclusion that so long as a baby is not nursed by a healthy woman, the opportunities for acquiring some kind of gastric disorder are very numerous indeed. *Dyspepsia* is therefore quite frequent. Its treatment consists in more or less abstinence and in the regulation of the diet. As a rule, food should be more diluted than usually. As the gastric contents of infants who have been brought up on artificial foods are liable to be very acid, alkalies in small doses, and frequently administered, have a good effect. Bismuth subcarbonate may be added. When there is vomiting, it must be determined whether it is gastric, and from what cause. Those who are in practice know too well how often they have seen meningitis mistaken for a gastric disorder, and how common is the occurrence of that symptom in the incipient stages of all kinds of inflammatory fevers. When all these and the local irritation of the stomach (brought on by foreign bodies, such as bulky foods, or by the presence of ascarides) and nephritis can be excluded, only then the vomiting should be considered gastric exclusively. Now and then abstinence only, or the drinking of warm water or warm mustard water to facilitate vomiting; or alkalies (sodium bicarbonate, magnesia, calcium carbonate), or alkalies with bismuth; or resorcin to disinfect the contents; or dilute hydrochloric acid for disinfection and to correct the nature of the gastric acid; or the washing out of the stomach with warm water or salt water (6 or 10 to 1000), or with a sodium bicarbonate (1 to 100 or 200) or a resorcin (1 to 50 or 100) solution; and, finally, after the stomach has been freed of its injurious contents, small doses of opium, from one-half to one and a half milligrammes (one-one-hundred-and-twentieth to one-fortieth grain), every hour or every two hours, or its equivalent in morphine or codeine, will prove satisfactory. Protracted and obstinate vomiting I have seen getting well with minute doses of arsenous acid, from a thousandth to a four-hundredth part of a grain every hour or every two or three hours, according to the age of the patient or the individual indications of the case. Small doses of ice-water or, better still, ice-pills repeated every five or ten minutes will answer in many instances. Effervescent drinks, iced, such as teaspoon doses of Apollinaris, Seltzer, or Vichy,

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remove the danger arising from the decomposition of milk. But, after all, it is cow's milk and not woman's."

It is a source of gratification to the writer to learn that he has not been wrong in his practice and teaching. Biedert and Heubner also advocate the use of cereals.

or champagne, may do fairly well in certain cases, but less frequently and less happily than in most adults under the same circumstances.

2. *Acute Gastric Catarrh.*

When it is produced by injurious ingesta, these ought to be removed. If vomiting have not occurred spontaneously, or not sufficiently, it should be produced by the above-mentioned drinks, tickling the fauces, friction of the precordial region, ipecac,—the syrup is very often an unreliable preparation,—or other emetics. In cases of great urgency only the subcutaneous use of apomorphine may be resorted to. The mildest (and quite safe) way of emptying the stomach is by irrigation. Purgatives must not be given in the beginning; large enemata will act more favorably. They may consist of warm water, warm water with antispasmodics, such as assafœtida, or with stimulants, such as turpentine. After a day or two a purgative dose of calomel will answer. Fever, unless it be high, requires no special treatment; in urgent cases only antipyrin may be given, either by mouth or rectum or subcutaneously. Tendency to convulsions requires cold to the head or cold applications to the heart, which will reduce both the irritation of that organ and the temperature of the blood. A warm bath will often do good, but the customary bathing and jostling and tossing of a baby in convulsions do more harm than good. Thirst should be relieved by water, carbonic acid water, or water acidulated with dilute hydrochloric acid (1 to 300 or 500).

No solid food. Milk should be given in small quantities only, diluted with water, lime-water, barley-water, or on Rudisch's plan (dilute hydrochloric acid 1, water 250, milk 500). Vomiting is to be treated on the plan detailed above, predominance of acids by alkalies, constipation by calcined magnesia in small and frequent doses rather than by drastics. The aqueous tincture of rhubarb, in doses of from ten to thirty minims every few hours, will prove very satisfactory in many cases.

3. *Gastritis.*

Severe forms of *gastritis*—the *corrosive, diphtheritic,* and *suppurative* varieties—require cold applications to the epigastrium, and opium in the most available form; in the beginning, morphine subcutaneously. The corrosive form demands neutralization of the poison first: salt water for silver nitrate, diluted acids (vinegar) for

lye, alkali (chalk, magnesia, baking-soda, soap) for acids, sodium sulphate or oil for carbolic acid, egg, water, and milk for corrosive sublimate, copper sulphate largely diluted for phosphorus, lime-water for oxalic acid, freshly precipitated ferric hydrate for arsenic, etc. All of these require total abstinence, which may be continued for more or less time. How long it ought to be endured depends on the condition of the patient and the good judgment of the medical adviser. Adults will bear it many days and infants and children from twelve to thirty hours. If such absolute rest be demanded longer than this period, nutritive injections into the rectum should take the place of feeding by the stomach. The rectum and the rest of the large intestine digest no albumin and emulsionize no fat, but they transform starch into dextrin and cane-sugar into grape-sugar; moreover, they absorb peptones of every kind, egg, emulsionized fat, and starch (p. 47). In all cases of rapid elimination of water by vomiting, or of utter exhaustion in gastro-intestinal catarrh with imminent thromboses in the small cerebral veins ("hydrencephaloid"), the hourly or two-hourly injection of salt water (the usual strength) into the rectum in doses of an ounce or much more will fill the blood-vessels and restore circulation.

4. *Chronic Gastric Catarrh.*

It is sometimes dependent on or interrupted by acute catarrh; the attacks of the latter must therefore be promptly relieved. The several causes of chronic gastric catarrh have their own indications. Both in adults and children venous congestion resulting from pulmonary or cardiac diseases will give rise to it; thus in many cases digitalis in small doses, continued a long time, will be the remedy or one of the measures of relief. Sedentary life must be avoided, school hours and private lessons kept within reasonable limits, and regulated by the meals rather than that these should be controlled by the former. Masturbation must be watched: I have seen it to be the cause of gastric disturbances exactly as in adolescence. Diet and food want attention. Most children eat too much, and many too irregularly. Solid food is to be given but scantily; no sweets, no fat, which will cause hyperacidity, that must be prevented or treated with alkalies like a genuine hyperchlorhydria (excessive formation of hydrochloric acid). Eating must be slow and mastication careful. Toasted bread or stale wheat bread, milk diluted with cereals or according to the muriatic acid plan (Rudisch), or peptonized (but not to bitterness),—everything of moderate temperature or hot,—will answer; in many cases small quantities of cold, fresh butter-

milk. Slowness of digestion, with heavy sensation about the epigastrium, demands additional sodium chloride, sodium bicarbonate, effervescent alkaline drinks; fermentation indicates resorcin, or creosote in doses of from one-quarter to one-half of a drop. A few grains of salicylic acid diluted in large quantities of water (1 to 500 or 1000) may also be tried. Rhubarb and magnesia, rhubarb and sodium bicarbonate, tinctura rhei aquosa, render excellent service. When there is a great deal of mucus, dilute hydrochloric acid with small doses of pepsin are indicated. When the tongue is thickly coated, with eructations, ammonium chloride (from half a gramme to one gramme daily) with tinctura rhei aquosa; the tendency to vomit and to pain demands bismuth, in older children Carlsbad, Congress, or stronger (bitter) waters. These measures may be continued for a long period; bismuth may be given indefinitely in small doses; zinc sulphate can be administered (doses from one-twenty-fifth to one-sixteenth of a grain = two to four milligrammes every few hours) a long time, silver nitrate (doses of one-thirtieth or one-fifteenth of a grain = two or four milligrammes several times daily) for not more than a week in succession.

Occasionally irrigation of the stomach is resorted to with advantage, and may be repeated.

5. *Dilatation of the Stomach. Stenosis of the Pylorus.*

It is not very frequent in early infancy, but results from extension by gas (overfeeding with amylacea) under the influence of feeble muscular development (congenital, rhachitis, anæmia, parasyphilis). The treatment may include an occasional irrigation of the stomach, and must consist of appropriate diet. The same indications hold good in the older child, besides those which are furnished by the very extensive etiology. Dilatation of the stomach in the child is by no means rare. When met with in the adult, it dates often from (infancy or) childhood. Its causes are overfeeding in general and with amylaceous material in particular; rhachitis with consecutive muscular debility; voracity, imperfect digestion, and gas inflation; catarrhal inflammation with diminished absorption; general muscular incompetency, as in anæmia and convalescence; congenital imperfection or partial absence of muscular tissue in the wall of the stomach; paralysis of the stomach, of central origin; hypertrophy and total or partial obstruction of the pylorus; cicatrized ulceration of the stomach near the pylorus, or of the duodenum; or peritoneal adhesions of the stomach resulting in a triangular or quadrangular shape of the dilated organ.

Dilatation of the stomach in the newly-born or the very young infant is the result of *stenosis of the pylorus,* the normal diameter of which is at birth six and one-third millimetres, at the end of the first month seven millimetres, and one-third of a millimetre more with every month thereafter. The narrowing of the pylorus is either organic or functional. There is a congenital hypertrophy of the circular (in a case of Finkelstein the longitudinal) muscular layers of the pylorus (Hirschsprung, 1887); the dilatation of the stomach may be followed by that of the œsophagus. Death follows within a few weeks or months, and autopsies reveal the exact condition. Such cases require surgical interference. Such a congenital hypertrophy may exist with all the symptoms of dilatation (even visible outlines of the descended lower curvature, and contractions of the stomach, vomiting, constipation mostly, etc.) without any spasm; but, on the contrary, it may safely be assumed that when there is originally a spasm, hypertrophy may be caused by it.

Such a congenital or infant spasm of the pylorus certainly exists. John Thomson, Pfaundler, and others believe in a spastic condition of the pylorus as the cause of its stenosis, that spasm being comparable with the tenesmus in anal fissure or ulceration, in vaginismus, or in blepharospasm. That is why careful and scanty nutrition (rectal alimentation) and sedatives (belladonna, opiates) and warm fomentations are expected to do good. When there is an excess of acid in the contents of the stomach, an occasional irrigation with sterile water or a slightly alkaline solution, and the administration of lime-water, calcium carbonate, or sodium bicarbonate is indicated. Nicoll and Meinhard Schmidt report a case in which the stomach was opened and the pylorus dilated, with good results. In some cases of genuine primary hypertrophy gastro-enterostomy has been performed successfully.

In dilatation of the stomach of more advanced age antifermentatives should be given, such as bismuth, silver nitrate, calomel, or resorcin; all of these in small but long-continued doses. The quantity of food taken at one time should be small; the meals should be numerous. Nothing should be given that is apt to ferment, like fat and great quantities of starch; a certain amount is digested; when too slowly, taka-diastase may be tried. Large amounts of fluid should not be given. Milk in small quantities may be given often. Diarrhœa may require gallic acid and other astringents; it depends upon the condition of the stomach; indeed, most cases of consecutive diarrhœa will be best treated by attending to the stomach. Raw beef is among those articles of food which are most easily digested, and beef peptones in small quantities are very useful. Raw milk is not

so easily digested as boiled. Peptonized milk and Rudisch's preparation should be tried. A bandage should be worn about the abdomen. The faradic and galvanic currents can be used with advantage. According to Ewald, electricity and massage accelerate the passage of chyme into the intestine. It seems to me, however, that it is questionable whether digestion was improved by them, for it may be that both of these applications resulted in opening of the pylorus before the gastric digestion was finished. Einhorn's method of using the electric current in the interior of the stomach is hardly applicable to infants and children. Preparations of nux vomica—the tincture—or strychnine in three daily doses of from one-one-hundred-and-twentieth to one-sixtieth of a grain each (one-half to one milligramme) will improve the muscular tone of the stomach. When the dilatation of the stomach depends on adhesions, operative procedures may be considered.

6. *Nervous Dyspepsia.*

Its therapeutics must be simple; its effect is not very encouraging Food should be digestible and sufficiently copious. Purgatives should never be given; enemata must take their place, if required. Bitter tonics, country and sea air, cold bathing or sponge-baths, electricity, one large electrode being applied to the stomach and another to the spinal column, are indicated. In these cases, which are not quite rare among older children, particularly those with early and obstinate chorea and other symptoms of anæmia and "neurasthenia," mild preparations of iron and of arsenic are among the very best remedies, and should be continued a long time. Training, arsenic, and hydrotherapy will relieve many an obstinate case by improving general health and will-power.

Rumination (*merycism*) I have exclusively seen in neurotic individuals, mostly adolescents, all of whom were devoted masturbators. The only case I have seen in a boy of eight years was also that of a diligent onanist. The food, mostly amylaceous, returns after every meal in instalments, until part of a meal or a whole meal comes up again; finally it stops, the last returns being acidulated. There is rather a pleasant sensation connected with it. Hyperacidity or anacidity has nothing to do with it. It has been observed in families, and small children of two years and over were affected. That would point to a neurotic tendency, or to a (atavistic?) peculiar condition of the stomach, which has been found to be divided into well-marked compartments. My own therapeutical measures were directed against the detrimental habit and to invigoration.

7. *Gastric and Duodenal Ulceration.*

With or without *hemorrhage,* gastric ulcer is not very uncommon in the newly-born, the infant, and particularly in children of from seven to thirteen years. Fatal hemorrhages, besides "melæna neonatorum," have been observed, by me and others, even in infants. Nor is duodenal ulcer very rare. Of Collin's two hundred and seventy-nine cases, forty-two belong to the first decade of life, seventeen of them to the first year. It is met within a few days after birth, and probably depends not so much on intra-uterine defect as on thrombosis of the umbilical vein and embolism of the vessels of the small intestine (Landau). Kinnicutt (Festschrift) emphasizes the causal effect of burns and of septicæmia, and the common occurrence of complication with nephritis, the frequency of which in infancy and childhood, from all sorts of causes and with many complications, should always be remembered. Hemorrhage requires absolute rest in bed, ice-bag to the epigastrium, morphine under the skin in appropriate doses, ice-pills, ligature of the lower extremities to compress veins for half an hour only; if tolerated, lead acetate may be given. No matter whether the cause be an embolic process, or a chronic catarrh of long standing, or a local injury (caustic or foreign bodies, stones, a safety-pin in a baby of eight months), the circulation in the parts is interrupted and the normal alkalinity of the tissues destroyed. Thus these are constantly exposed to the injurious effects of the gastric acids, similarly to what occurs in the dead body when the action of the acids on the non-secreting gastric surface results in softening and perforation of the wall ("gastromalacia").

The first indication is to *keep the stomach and duodenum as alkaline as possible,* at all events between meals. Now, the introduction of any food will give rise to the secretion of gastric juice, which is first lactic, afterwards hydrochloric acid; a certain amount of both is required for normal digestion. Whatever there is, however, in the stomach of acid or acids which are not required for the physiological process, particularly acetic, butyric, caprylic, or only an excess of lactic acid, must be neutralized. An occasional dose of an antacid is not sufficient for that purpose, but it must be given regularly and for a long time. I generally give the doses at intervals of two hours. I also give a dose a few minutes before each meal to neutralize every abnormal acid, no matter whether the patient is an adult or a child.

Which antacid is to be selected,—the potassium, sodium, calcium, or magnesium salts? Of the latter, I prefer calcined magnesia to the

carbonate, to obviate the expulsion of free carbonic acid into the stomach. I use it frequently, but rarely (for a child) in larger doses than from eight to ten or twelve grains (0.75) daily. A small part of this, say one grain (0.06), is taken every hour or two, before meals, mostly in water, which should not be too cold; hot water is even better. More than that quantity is seldom tolerated because of diarrhœa caused by it; still, its purgative effect is very welcome in patients suffering from constipation; these may take larger doses. When the above quantity does not suffice to neutralize the acids, or it is feared that more magnesium may cause diarrhœa, it may be combined with the carbonate or the phosphate of lime. Sodium bicarbonate does not take the place of the calcium and magnesium so readily, inasmuch as it also appears to promote the secretion of gastric juice. Therefore, in most cases, I use magnesium or calcium with or without bismuth subcarbonate, or such adjuvants, if any, as may appear to be indicated for other reasons. The addition of small doses of an opiate is indicated (only) when the intense motory action of the stomach is to be quieted.

This medicinal treatment must be continued for weeks or months; without it I do not see gastric or duodenal ulcers getting well.

The Carlsbad waters, and salines in general, owe their effect partly to their neutralizing and partly to their purgative influence.

The effect of lime-water is illusory, if given for the purpose of neutralizing the acid, unless in sufficient quantities; it contains only a single grain to nearly two fluidounces (50.0) of water. But when added to cow's milk in sufficient quantities (1 to 2 or 3) it certainly makes it more digestible.

The very function of the diseased organ involves danger. Both the stomach and the duodenum should be kept as idle as possible, and their labor should be made easy. Indigestible food must not be given and solid food must not be allowed. Most older children tolerate boiled milk, strained oatmeal, barley gruel, stale wheat bread. and a few also raw beef. Some take nothing but boiled milk, or buttermilk, or koumiss. Many, particularly adolescents or adults, will tell you that they do not digest milk. That may be true; but then they gulped it down, and it formed in the stomach a large cheese-cake that was not afterwards dissolved and digested. They should boil their milk in the morning and *heat it* several times during the day almost to the boiling point, or should pasteurize it for the day. They should add a small quantity of table salt, provided their stomach is not too acid, for the sodium chloride may increase the gastric hydrochloric acid; also, in case the stomach is very acid, some sodium,

or calcium, or magnesium bicarbonate, and no salt. They should not drink their milk, but pour it into a plate and sip it with a spoon. Thus prepared, they will digest it, particularly when it is not quite cold. In fact, many require their meals warm or hot.

For the purpose of easier digestion, milk may be peptonized, or it may be rendered more digestible by the process recommended by J. Rudisch, or mixed with farinaceous decoctions as recommended above.

With an alkaline condition of the surface and an innocuous diet, the ulcers have an opportunity to heal. This may be aided by the administration of silver nitrate. A child may take from one-thirtieth to one-twentieth of a grain (two to three milligrammes) in a tablespoonful of distilled water four or five times a day; if possible, on a fairly empty stomach. Or a smaller quantity may be given in a pill with or without a small dose of opium, say one-sixtieth to one-fifteenth of a grain (one to four milligrammes) in each pill. Sometimes I give but a single dose at bedtime in addition to the alkaline treatment. Silver nitrate must not be given beyond a reasonable time, to avoid argyria.

Tincture of iodine, in doses of from one to three drops for the adult, of one-half to one drop to a child, well diluted with water, has often been recommended. Its action is probably antifermentative here as in chronic gastric catarrh.

When there are much pain and a great deal of acid or other secretion, opiates are indicated. Chloral is tolerated badly. Papain, which acts quite well in chronic gastric catarrh, is not indicated in ulcer, hyperacidity, or in the presence of a neoplasm.

Operations recommended for gastric ulceration are, first, excision of the ulcer; second, gastro-enterostomy; third, pyloroplasty; fourth, resection of the pylorus; also cauterization of the ulcer and ligation of the bleeding vessels near the ulceration. These methods are difficult, take time, and the operation must be performed on an exsanguinated patient. Witzel, therefore, ligated the efferent blood-vessels without opening the stomach (the right and left superior coronary arteries), with good result (*Deutsche Zeitsch. f. Chir.*, vol. lxii.).

Bad cases require rest in bed, particularly those of anæmic girls (and women).

The stomach has a better opportunity to get well when at rest than when at work. Thus it sometimes becomes necessary to abstain altogether from feeding by the mouth. Rectal alimentation is then resorted to to great advantage. In conditions of such genuine starva-

tion the lymphatics are very greedy and absorption from the rectum is very active.

Ulcer of the stomach, both in the young and old, being frequently associated with intense anæmia, the result, in these as in many other cases, is mistaken for the cause. Then iron, the great presumed panacea for anæmia, is often introduced into a stomach which cannot digest it, and, in its attempts to do so, pain and ulceration, with their dangers, are increased. One of the dangers is a cicatricial obstruction of the pylorus with dilatation of the stomach.

Carcinoma and *sarcoma* of the stomach are quite rare in infancy and childhood. There are but few cases on record. But as they are rarely suspected except in advanced age, and have occasionally been overlooked in the adult, it is advisable to watch for them.

F. Intestinal Disorders.

1. *Constipation.*

The catarrhal and inflammatory diseases of the mucous membrane of the intestinal tract have so many common anatomical and pathological features that, for practical reasons and to avoid repetition, I prefer to discuss them under the heads of their principal symptoms. Indeed, acute, subacute, and chronic catarrh (enteritis), cholera nostras, follicular enteritis, even membranous enteritis, are, to a great extent, varieties of the same process, differing only in individual acuteness, or extension, or in its localization in the epithelium, muciparous follicles, or lymph-bodies, or in innervation, or in the amount of microbic infection, which, as the intestine is relatively longer than in the adult, renders absorption of toxins much easier. That is why indican and acetone are readily found in the urine.

The main symptoms observed in diseases of the intestinal tract are constipation (less frequent) and diarrhœa.

The therapeutics of *constipation* depends on its etiology and its degree. In no case should the diagnosis be made without a thorough examination, which must in many be manual. The abdomen may be painless, but it is mostly inflated. Fæces come away in large lumps or in small and broken pieces. The liver and spleen may be displaced, the former turned in such a way as to protrude its edge and posterior surface. The abdominal veins may be enlarged, the appetite diminished; vomiting is sometimes met with, occasionally also intervening attacks of diarrhœa which are the result of the irritation produced by the hardened fecal masses contained in the colon.

An *actual* constipation should not be mistaken for an *apparent* one, which is observed in infants that have a small movement every two or three days only. The baby is emaciated, atrophic, not always fretful. In it the scantiness of defecation is the result of lack of food, and the alleged costiveness is speedily remedied by the furnishing of a sufficient quantity of appropriate nourishment.

Among the foremost causes of constipation is *mechanical obstruction,* brought on by cystic and other tumors, imperforation, hernia (pervious or incarcerated), dilatation of the colon, congenital muscular incompetency (general or local), intussusception and twisting of the intestine, or by a peculiar condition of the sigmoid flexure described by me in the *Journal of Obstetrics* of 1869. Cases of constipation depending on the undue length of the descending colon and on the multiplicity of flexures which compress one another and thus obstruct the passage are quite numerous in every physician's practice. These cases of constipation are apt to last up to the sixth or seventh year and require constant attention, but medicinal treatment should be avoided, unless it be demanded by intestinal autoinfection. The fæces may, in very bad cases, be so hardened and immovable as to necessitate their extraction from the rectum by means of the finger or a spoon. Now and then, in this, also in other varieties of constipation, the hard masses are felt in the abdomen, and have been mistaken for tumors. On no account should purgatives be given as a regular thing, but an enema should be administered daily for many years in succession. At the above-mentioned ages the relation of the several parts of the intestinal tract to one another becomes more normal, and the necessity for mechanical interference ceases accordingly.

An improper condition of food is a frequent cause of constipation. Excess of casein is relieved by diminishing its quantity, by replacing the milk of a cow by that of a wet-nurse, the white and heavy one of a wet-nurse by the thinner and more bluish one of another woman, or by reducing the amount of casein in artificial food to one per cent. or less. Besides, the milk thus reduced should be mixed with a glutinous (farinaceous) substance; oatmeal, to remedy constipation, is preferable to barley or any of the rest. Large amounts of starch must be avoided. Milk and artificial food will often lose their constipating effect by the addition of cane-sugar. Babies at the breast are frequently cured of constipation by the administration of one or two teaspoonfuls or a tablespoonful of water, or oatmeal-water, thoroughly sweetened, before each nursing.

Many preparations kindly supplied by the ever-watchful and humanitarian trade contain large quantities of phosphates. They

are apt to pass mostly into the intestine undissolved and unabsorbed. So will large doses of bismuth. Thus constipation may follow their use. The treatment of such a case is plainly indicated; likewise of those which are the direct result of the administration of astringents and opiates. The omission of such medication is the first condition of a cure.

The rise of temperature which occasionally accompanies uncomplicated constipation, usually without a rise of the pulse (sometimes it is retarded), is seldom high. It is often relieved by the hardened fæces changing their place, always after evacuation of the bowels. If there be chills (rare), they mean sepsis and require active purgation.

Constipation is often dependent on the partial absence or the viscid condition of *intestinal mucus*. This is so in fevers, now and then in chronic enteritis (chronic intestinal catarrh), mainly of the lower bowels; also when there is too large a secretion from the skin and (or) kidneys, and when too little water is introduced into the circulation. I have repeatedly emphasized the fact that most infants are given less water than they require. In *membranous enteritis* the large amounts of mucus discharged through many weeks or months, and sometimes years, are less frequently found in children than in hysterical (men or) women. That mucus is no longer viscid, but appears in the shape of membranes, sometimes in casts, and consists of nothing but mucus, with little pus, many leucocytes, and more or less traces of fibrin. In this condition also there is constipation, sometimes interrupted by diarrhœa; the discharges, hard or loose, may be quite frequent, however. Moderate cases, with mucus as the main part of the discharges, are called *mucous enteritis*. Large injections of warm water with one or two per cent. of sodium bicarbonate should be made daily, at least once daily. Now and then a mild purgative (castor oil) is advisable. But the condition which is mostly found in neurotic children, or such as belong to a neurotic family, will not be relieved except through persistent attempts at improving the general condition by hydrotherapy and other general tonics. In a few cases occurring in more advanced years, to give the irritated, nervous colon a protracted rest, a right inguinal colostomy has been performed, with alleged recoveries. After a while the artificial anus was closed.

Incomplete peristalsis resulting in costiveness may depend on a morbid condition of either the muscle, both of the intestine and the abdominal wall, or its innervation, like its reverse,—viz., *excessive peristalsis* or *antiperistalsis*,—which are both of nervous origin (Gus-

tavus Langmann, Festschrift *). Early rhachitis shows its effect in producing muscular incompetency; babies with regular evacuations after birth will become costive in their second and third months, and remain so although they are alleged to "look the picture of health." Not rarely rhachitis will make headway in muscles, epiphyses, and diaphyses, even in cranial bones; at that time and afterwards, while the weight of the patient does not decrease, his skin feels soft and flabby, and the limbs and trunk are rotund though bleached. Indeed, there are many in whom constipation is the very first symptom of rhachitis. In all of them it is self-evident that constipation cannot be relieved permanently except by a thoroughly successful antirhachitical treatment. Sedentary habits of school-children have the same effect in producing constipation. It is relieved by change of habit, plenty of physical exercise, and additional fruit diet, but purgative medicines, given persistently, render these cases worse. The binding effects of chronic peritonitis, either general or local, must, as a rule, not be combated with purgatives; a snug bandage round the abdomen gives support and tone to the bowels, and an enema, given every day for months in succession, prevents accumulation and its consequences (dilatation, disorder of circulation, septic absorption). No massage. Universal emaciation and atrophy resulting in constipation have their own indications, and chronic cerebral disease (hydrocephalus) may require such local and medical treatment as has been detailed above.

In all forms of constipation in infants or children few medicaments ought to be used. Honey, or sweet butter, or a teaspoonful of olive oil, given between meals, relieves many a case. An habitual drink of cold water after rising may have the same effect. As there is so often an excess of acid in the gastric and even intestinal contents, calcined magnesia has its twofold indication. It may be given in many small doses or a single large one which need not exceed five or ten grains (0.3 or 0.6) a day. Doses of a grain or two grains may be continued for many days and repeated from three to six times daily. Rhubarb acts well when combined with it for the purpose of overcoming protracted costiveness. Rectal injections may be given from the fountain syringe, the nozzle of which should be introduced beyond the two sphincters. In some cases it is desirable to introduce the instrument to a greater distance; an elastic catheter attached to

* William B. Cannon (Amer. Jour. Physiol., vol. v., No. 5) proves that emotions may stop the movements of the small and large intestines; but that the colon (not the small intestines) has normally a period of peristalsis and antiperistalsis, each lasting five minutes, with a rest of five minutes, so that the whole process takes fifteen minutes.

the nozzle may be used for that purpose, but the condition of the sigmoid flexure, detailed above, renders the introduction of the instrument beyond the very beginning of the sigmoid flexure a perfect illusion in many cases. It happens quite often that an elastic or flexible tube, when introduced to or beyond the third sphincter, bends upon itself and reappears at the anus. To facilitate the entrance of the liquid into and beyond the sigmoid flexure the injection should be made gently and slowly while the pelvis of the infant is raised. The nozzle must be smooth and not thin.

To facilitate the downward movement of fecal masses and to stimulate peristalsis, friction and kneading (massage) may be resorted to. Kneading must be performed with the palm of the hand, gently and persistently; or gentle thumping with the closed hand and friction are best commenced on the right side and continued over the epigastrium and down the left side, in the course of the colon. Great caution and judgment must be used because of the frequency of local chronic peritonitis, which, when disturbed, causes subacute or acute exacerbations.

Electricity has been used successfully when constipation was the result of insufficient peristalsis. E. Schillbach found that the several portions of the intestinal tract respond differently to the application of the faradic and galvanic currents.* The latter appears to have a stronger effect than the former. Local contractions result from the negative pole (cathode), peristaltic waves from the positive (anode). Thus, for the relief of chronic constipation depending upon incompetency of muscular action, the former ought to be applied to the interior of the rectum, the latter over the abdomen, along the colon.

In the cases of persistent constipation depending upon an insufficient muscular action of the intestine medication may now and then be required. I have treated a number of cases of the kind with nux and (or) physostigma, adding some purgative extract. A little boy with a decidedly rhachitical history (three years old) took three times a day a sixteenth of a grain (four milligrammes) of each—extract of nux vomica, extract of physostigma, and compound extract of colocynth—for many weeks in succession. But cases of the kind are, and should be, exceptional. As an occasional purgative, for the purpose of relieving the intestinal tract of indigestible and injurious masses, castor oil is probably the best and mildest; a few grains of calomel, or less, will act both as a purgative and an antifermentative. Compound powder of licorice will take the place of oil, when the

* See Meltzer, p. 270.

latter is not tolerated or is objected to; also the fluid extract of rhamnus frangula or of rhamnus purshiana.

Among the drastics, all of which are irritants, rhubarb and aloes are probably the mildest, and are tolerated a long time in succession. Of the salines, sodium chloride is the simplest. Its main action is osmotic; besides, it occasions thirst and thereby induces the ingestion of a large amount of water. The continued use, however, of salines irritates the mucous membranes. The combination of sodium sulphate with magnesium sulphate and sodium chloride has a mild and happy effect.

A frequent accompaniment of constipation is *colic*. Its causes are, besides constipation, fermenting food, gastro-intestinal catarrh, the presence of ascarides in large numbers, reflex spasm produced by cold feet and chilled skin, diminished tonicity of the muscular layers of parts of the intestine (in general anæmia and rhachitis during early infancy), mesenteric neuralgia (lead), and, finally, chronic peritonitis, which results in adhesions or such local changes in the walls of the intestine as will produce local contractions or dilatations. There may be many cases in which a diagnosis is difficult, but there is no such thing as "pseudo-peritonitis." Thus, as the etiology of colic varies so much, the treatment must vary in order to be rational and effective and adapt itself to the cause. Its symptomatic treatment will often require either an enema or a purgative medicine, antispasmodics or narcotics (assafœtida, opium); they are apt to give speedy relief. Gentle friction of the abdomen, the application of dry heat (flannel, hot plate, hot sand-bag), the administration of hot aromatic teas freshly prepared (fennel, anise, catnip, German chamomile), a few drops of essence of peppermint in a teaspoonful of hot water, or the injection into the rectum of large quantities of aromatic teas, at a temperature of 100° F. or more, will do good; great care should be taken lest atmospheric air enter the bowel.

2. *Diarrhœa.*

Diarrhœa is always dependent on, or connected with, surface changes of the intestinal mucous membranes, from simple catarrh to ulceration. Catarrh may be localized, but is generally very extensive. It may descend from the stomach, ascend from the rectum and colon, or originate in any part of the small intestines.

The treatment of diarrhœal diseases depends in part on the locality, in part on the etiology of the individual affection. No "specific" treatment will ever do good, not even the modernized stomach-pump sticking conceitedly out of the coat-pocket of the delighted medical man,

who appears eager to emulate the midwife of our mothers with the rectal syringe under her arm as her emblem.

The causes of diarrhœa are various. A predisposition is produced by the incompetent or defective condition of the mucous membrane in anæmia of long duration, rhachitis, scrofula, etc. Food in improper quantity or quality, mostly unsuitable artificial food, is among the principal causes; but even mother's milk may give rise to it, as is proven by the fact that there are babies who, while falling sick at the breast of one woman, recover at that of another. Mothers who are sick or convalescing, or subject to very strong emotions, those who nurse too often, who suffer from tuberculosis or syphilis, who are pregnant, some when they are menstruating, and all anæmic persons secrete an improper milk. The colostrum furnished immediately after childbirth is apt to give rise to diarrhœa. Milk containing too much fat is the principal source of what has been described as "fat diarrhœa," by German authors mostly; that containing salts in superabundance, mainly in anæmia of the mother, is liable to produce the same effect.

The amount of food introduced may be too large either absolutely or relatively; the latter when the secretion of gastric fluids is insufficient, thus facilitating gastric fermentation in place of digestion; or when the flow and activity of pancreatic juice, limited at a very early age, is still more interfered with by a diseased condition of any kind and fever of any description.

The infant intestine is not controlled by emotional influences to the same extent as that of the adult; but local irritation is a frequent cause of diarrhœa, and the organ is very sensitive to the diminution or increase of atmospheric moisture and heat. It is quite probable that the overheating of the general surface affects the blood, the duodenum, and the general nervous system similarly (though not to the same extent and with the same suddenness) to what is observed after serious burns.

The mucous membrane with its lymph-vessels and follicles is easily irritated by such results and companions of fermentation as phenol, indol, skatol, and bacteria; by the alkaline salts formed through the frequent (normal and abnormal) prevalence of acids in the upper part of the intestinal tract; by the direct influence of purgatives, occasionally by even the very smallest doses of arsenic and mercurials, though, indeed, the latter are tolerated very much better by the very young than by the adult; and by sudden exposure to a cold temperature. It is also liable to suffer long from the results of typhoid fever, dysentery, and occasionally from severe attacks of malaria. Protozoa are stated by Quincke to be causes of chronic

diarrhœa (*Berl. kl. Woch.*, 1899, No. 47); amœba coli is often found on ulcerations.

Disturbances of the circulation depending upon diseases of the liver, lungs, or heart predispose to passive hyperæmia of the intestine and to diarrhœa. Indeed, when it does occur in these diseases, it is an ominous symptom. In no case of intestinal disease ought the diagnosis to be considered complete or a prognosis ventured upon unless the liver, and particularly the heart, lungs, and kidneys, have been examined with great care. Uræmia sometimes causes diarrhœa without any apparent anatomical changes in the pale mucous membrane, at other times with catarrhal, ulcerous, or croupous changes depending—in part, at least—on the action of ammonium carbonate.

The variety of causes suggest a number of different treatments. Disorders of circulation should be regulated while the local disease is attended to; ulcerations of the intestines are to be treated by some such method as has been suggested in previous remarks on dysentery; the skin, if there be fever, should be kept cool by bathing or sponging; the air-supply should be cool and plentiful.

Most cases of intestinal catarrh (with or without gastric catarrh) and diarrhœa depend on the administration of improper food and the derangement produced by it. That should be changed immediately. When the process of fermentation is still limited to, or going on in, the stomach, or the stomach still contains injurious masses, these ought to be brought up. In such a case the sound judgment of the practitioner must decide whether emesis is still useful or whether the stomach ought to be irrigated and washed out. Most cases of "gastro-enteritis" are pre-eminently enteritis; therefore the assertion that the washing out of the stomach must not only take place in every case, but is the almost infallible remedy in the very worst class of cases, will have no other result than that of discrediting that useful procedure in those who are inclined to believe implicitly in the value of "new" methods and the pretentious claims of short-sighted enthusiasts. If we were to believe some of the loud talk of the journals, and the reporters' columns in the secular press, gastro-intestinal catarrh would soon be "one of the lost arts."

In fact, the injurious element is in most cases beyond the reach of the stomach-pump; indeed, the latter cannot remove anything but what is dissolved or suspended; the expulsion of large masses, curd particularly, through an elastic catheter is not always possible.

The *rôle* played by bacteria in the stomach and intestines is surely great; the class of the schizomycetes is numerously represented alike in the healthy and the diseased intestine. Even within from four

to eighteen hours after birth there are large numbers of bacteria, cocci, bacilli subtiles, and bacteria coli communia (Escherich) in the remnants of digested milk; the latter microbe in the large intestines. How many are introduced into the stomach immediately after birth by the air swallowed by the newly-born cannot be determined. Besides those enumerated above, there is the bacterium lactis aërogenes, which is credited with the decomposition of milk-sugar into lactic acid, carbonic acid, and hydrogen, thus giving rise to most of the gases constantly present within the intestinal tract.

The presence of immense quantities of micro-organisms, however, proves nothing in regard to the etiology of diseases, for they are found in the healthy state as well, as also in those morbid conditions in which the cause of death cannot be attributed to the presence of parasites or to the usual pathological changes. Thus, in arsenical poisoning the intestines are swarming with saprophytes. To what extent bacteria, and which of them, are the actual causes of diarrhœal diseases, and of which and of how many of them, is still debatable, in spite of Baginsky's and Booker's labors. During lactation, in the young child, the upper part of the small intestine holds bacterium lactis aërogenes, the ileum and colon bacterium coli commune. During the summer diarrhœas both varieties increase in numbers and swarm over the whole intestine; therefore in neither of them is there anything specific or etiologically important. In protracted cases of catarrhal enteritis leading to ulceration, according to W. Booker, streptococci are found in large numbers; in more than half the cases proteus vulgaris is found, mainly in the stomach and the colon; the putrid odor appears to depend on its presence. Both these microbes (mainly, however, the bacterium coli and the pneumococcus) may immigrate to the abdominal viscera, the lungs, the blood (not frequently), and the kidneys; thus, if they be causes of the original disease, establishing a local, distant (pneumonia, nephritis, pyelitis), or a general, constitutional malady (sepsis or furunculosis) as consequences. Or they are carried mechanically, causing pharyngitis, otitis, bronchitis, and broncho-pneumonia. To judge from the undoubted occurrence of diarrhœal diseases by contagion ascending through the anus (soiled diapers, fingers of nurses, contact in institutions), bacteria and their toxins must be credited with being more than companions,—that is, direct causes and sources of the local and general affections.

The different forms of diarrhœal diseases are classed under dysentery by C. W. Duval and V. H. Bassett. They say, "We believe our findings justify us in the conclusion that the summer diarrhœas of

infants are caused by intestinal infection with bacillus dysenteriæ, Shiga, and therefore are etiologically identical with the acute bacillary dysentery of adults. The cases studied, from which the dysentery bacillus was isolated, include examples of so-called dyspeptic diarrhœa, of enterocolitis, and of malnutrition and marasmus with superimposed infection" (*Amer. Medicine,* September 13, 1902).

The intestine may be emptied either by purgatives or enemata; the former act upon the whole length of the intestine, the latter upon its lower portion. Castor oil, so common in domestic practice, deserves all the credit given to it. It acts mildly and speedily. The addition of opium is not wise; the latter may be administered after the former has exhibited its effect; the action of the oil must not be inhibited by the sedative. In many cases a single dose of calomel (from one-half grain to six) answers better, being both a purgative and an antifermentative.

The surplus acids of the stomach—mostly lactic, acetic, and butyric—must be neutralized by sufficiently protracted treatment. Magnesium and sodium salts must not be selected for that purpose, for they add to the diarrhœa. Calcium salts, the carbonate or phosphate, are preferable because they have no such effect, but the additional advantage of forming with the fat acid an insoluble salt which acts as a protection to the sore surface. Doses of about one or two grains (0.05 or 0.1) may be given every hour or two. Besides being an antifermentative in general, bismuth (the subcarbonate) binds hydrogen sulphide, and thus has a favorable effect in frequent doses of from a quarter of a grain to two grains or more. They may be administered with or without the addition of opium. If they be given in liquid form, no syrups should be added to correct the taste, but rather glycerin, which has the advantage of not turning sour. The subgallate is credited with a still more constipating action and the salicylate with additional antiseptic effect. It is not so well tolerated as the subcarbonate.

To combat the existing fermentation, antifermentatives may be given at regular intervals. Calomel, bismuth, alcohol, creosote, sodium salicylate, salol, naphtalin, resorcin, mercuric bichloride, and others have been eulogized. To take effect in the intestine, it appears that those which are not readily soluble in the stomach ought to prove more useful. Still, I feel positive that resorcin in doses of from a quarter to one-half of a grain (0.015 to 0.03) in solution, or as a constituent of a powder containing bismuth, chalk, or (and) opium, given every two hours, has rendered me the most valuable services in a great many cases. Of the two mercurials I prefer calomel by far,

in doses of from a twentieth to a quarter of a grain (three to fifteen milligrammes) every few hours. The antifermentative effect of alcohol in the dilution in which we are entitled to give it as a stimulant, though the sum total of a daily dose may be large now and then, is not great; sodium salicylate is less effective than any of the rest, creosote acts more vigorously in the stomach than in the bowels, salol is readily taken; naphtalin is objectionable to many because of its taste and odor.

Opium, by its inhibitory effect on reflexes, diminishes hyperæsthesia, hyperperistalsis, and hypersecretion. The objections to its use in certain conditions in the diarrhœal diseases are theoretical only. Doses of from one-tenth to one-third of a grain (six to twenty milligrammes) of Dover's powder every two hours, in all sorts of combinations, act very well indeed, and may be considered indispensable when the above indications are to be fulfilled; but its time has mostly arrived only when the odor of the evacuation begins to be normal. That is why Vaughan and McClymonds (Festschrift) advise against the use of opium in cases of bacterium coli poisoning; they have observed that the condition got worse rather than better after its use. For that reason opium should be deferred until the alimentary canal has expelled its highly irritant poison. It is contained within the bacterial cell. That is why the bowels in their normal condition may carry untold undelivered bacteria coli without harm; that is also why the path of the practitioner is beset with so many difficulties in forming his etiological diagnosis and his therapeutical indications. For, indeed, there are cases of "follicular enteritis" of a chronic nature, with malodorous discharges for weeks in succession, in which opium is not contraindicated. Bad odor and toxic infection are not identical.

In acute cases, and when the stomach participates in the process, astringents, such as lead, tannin, gallic acid, alum, etc., are badly borne. In chronic protracted cases they will find their indication. Silver nitrate does better in many cases, from one-fiftieth to one-thirtieth of a grain (one to two milligrammes) in two drachms of distilled water (dark bottle) every two hours. In chronic cases only, coto, from half a minim to a minim of the fluid extract, will sometimes act favorably. Tannalbin, in daily doses of from four to fifteen grains (0.25 to 1.0) or more, as a powder or in mixtures, is among those modern medicines which are highly recommended (mainly for affections of the lower bowels) by some observers, too highly by manufacturers. Biedert recommends tannigen when the discharges are alkaline, tannalbin when they are acid.

Of the stimulants, alcohol may be admixed with food. Bad brandy or whiskey contains fusel oil, which is a paralyzing agent. Whiskey is therefore preferable in America, because it can be obtained in greater purity for less money. It must not be administered unless diluted. Camphor is better borne than ammonium. It is easily taken when simply rubbed off with glycerin and suspended in mucilage (from one-fourth to two grains every one or two hours). The strongest nerve-stimulant of all is musk. Urgent cases of collapse require one or two grains (0.06 or 0.125) every fifteen or thirty minutes (best suspended in mucilage) until six or twelve grains have been taken. A very good stimulant in collapse is the injection into the bowels, through a good-sized flexible tube (catheter No. 12, English) of hot water with not more than five per cent. of alcohol and one or a few drops of tincture of opium. In threatening cases of heart-failure strong coffee, hot or iced according to circumstances, by itself or in mixtures, may be used to advantage by mouth; hot in the rectum; or a subcutaneous injection of sodio-caffeine benzoate or salicylate, a few grains in the double quantity of water (1 to 2) repeatedly. Cold tea may be tried in small doses, particularly in the chronic cases of older children.

In acute cases of intestinal (or gastro-intestinal) catarrh with high temperature, applications of water of from 60° to 70° F. to the abdomen will render good service. The cloth must be wrung out thoroughly, covered with rubber cloth and flannel, and changed when warm. Anæmic children and those with much pain require warm or hot applications, which may be preceded by a warm bath. Frequent injections of water of 100° F. or more, with or without an antifermentative, such as thymol (1 to 1000 or 2000), answer well in most cases, not alone in rectal catarrh. In great debility or collapse the water ought to be from 105° to 112° F., and contain some alcohol and opium or (and) a teaspoonful of the tincture of musk. The addition of gum-arabic to the injection, or the use of glutinous decoctions (flaxseed) instead of water has a satisfactory influence. Starch injections have the advantage of adding to the nutrition of the body by the facility with which the colon changes amylum into dextrin, which will be absorbed. Part of the injected water will always be absorbed, fill the blood-vessels, and may prevent intracranial and other thromboses. Indeed, in many bad cases in which the cerebral symptoms of the so-called hydrencephaloid condition have made their appearance, or are imminent, frequent injections into the rectum of a few ounces of warm fluid contribute considerably to the restoration of circulation.

In hot weather doors and windows should be kept open and the coolest place selected in the house or neighborhood, day or night; for night air is preferable to no, or foul, air; and sea air or country air, particularly at some altitude, is superior to city air. When in hot weather the body feels hot, it should be washed with cold or cool water, or water and alcohol (5 to 1), frequently. Cold feet must be warmed by flannels, hot stones, hot sand- or water-bags, and gentle friction, and well covered.

The food supply must depend on the condition of the stomach and of the upper part of the intestine, and also on the rapidity of the peristaltic action of the latter. The complication of gastritis with enteritis contraindicates the introduction of food altogether. Abstinence is better in cases of intense vomiting than the use of ice; the latter may quiet the stomach for a while and feel pleasant, but it fills the stomach, which ought to remain at absolute rest, and excites peristalsis. Babies with an irritated stomach tolerate abstinence better than ingesta. The ubiquitous beef-tea ought to be avoided; its concentration of salts is irritating. If in convalescence it be given at all, it should be mixed largely with barley-water or rice-water.

In all cases of "summer" diarrhœa milk must be avoided. Bad cases forbid raw milk, boiled milk, milk in any and every shape, for days and longer. Its rapid fermentation contraindicates the smallest quantities, even in farinaceous mixtures. The absence of gastric juice (pepsin and hydrochloric acid) in the stomach of a feverish child or of one that is being drained of its fluids prevents the digestion of albuminoids. Even mother's milk is often not borne to any extent. When milk is again tried after a while, it ought to be done very carefully: cow's milk thoroughly boiled, or sterilized with six times its volume of barley-water at first, the percentage of milk to be increased slowly. I repeat: cow's milk, ever so often boiled or sterilized, is still cow's milk. Milk may be replaced by the white of egg, which should be thoroughly mixed with barley-water, some salt added, and not more (cane-) sugar than is required to make the mixture palatable. During the course of a day and night the whites of from one to five eggs may be given according to the case and age. Severe vomiting and diarrhœa demand, as suggested, total abstinence for from two to eight hours or more. Afterwards, mucilaginous or farinaceous decoctions may be given in small doses at short intervals. A mixture which has rendered me very valuable services in the worst cases of vomiting and diarrhœa, after the period of absolute abstinence was terminated, is about as follows: five ounces (150.0) of barley-water, the white of one egg, from one to two teaspoonfuls

of brandy or whiskey, some salt and cane-sugar; a teaspoonful every five, ten, or twenty minutes according to circumstances. Mutton-broth may be added to the above mixture, or it may be given by itself, with the white of egg and a little salt.

3. *Tumefaction of the Mesenteric Lymph-Bodies.*

It is of frequent occurrence. Its results are very serious, though the non-absorption of chyle does not depend exclusively on the functional incompetency of the lymph-bodies. Simple inflammatory hyperplasia of the lymph-bodies can be more safely prevented than cured. Its original cause is mostly a diarrhœa of some form or another. The irritation of a mucous membrane leads always to that of the neighboring lymph-bodies; thus a nasal catarrh, a stomatitis, a diphtheritic process, a pulmonary catarrh, produce secondary adenitis, and the mesenteric glands near an intestinal catarrh are soon congested and begin to swell. Cell-proliferation accompanies the changed circulation; when its original cause—viz., the hyperæmia of the mucous membrane—has ceased, absorption of the newly deposited material will always take place in the same way that the swelling of the glands of the neck will disappear when a nasal catarrh is treated with cleansing and disinfecting irrigations or injections. As soon, however, as the newly formed cells have been transformed into firm fibrous tissue, the possibility of absorption becomes less from day to day. Thus, the prevention of mesenteric glandular hyperplasia consists in the immediate removal of a diarrhœa. Be it ever so mild, it is always a morbid process. Be its name ever so innocent (for instance, "dental"), and the prejudice in favor of letting it alone ever so strong, it leads to anatomical changes which may become permanent in the mucous membrane and the glands. When a diarrhœa has been protracted, it may safely be assumed that the lymph-bodies necessarily undergo chronic changes. Then the cautious administration of an iodide, preferably sodium, is indicated, in daily doses of from five to fifteen grains (0.3 to 1.0), according to the age of the patient, the severity of the case, and the probable duration of the process. It should be continued for weeks, and may then be replaced by three daily doses of from five to twelve minims of the syrup of the iodide of iron. When no iodide is tolerated, it may be substituted by iodipin (containing ten per cent. of iodine), of which from one-half to one teaspoonful may be given daily, in emulsion; for inunction, one part of iodipin with three of vasogen, or with two of lanolin and one of vaseline. Morbid processes of any kind in neighboring

organs may cause glandular swelling. Adenoma of the liver in a girl of twelve led to (not adenomatous, but simply hyperplastic) tumefaction of the periportal lymph-bodies and to a very rapid development of ascites (*Trans. Assoc. Am. Phys.*, 1897).

Primary tuberculization of the mesenteric glands is quite rare; so is primary tuberculosis of the intestine, in spite of the fact that meat (very rarely) and milk containing the bacillus are known to be the occasional cause of tuberculosis of the bowels. Both are, as a rule, though by no means always, the results, or complications, of general tuberculosis, and in this way they, and tubercular peritonitis also, are not uncommon. Thus, the treatment of tubercular tumefaction of the mesenteric glands forms part of the measures undertaken for the relief of the symptoms of the general infection, and leaves but little hope. But there are cases in which the tubercular nature of the swelling cannot be doubted, that nevertheless get well. There are now on record a number of cases of peritoneal tuberculosis in which laparotomy was performed, either through a mistaken diagnosis or purposely, and the lymph-nodes were found numerous and greatly enlarged, that recovered. Thus, even such cases afford no reason to pronounce a fatal prognosis.

The conditions alluded to must not be mistaken for tumefaction of the mesenteric lymph-bodies from other causes (for instance, primary lymphoma, the glandular enlargement of leucocythæmia or syphilis, or sarcoma which occurs primarily, or from carcinoma which is occasionally met with secondarily in young or older children). Lymphoma and sarcoma are positively improved by the protracted use of arsenic in increasing doses, such as are discussed on page 120. Syphilitic swellings require the persistent administration of active doses of both mercurials and iodides.

4. *Appendicitis.*

It is a very frequent disease in childhood, and much more so than acute colitis or typhlitis not attended by an affection of the appendix. There are, it appears, anatomical reasons for it. The appendix of the newly-born is one-tenth of the length of the colon, that of the adult one-twentieth (Ribbert). It continues to grow (Sokolow) to the thirteenth year, remains stationary until the twentieth, and then undergoes atrophy, so that at fifty its width is less than at birth. In the young its contents may be expelled by its contraction (Klebs), or are retained in the fœtus and in children with flabby intestines, and give rise to colic when the mucous membrane is thickened. Appendicitis from this cause must be frequent at that age. There is, besides,

much folliculitis in the young (rare after thirty years); that is why gangrene is frequent in early life. Absolute rest and very careful observation of the patient by a competent person are required. Even in the mildest cases the patient must use the bedpan and urinal, and under no circumstances be permitted to change his position unaided. The disturbance of an incipient peritonitis by mechanical causes is a serious matter; recent adhesions are very liable to be torn and give rise to new attacks. No purgatives must be given except a dose of oil in those rare cases in which no evacuation has taken place for some time, and when the accumulation of large quantities of fæces in the colon is certain or considered probable. In these cases, however, a large enema of soap and water given at once will mostly fulfil all the indications. Thus, I am not at all prepared to advise, with a few modern authors, to commence the treatment of appendicitis (and peritonitis in general) with magnesium sulphate or a large dose of calomel. The injection, however, first of a few ounces of olive oil, and afterwards of large quantities of soap and water, through a fountain syringe, is again indicated after a week or ten days. No stomach washing, no puncturing to establish a diagnosis. Opium must be given freely by the mouth, rectum, or subcutaneously, in full doses, but discontinued, or its doses reduced, when there is tympanites. In almost every case ice applications should be made for days to the right hypochondrium, and warm applications after many days when the fever subsides. The food must be liquid and given in small quantities at a time. The patient must remain in a recumbent posture for weeks after apparent recovery, and be kept quiet even then, for an abscess may be capsulated and perforation may occur. If after a few days the fever increase and there be more exudate, the operation should not be deferred. If the mild symptoms remain unchanged for eight or twelve days, the operation should be performed.

A positive diagnosis should be made early. Frequent previous pain in the same locality and intestinal disorders accompanying it, or a similar attack which occurred months ago, a very sudden cæcal pain (McBurney's point) with vomiting (or without) a few hours or days ago, and illness with fever, perhaps the presence already of slight swelling, and the raising of the whole right lower extremity by the unaided patient, while lying on his back (Meltzer), leave but little doubt. In many cases the locality of the pain is not conclusive; it may begin on the left side, or in the transverse colon. When the diagnosis of appendicitis is established, to say, with a modern author (Tyson), that the surgeon should be called in to

decide on the time of operation is rather rash. Of Biermer's one hundred and twelve hospital cases of all ages not operated upon, between the years 1874 and 1889, ninety-eight left well and nine "relieved." Relapses took place in seventeen, of which two died. In five many recurrences took place. These figures are very favorable, —too favorable, in my experience,—though the course is apt to be milder in children than in adults. Hawkins reports on two hundred and sixty-four cases with a mortality of fourteen per cent.; of those which terminated in abscess twenty-six per cent. died, of those with peritonitis seventy-five per cent. But even the complication with general peritonitis need not be despaired of. R. Abbe (*Med. News,* May 29, 1897) concludes from a large array of such cases, his own included, that "the earlier the operation the better the prognosis;" but "there still remains a chance for life if the period elapsing be not more than two and one-half days."

In many acute cases with violent symptoms a timely operation alone will save the patient. To establish the indications for surgical interference in these cases is, however, rather difficult. Pulse, temperature, local pain (with or without pressure), and swelling require close watching. If the pulse goes up to from 120 to 140 and stays there, if after five or six days there be no improvement in the general symptoms, in the fever and swelling (or either of them), or if the temperature of the body, after decreasing, rise again, I consider the indication for operation very urgent. A general rule, however, cannot be established.

The indications for the time at which the operation is to be performed are not always easily found. Indeed, opinions still vary with reliable authors and surgeons—a great many of whom, in all countries, have given the very closest attention and the very best thought to the subject—as to the proper time at which the operation ought to be resorted to. Some recommend and practise the operation as soon as perforation of the vermiform process has taken place, some favor procrastination until the beginning of the second week. Besides, there are those who object to any operation when universal peritonitis has set in, and those who perform laparotomy in the same class of cases. In a number of instances the time of the operation depends on the condition of the patient; immediately after the perforation of the gut collapse is sometimes so great as to render surgical interference absolutely inadvisable. In these ice, opium, and stimulants are required to bridge over the imminent danger until the operation can safely be performed. I have seen such cases in which it was considered positively fatal at first, and proved successful

a week afterwards. There is no class of cases in which the responsibility of the medical man is greater and full knowledge and keen judgment are more urgently demanded. Not every case terminates in suppuration. In some there is a great deal of inflammatory exudation. In them the protracted use of potassium or sodium iodide, lanolin ointments of the same, and occasional vesicatories will render good service. I have known many who had repeated attacks extending over years, and finally got practically well.

Still, there remain the results of the inflammation,—cicatrization, shrinking, adhesions, and the constant danger of a relapse. If those cicatrices and the appendix were removed, how much safer it would be! The responsibility of advising an operation for the purpose of removing the appendix of those who have suffered from repeated attacks in the intervals is great, that of not advising it is very much greater. Of thirteen children of Broca operated on for that purpose after recovery from one of the attacks,—that is, elective treatment between attacks,—all got well. Of seventy-two operations during the attacks, however, thirty-five per cent. died; of five children whose appendix was removed during the operation for an acute attack, three died. Sonnenburg lost one case in one hundred and seventy-nine interval operations, Kümmel none in one hundred and four, and the experience of all our American operators is equally favorable. The practice of performing interval operations is becoming more and more rational and successful.

The indication for the operation in acute cases and the selection of the time for its performance are, perhaps, apt to be influenced by the observation—in New York City—of two facts: first, no matter what its unknown cause or causes may be, appendicitis is becoming more and more frequent; secondly, it is becoming more septic. In emergency cases, in the hands of the most skilled operators, many cases have died of sepsis soon after the operation, though it was not much delayed. That observation is liable to encourage the very earliest interference in acute cases.

After recovery, purgatives must not be given for a long time; but, as a matter of precaution, warm enemata should be administered every day.

5. *Paratyphlitis.*

This name refers to local inflammation, exudation, and suppuration which have nothing to do with the vermiform process, but with the copious connective tissue between the bones of the pelvis and the colon, which at that place is not covered by peritoneum.

Such abscesses are sometimes the result of trauma; not infre-

quently of pelvic abscess; of inflammation of the psoas; of caries of the vertebræ; sometimes no cause can be found, even after it terminates in recovery. They will develop rapidly and some become very large. Sometimes pints or quarts of pus will either be discharged spontaneously or be removed by incision. Still, it is not always suppuration that results from the inflammatory process in the connective tissue, but exudation and thickening only. When these happen, the treatment consists in the internal use of the iodides and the applications of ointments of iodoform or iodide and lanolin, or of iodoform collodion (1 to 8 or 10) several times daily; cold-water applications which are kept up until they become warm; or sometimes warm poultices, particularly in the cases of very anæmic children.

6. *Intussusception.*

Twenty-five per cent. of all the cases of invagination or intussusception of the bowels occur in the first half-year of life (two-thirds of them between the fourth and sixth months) and fifty-three per cent. before the end of the first year.* Thus, a knowledge both of the condition and the means to remedy it is essential to the family physician. The only successful treatment consists in the reposition of the intestine. When it has been accomplished the relief obtained is immediate. The vomiting, anxious expression, pallor, and collapse improve instantly, the little patient goes to sleep, and soon takes food. In the commencement of my practice, when an invagination extended down to the rectum I employed large sounds for the purpose of reducing the invaginated mass, but I have almost invariably found the case to be worse afterwards, because the sound will crowd the parts upon one another. I also used to blow air into the intestine through a long tube by means of bellows; and in order to make the supply more regular I availed myself, forty or more years ago, of an apparatus for the production of carbonic acid gas. After that time, when the siphons with carbonic acid and mineral waters were invented, I used them for the purpose of filling the intestine more or less slowly with both gas and water. All these measures have proved successful in occasional cases. What has rendered me better service, however, is the following simple plan. The baby is turned on its belly, the hips are raised, and the abdomen gently supported by a soft pillow. The mouth and nose, being the lowest parts of the body, must be protected. The baby is anæsthetized with chloroform, and warm water is poured into the rectum with but little pressure, not from a height of " four-

* See my Intestinal Diseases, p. 242.

teen feet." This is important, for the intestine is no iron pipe subject to the laws of hydrostatics only. The injection is frequently intermitted, while the anus is closed by the finger. At the same time the abdomen, in the direction from below upward, is gently kneaded and its contents moved about.

In not a few cases in the course of the last twenty or thirty years I have seen immediate result from this treatment. When reduction has been completed, the baby must be kept absolutely quiet, take opium, now and then a rectal injection of chloral in solution, and wear an abdominal bandage just tight enough to steady the bowels. Relapses are not at all uncommon; probably it was a case of frequently relapsing intussusception in which Knaggs operated after forty-four days (London *Lancet,* April 24, 1891).

In adults, Kussmaul reports favorable results from washing out the stomach. When the simple measure which I propose is unsuccessful after a number of trials, laparotomy should be performed. The successful cases of laparotomy are becoming more numerous, sufficiently so to justify the operation as the only means that promises a favorable result in irreducible cases. The late Henry B. Sands was one of the first who saved a baby of six months by this operation; at present the number of reported (and not reported) cases, both successful and unsuccessful, is very great. The latter should not count to the same degree as the former. All those who were saved by the operation would have died without it. Pitts (London *Lancet,* June 12, 1897) saved six out of seven consecutive cases. It is necessary to operate in time; for at best, laparotomy, in these cases, has its serious difficulties, and prolonged abdominal manipulations are not borne by infants.

At an early period all the tissues involved are hyperæmic and soft, with a tendency towards gangrene. In a child of eight weeks, on whom I operated, it took me ten minutes to separate the parts from one another, although I had the invagination, measuring six or seven inches, outside of the abdominal cavity. This delay was due to the softness of the tissues, the close impaction of the three layers, and the presence of a large amount of mesentery in the mass. Besides, the field of operation is very small and the difficulty of returning the intestine into the abdominal cavity very great.

7. *Helminthes.*

The medicines available for dislodging intestinal worms are all strongly irritant. They must not be given unless the diagnosis has been made positive. It is better that the diagnosis of a gastritis,

enteritis, or meningitis, when present, should be made by the medical man than that the child should be punished for his carelessness or ignorance. Before taking anything to expel *tænia,* a child ought to be in fair general condition. Moreover, its own tænia, the *mediocanellata,* is the most difficult to dislodge. The best time is when proglottides are seen in the movements. Moderate abstinence for days, at least for one day, and a purgative (castor oil) ought to precede the administration of drugs. The parasite must be expelled; for though the symptoms may not be urgent, some day there will come either local or reflex disorders, possibly attended by danger.

Spontaneous emigration will be noticed occasionally, but it should not be waited for. After the successful termination of the treatment the intestine should be allowed to rest. The plainest diet, such as milk, strained farinacea, and peptones, is indicated for days.

I have administered a great deal of kamala, sometimes from ten to fifteen grammes (a quarter to one-half of an ounce), during one hour, early in the morning; the breakfast (milk) to be postponed for two hours. The effect was not uniform and often negative. It was improved by giving a dose of from twenty-five centigrammes to one-half gramme (four to eight grains) four or five times daily, for ten days or more, previous to the larger dose. A few hours after the larger dose castor oil ought to be given.

Kousso, from four to fifteen grammes within two hours after the required preparation, to a child of from two to ten years.

Ethereal extract of filix mas has proved most successful in my hands. A small child may take one gramme (fifteen grains) in an aromatic mixture, or in one or more capsules, within one early morning hour. Four grammes are tolerated and required by a child of seven or eight years. The oleoresina aspidii of the Pharmacopœia seems to act differently when purchased at different places. As the whole procedure of expelling a tænia is no trifle, it is worth while to be very careful in the preparation selected.

Pelletierin tannate is given in doses of one or three decigrammes (one and a half or five grains). I have but little experience with it. It is obtained from cortex punicæ granatum, which was (and is still) given as a decoction, but is too disagreeable and sometimes dangerous a mess for a child or infant.

For the removal of *ascaris* some general preliminary treatment like the above should precede medication; at least, the bowels ought to be moved gently. The powdered semina cynæ (santonicæ), or flores cinæ, one gramme (fifteen grains) or more, mixed with a syrup, and followed by castor oil, will work well, but is very unpalatable. San-

tonin, which is obtained from it, works as well and more pleasantly; from one to six centigrammes (one-sixth to one-half or one grain) several times a day, with a purgative such as magnesia, calomel, or jalap. The latter addition is desirable, inasmuch as now and then poisonous symptoms may appear. Older children will complain of "xanthopsia," yellow vision. Sometimes the urine and conjunctivæ are yellow.

As the *oxyuris vermicularis* (pin-worm) is frequently found in the rectum or its neighborhood, the internal administration of drugs will not relieve the local itching. Vaginal catarrh, resulting from the immigration of the worm, must be treated locally. The worm is removed by a small piece of blue ointment introduced into the rectum, or by rectal injections of vinegar and water (1 to 3 or 4), of corrosive sublimate (1 to 1500 or 6000), or of decoctions of onions or garlic. It is difficult to dislodge, as it originally inhabits the colon and even the small intestine, and is within reach only after descending into the rectum. The rectal catarrh and tenesmus are best treated with warm irrigations of saline solution, or of starch-water, or of bismuth subcarbonate suspended in water or starch-water.

Anchylostoma duodenale has attracted a great deal of attention of late, and may become of more practical importance to us when the numerous blessings of emigration from the parts where the worm is indigenous go on as hitherto.

The male is from six to ten, the female from ten to eighteen, millimetres in length (one-third to one-half inch). The mouth is bell-shaped; there are two dental prominences above and four below. Particularly the female is thus characteristically endowed, so that it sucks and bites at the same time. Eggs, smaller than those of ascaris, are found in the fæces of the patient. The parasite is found in large numbers among the Italian workmen of the St. Gotthard tunnel, the tile laborers of the Rhenish provinces, and the Hungarian miners and their children. The causes of its presence are the muddy water they drink, which is filled with the ova, and the clay they work in, which contains the larvæ. We now find it in the United States, mostly in the emigrant population. The general symptoms are very severe and dangerous,—debility, pallor, utter exhaustion like that of pernicious anæmia, and relative diminution of red blood-cells. This "Egyptian chlorosis" was explained by Griesinger, by the presence of anchylostoma, as early as 1854. Besides, there are pain in the epigastrium, constipation, mucous and bloody discharges, sometimes real hemorrhages and dyspnœa.

Anchylostoma duodenale requires santonin, thymol (adults should

take from two to ten grammes daily), and principally extract of filix mas. It would not enter the digestive organs if the water were boiled and filtered before drinking. Anguillula intestinalis is often found in its company and probably adds to its dangers.

8. *Umbilical Hernia.*

It is of very frequent occurrence in the infant, but seldom attended by danger. Incarceration takes place very rarely; still, Treves and many others have reported successful operations for such accidents. As there is a predisposition to the development of this variety of hernia, so there is a tendency towards spontaneous recovery. The round umbilical aperture will normally change after a number of months, or even a year, into a narrow fissure, more fat will develop, the muscles will become stronger, and then the intestine will be retained within the abdominal cavity. To accomplish this still more certainly, it is desirable to retain the contents of the hernial sac inside the abdomen. For this purpose the common forms of trusses are unavailing. Strips of adhesive plaster serve very much better, but in most cases they are objectionable because they irritate the sensitive skin of the baby. An adhesive plaster ("Dieterich's"), containing from ten to twenty per cent. of zinc, does not irritate and answers the purpose.

Whatever application is made to the hernia directly must be larger than the aperture. It should not be too hard. Linen compresses and those of woven lint, plates of cork covered with linen or lint, may be applied and held in position by means of a bandage. A knitted one will suit better than the ordinary one of linen, cotton, or flannel.

9. *Inguinal Hernia.*

In the newly-born or the very young it is apt to disappear spontaneously; when, however, it depends on or is complicated with phimosis, circumcision should be performed to prevent the straining caused by it. Constipation must be overcome. When the short and straight inguinal canal becomes, in the course of a few years, longer and more oblique and the amount of fat goes on increasing, the rupture may disappear; but all these predisposing factors never succeeded in effecting a cure by themselves. This is accomplished only when the hernia is retained inside the abdominal cavity completely and constantly by means of a truss, which must be worn for years. It must not be removed except when the baby is sleeping quietly. Trusses are uncomfortable in the beginning, and give rise to cutaneous irritation, particularly under the influence of urine. So much the more is it necessary to keep the truss clean, and always to select one which fits

exactly without exerting too much pressure. If these mechanical means do not effect a cure after a few years, or when parts of the contents prove irreducible, the radical operation (Bassini, Kocher) or a new procedure devised by George R. Fowler, which consists in intraperitoneal displacement of the spermatic cord and obliteration of the internal ring and inguinal canal (*N. Y. Polyclinic,* July 15, 1897), will save the patient much discomfort and remove the danger of a possible strangulation. A similar operation is recommended by Nélaton and Ombréville (*Lyon Méd.,* August 1, 1897). Lannelongue's method of injecting zinc chloride solutions into the tissue should be recommended as little as the same method applied to tuberculous joints or to spondylitis.

Hernia is easily reduced into the abdominal cavity, in most instances, by gentle pressure while the legs are raised, sometimes best in a warm bath or under the influence of an anæsthetic; but there are on record quite a number of cases in which incarceration and strangulation required operative interference. The operation should not be delayed after reduction, under the influence of an anæsthetic, has proved impossible. The mortality after the operation does not seem to be greater in children or infants than in adults. An instance of a successful operation on a case of strangulated *femoral* hernia, which occurred in a girl of eleven years, has been reported by St. Germain, also by Dowd (*Arch. Ped.,* May, 1897) and others. Rees succeeded in reducing an inguinal hernia by aspirating from the intestine a quantity of turbid liquid. An exceptional procedure of the kind, however, must not be recommended for general adoption. If strangulation is old, taxis should not be attempted; the less so, as the last few years have proved the almost uniform success of the operation.

10. *Catarrh of the Rectum.*

It behaves very often like a merely local disease. Indeed, it may occur as the result of a local irritation of the anus (scratching, sitting on muddy stoops), of oxyuris, of foreign bodies, or of hardened fæces. The immigration of bacteria through the anus was discussed above (p. 347). In all these cases the treatment should be directed to the cause, which must be removed. Warm injections of water, flaxseed tea, or starch decoction (with a little opium in tenesmus) are sufficient. Real proctitis, leading to ulceration (other than dysenteric) or fibrous hyperplasia, is an infrequent result. But it may occur; the infiltration may become copious and lead to an invasion of the surrounding cellular tissue. This *periproctitis* gives rise to abscesses, and often to fistula, either external or internal, complete or incomplete. These, as well

as the periproctitic abscesses due to pyæmia, to sepsis, or to the severe form of typhoid fever, require an early and large incision and careful antiseptic after-treatment.

11. *Prolapse of the Anus and Rectum.*

It is the consequence of catarrhal and inflammatory irritation and softening. It may follow chronic catarrh and dysentery. It is produced by debility of the sphincter, which is often congenital, or sometimes the result of neighboring diseases; also due to drastic purgatives, or to constipation with the incidental straining; it first appears as a mere ectropion of the mucous membrane. Straining, resulting in prolapsus, is also produced by the presence of polypus or worms in the rectum, by stone and catarrh of the bladder, and by phimosis. A predisposition arises from the peculiar shape of the rectum in the young. It is straighter, inasmuch as the sacrum is not so concave as it is in the adult.

The temporary reduction of the prolapse is readily accomplished, particularly in those many cases in which the sphincter is feeble, but the intestine will come down again. Attention must be paid to defecation. The children should not be allowed to strain. Thus the chamber, if any be used, should be placed in such a position, and raised to such an extent, that the feet cannot touch the floor, or the child must not be permitted to sit up during defecation.*

Many applications have been devised to retain the rectum inside. Adhesive plaster has been used as best it could be, and a number of instruments have been invented for the purpose of retaining the rectum in position, while leaving an opening for the passage of the fæces. They have been made of hard rubber, lead, and other materials. Some have used a tampon and others a compress to hold the nates together; but a tampon will certainly dilate the paralyzed sphincter more than it was before. Curling confines his efforts to compressing the nates.

The main attention should be paid to the treatment of constipation or diarrhœa, local catarrh, rectal worms, polypi, stone in the bladder,

* Hippocrates makes the following remarks on this subject: "In children suffering from stone, and protracted genuine dysentery, the rectum is apt to protrude. It should be pressed in with a soft sponge, and touched with a snail. Then the patient should have his hands tied, and be suspended a short time, and thus the rectum will slip in. If it comes down again, a band should be placed around the loins; a bandage must be attached to this, and the rectum, after being moistened with a decoction of lotos, be replaced with a soft sponge. Also, the intestine must be washed with this decoction and the bandage carried up between the legs to the umbilicus. During defecation the baby must sit with extended legs upon the feet of the mother, its body leaning against her knees."

phimosis, and all the causes of straining and prolapse which have been enumerated above.

But there are direct indications. Astringents have been used locally in the form of injections; principally alum and tannin, in solutions of one or two per cent. Ice has been applied locally, and injections of from half an ounce to an ounce of ice-water may be used with advantage three or four times a day.

One enema must be given daily for the purpose of emptying the bowel and thus avoiding the possible straining.

In most cases there is considerable swelling, sometimes real hypertrophy of the mucous membrane and of all the tissues. Swelling and hypertrophy must be reduced. A part of the hypertrophied tissues has been excised. Caustics have been used; for instance, silver nitrate. It should be carefully neutralized immediately after the application by sodium chloride in solution. Concentrated nitric acid has been employed for the purpose of destroying some of the superfluous tissue. The best remedy, however, for this purpose is the actual cautery. It should be applied either in long welts or strips or at half a dozen or a dozen points. It matters not whether the galvano-cautery, or Paquelin's thermo-cautery, or the common actual cautery is selected.

For the purpose of strengthening the sphincter, I have used frequently, for dozens of years, an ointment consisting of extract of nux vomica, one part in ten or fifteen parts of fat, to be applied to the lower part of the rectum from three to five times a day, or every time the bowel protrudes. The internal administration of strychnine is of very little avail, but that of ergot is serviceable. The subcutaneous injection of strychnine (sulphate, from one-sixtieth to one-thirtieth grain dissolved in water, once daily) in the neighborhood of the sphincter is beneficial, particularly when supported by the action of the interrupted electric current, which may be applied for a few minutes once or twice every day. Rational treatment is required for the constitutional causes of debility and emaciation (rhachitis, tuberculosis).

12. *Fissure of the Anus.*

It is by no means rare in infants and children, particularly in the latter. It gives rise to symptoms similar to those encountered in adults: severe pain during defecation, tenesmus, dysuria. Many cases of alleged flatulency and colic, and excruciating screaming spells, are due to fissure. The more severe form follows a direct injury by foreign bodies, hard fæces, etc.; a mild form is due to slight erosions and ulcerations, the rhagades of congenital or acquired syphilis, or the sores made by erythema, eczema, or herpes, and by vulvo-" vaginitis."

The mildest form is that which is found on a very loose and dilatable anus. This yields readily to a mild local treatment of the sore with a solution of silver nitrate (1 to 250 or 500). Cases depending on syphilis require both general and local treatment; vaginal catarrh (colpitis, not "vaginitis") must be stopped and eczema healed.

The treatment of the severe form has consisted in the relief of occasional diarrhœa, and that of the more frequent constipation by enemata and mild purgatives; in the application of astringents, such as lead, copper, zinc, or alum; or of caustics, such as the solid silver nitrate (Esmarch) or nitric acid. This treatment is painful and tedious. Boyer advised incision through the whole of the sphincters. The open wound, however, which is kept clean with difficulty, may bleed and give rise to ulceration or sepsis. The proper treatment consists in dilatation of the sphincters. Josseline directs it to be gradual, thereby protracting uncertainty and pain. The best and speediest method, however, is forcible and instantaneous dilatation, without or with anæsthesia. The operation takes so little time that it is hardly required, except in very puny or convulsive infants or children. The introduction of two fingers of the same hand is rarely sufficient; three or four do better, or the thumbs of both hands. The easiest way is to use the two index-fingers for pulling; a sufficient dilatation is recognized by the distinct sensation that the muscular fibres have given way. The external wound is trifling and but superficial. There is rarely any bleeding, which will stop under the application of ice or a sterile tampon. Two or three warm rectal injections of salt water or starch-water should be made daily for some time.

In the rare cases of fissure and polypus combined the treatment must be directed to both.

13. *Polypus of the Rectum.*

They are tumors from the size of a pea up to that of a cherry or hazel-nut, or more. They are single or numerous, quite soft, or more frequently of greater consistency, composed mostly of cells or cellular tissue, quite vascular, and contain often a harder adenomatous nucleus and a Lieberkühn gland embedded in them. They are either pedunculated or sessile, on a broad base. They are often found in many members of a family, and (F. Huber) frequently connected with adenoids of the naso-pharynx. They are sometimes found between the two sphincters, mostly above and near the inner sphincter; not infrequently, however, all over the middle portion of the rectum, sometimes quite near the "third sphincter," and very rarely in the cæcum (Vajda in *Jahrb. f. Kinderh.*, vol. 1.).

Among the symptoms we occasionally meet with abnormal defecation (constipation, diarrhœa, or both in alternation), sometimes with enteralgia or tenesmus, and frequently a discharge of mucus or of blood. Tenesmus is found about polypi when seated near the internal sphincter or between the two sphincters. Blood is seldom mixed with mucus, mostly quite clear, from half a teaspoonful to a teaspoonful, sometimes more, so that the constant repetition of these small hemorrhages is sufficient to result in anæmia, but also to establish the diagnosis. The tumor is often pushed into or through the anus during the evacuation of the bowels.

The treatment consists in the removal of the tumor by means of the cold snare, by the galvano-caustic snare, by pincers or the fingers, or by ligature. The latter is easy of application in all cases in which every movement of the bowels results in rolling out the growth like a foreign body. In these many excursions a polypus with a thin pedicle is often removed spontaneously. When that occurs there is hardly a show of blood. Indeed, there is seldom much bleeding after removal. It is true that some writers report the occurrence of hemorrhages; but in infants and children, with whom varicosities of the blood-vessels are exceedingly rare, I have never seen a hemorrhage of any account after breaking the pedicle with my finger in the rectum. The latter is very accessible indeed to an index-finger of moderate size.

Sessile polypi do not give rise to urgent symptoms, and sometimes are not easy to find. The astringent injections which are to remove them should be mild. Solutions of one per cent. of alum, injected several times daily, will be found sufficient, or a two-per-cent. ointment, or a suppository. Bad cases require the speculum and scraping, with an antipyrin solution of fifteen or forty per cent., or the actual cautery to stop bleeding.

G. The Liver.

The diagnoses of alleged diseases of the liver are more numerous than its diseases. Primary affections are rare. *Enlargement* is frequently assumed to exist when the size is normal. In the fœtus and infant the liver is proportionately large. At two weeks of age (Birch-Hirschfeld) it amounts to 4.2 per cent. of the body weight, at six months to 6.1 per cent., at one year to 5.8 per cent., at two years to 4.3 per cent., at three years to 4.7 per cent., at four years to 4.8 per cent., at five years to 4 per cent., at six years to 3.5 per cent., at nine years to 4.4 per cent., at ten years to 3.2 per cent., at twelve years to 3.8 per cent. Thus there is a gradual diminution, with but few exceptions. Its

size in the very young appears still larger because its lower part is not covered by the ribs (which in the young are placed more horizontally) as it is in the adult. Besides, the tympanitic intestines encroaching upon the liver from below and behind, and the rhachitical contraction of the chest-wall, if present, render a much larger surface of the organ accessible to percussion and palpation. Thus, actual and primary enlargement is not a common occurrence. Secondary enlargement, however, may depend on constitutional—either chronic or acute—disorders, such as alcoholism, syphilis, leucocythæmia, chronic tuberculosis, suppuration of bones or glands (amyloid degeneration, together with that of the spleen and of the kidneys), malaria, or typhoid fever. The therapeutics of these kinds of enlargement depends, therefore, on the character of the different causes. A case of multiple adenoma of the liver in a girl of twelve years was published by me in the *Trans. Assoc. Am. Phys.*, 1897. Enlargement of the liver should not be diagnosticated when the organ is merely dislodged downward (*floating liver, hepatoptosis*). It may be primary, or secondary to emphysema of the lungs, rhachitis of the chest, etc. In very rare cases its position may be so changed that the diaphragmatic surface looks outward, to the right side. Ptosis requires proper support by an abdominal bandage, or by strapping with broad adhesive strips (Achilles Rose).

Another series of enlargements is that which results from changes in the circulation. Diaphragmatic pleurisy of the right side may constrict the vena cava inferior and thereby lead to hypertrophy of the liver, ascites, anasarca of the lower extremities, and death. Pneumonia in its acute stage impedes the hepatic circulation, temporarily mostly; when it is chronic, the consecutive hyperæmia may lead to hypertrophy; the same effect may be produced by the persistence of pleural effusions on either side. Persistent obstruction of bile-ducts may have the same effect. More frequent yet is the secondary hepatic enlargement of heart disease, not so much in the congenital form, in which the amount of blood is greatly reduced by the low state of general nutrition, as in acquired (mostly rheumatic) endocarditis, but much more so in acute and chronic myocarditis. Indeed, rapid swelling of the liver will confirm the diagnosis of cardiac disease in the myocardium. A chronic perihepatitis with a thick and extensive exudate ("Zuckerguss") depending on pericarditis or right side pleuritis was described by Curschmann. It is independent of changes in the liver. A congenital induration of the liver, independent, however, of perihepatic alterations, and due to portal changes, was described by Pick. Pericardial obliteration is frequent in both forms.

The number of such cases increases with every year of life; indeed, children of eight or ten years with chronic valvular diseases and consecutive enlargement of the liver are frequently observed. Myocardial alterations are also very frequent. Thus, the treatment of hepatic disorders is that of the primary disease rather than of the secondary changes.

Fatty infiltration of the liver is, in the very young, not often complicated with much increase in size; for to a certain extent it is normal. But, in ill nutrition, protracted diarrhœa, to which the tendency is greater on account of the absence of antiseptic property of the (otherwise copious) bile in the young, chronic pulmonary tuberculosis, and after severe cases of diphtheria or scarlatina, or in alcoholism and acute meningitis, an actual fatty degeneration is liable to occur, with enlargement of the organ. Dead foundlings are reported with fatty liver in forty-one per cent. of the cases. Sometimes it is found combined with interstitial inflammation (cirrhosis), particularly in cases of syphilis, rhachitis, tuberculosis, or after measles or scarlet fever. All of these facts are here alluded to in order to show that the intellectual physician may accomplish a great deal by attending to an evil before it is developed. Nothing is easier and more luckless than to prescribe iodides, calomel, or purgatives for an established local disorder, and fold the hands at the sight of an impossibility; nothing more efficient and happy than to watch *and treat* in time rhachitis and measles and scarlatina and the whole army of primary ailments. *Obsta principiis.* Noiseless prevention counts more than the loud officiousness of the recipe fiend after the evil has been permitted to advance to maturity.

Besides the cirrhotic induration of the liver complicated with fatty infiltration, there are instances of genuine cases of *cirrhosis,* mostly connected with, or depending on, cardiac disease (myocarditis mostly), parenchymatous inflammatory disease of the liver, alcoholism, syphilis, rhachitis, acute exanthemata (measles, scarlatina), and tuberculosis, also arsenic or phosphorus poisoning. Thus it is either circulatory or toxic. Of microbes, Charin found bacillus pyocyaneus, Weaver bacillus coli, Hektoen bacillus coli and pseudodiphtheriæ. Flexner found toxalbumins of different origins. According to all these observers, cirrhosis of the liver destroys the vital capacity of the organ, so that microbes are no longer annihilated by it. Adami found bacillus coli alive in the diseased liver, dead in the normal. The atrophic form is rare and mostly due to syphilis; the hypertrophic, with more or less jaundice and only a mild degree of splenic enlargement, is more frequent. Still, both forms may develop in the course of the

same process, the atrophic being the last development of the hypertrophic form. *Pigmentary cirrhosis* of the liver (and pancreas) is sometimes a symptom of hæmatochromatosis connected with (bronzed) diabetes. Cirrhosis of the liver is by no means so rare as it was believed to be before attention was paid to it. It took a long time before a hundred cases were enumerated in literature. That has changed. Gilbert and Fournier (*Sem. Méd.*, 1895, p. 248) published six cases of from five to eleven years. There was jaundice in all, the spleens were large, in some cases larger than the liver, the last phalanges of fingers and toes were enlarged, the nails curved, the ends of femora, tibiæ, and fibulæ enlarged, many joints painful, and there was synovial effusion in the knees. All the children were undersized and puny. Ascites is not so frequent in the young as it is in the adult; it is more often observed as the result of chronic peritonitis than of cirrhosis, and of portal obstruction of any kind. The energetic suppression of the alcohol habit (more frequently found in children and adolescents than many presume) and the treatment of syphilis (not always hereditary) may result in recovery. Ascites gets well sometimes after a single paracentesis. Mercury and iodides are very effective, not alone in syphilitic cases. In every sort of cases, and at every age, I have succeeded in relieving cirrhosis, and sometimes permanently, by alternating, by the week or fortnight, the administration of iodides (potassium or sodium, iodipin) and mercury (bichloride or the green iodide, and sometimes calomel). The bowels should be kept open with salines (sodium or magnesium sulphate), and diuresis improved. It is true that, as a rule, organized exudates will not melt and become absorbed when old, but recent cell proliferations submit to medicinal interference. Collateral circulation has been established for the purpose of draining the liver and re-establishing local circulation. The liver, spleen, and peritoneum were actively rubbed in order to cause an inflammation, successfully in a few cases. Forty years ago I injected tincture of iodine into the abdominal cavity of an alcoholic cirrhotic of fifty years after having been obliged to tap a dozen times at short intervals. The result was a formidable peritonitis and no more ascites for about four more years, when he died of senile general degeneration and a moderate attack of ascites.

The therapeutics of *congestion* of the liver is that of its causes,—viz., the lungs and heart, phosphorus poisoning, infectious fevers, or very high temperatures. While nothing is more preposterous than the abuse of antipyretics in the presence of moderate temperatures, nothing is more reprehensible than to allow paralysis of blood-vessels and even disintegration of tissues to take place from excessive pyrexia. The

same is true of hepatic *inflammation* and *suppuration*. In our country the former, when general, is mostly traumatic, the latter the result of bacillus coli infection, pyæmia, umbilical phlebitis, dysentery, perityphlitis, and pleuritis, besides an occasional case produced by pylephlebitis, or the immigration of an ascaris, or a contusion. Many a case of abscess need not have occurred if the dysenteric rectum had been disinfected by frequent enemata, a perityphlitic or pleural abscess been incised in time, and the umbilical phlebitis of the newly-born prevented by keeping the cord aseptic. Multiple abscesses will always terminate fatally; a single abscess may get well by either aspiration or incision and drainage. Of the two I prefer the latter, though, indeed, I have seen a successful result from a single aspiration followed by antiseptic irrigation. The diagnosis of hepatic abscess from *subdiaphragmatic abscess* may become difficult. It is not very rare; in one hundred and seventy-six cases collected by Lanz twelve occurred in children. Intestinal disease very often precedes it. The skin is sensitive, the pain radiating, the liver and heart are not dislodged, the dulness is most marked over the sixth rib behind and the third and fourth ribs in front, the lung being normal above it. The puncture should be made during expiration (Fürbringer).

Acute yellow atrophy has been observed in infants of from one month to fourteen years. Greves (*Liverp. Med. Surg. Journ.,* July, 1884) collected seventeen cases; I have seen but two, with pain, vomiting, jaundice, nephritis, fever, and early brain symptoms. They all die, mostly within a week.

The treatment of *jaundice* depends on its causes. The dangerous form met with in the septic newly-born might have been prevented, but cannot be cured. That which results from syphilitic stricture of the bile-ducts may recover, even after months, through a thorough mercurial treatment; complete obliteration of the bile-ducts leaves no hope, except in those cases which can be proved to be inflammatory. In them persistent alternation of mercury and iodides may relieve, or restore health. With mercury alone, aided by but little potassium iodide in the rectum, a child of ten years with large and hard liver (probably fatty, previously) got well of icterus which lasted five months and was complicated with secondary nephritis. The mild form depending on the sudden postnatal change in the hepatic circulation corrects itself; that which follows a gastric and duodenal catarrh in the newly-born, the infant (rarely), or the child will get well with proper diet and medicines, which have to be adapted both to individuality and age. As a rule, the amount of food ought to be diminished, but little meat (chicken) permitted, and milk and farinaceous foods preferred.

Alkaline waters (Seltzer, Vichy, Waukesha, Poland), sodium bicarbonate or phosphate, bismuth, hydrochloric acid, resorcin, and calomel will be found appropriate in a great many cases; in others, copious cool enemata or tinctura rhei aquosa. Jaundice attributed to the influence of foods, localities, miasms, and atmospheric influences has been observed to occur epidemically. J. M. Da Costa (*Amer. Jour. Med. Sci.,* August, 1899) published a case of typhoid cholecystitis which occurred in a girl of eight years, with pain, vomiting, and jaundice. Ice, afterwards warmth, and the subcutaneous use of morphine relieved her. Such cases require, besides the treatment outlined above, rest in bed, warm bathing, and diaphoretics. H. Pletzer (*Seventh Ann. Rep. Health Dep.,* Bremen) reports an extensive epidemic, not contagious, after revaccination. The glycerin lymph (humanized) which was employed was all obtained through different agents from Eastern Prussia. Jaundice from gall-stones, though it has been observed in the very young, even in the newly-born, is excessively rare. The rules for both dietetic and medicinal treatment of biliary calculi must be the same at all periods of life. Strictly nitrogenous food should be avoided or taken in small quantities only, and milk and fruit (oranges, grapes) and fresh vegetables permitted. Of all the medicinal agents known to me, sodium sulphate and salicylate, administered for months in succession, have answered best to guard against a repetition of the attacks.

Baccelli's method of operation in *echinococcus* of the liver consists in aspirating thirty cubic centimetres (one ounce) of the liquid through a thin aseptic trocar and injecting twenty cubic centimetres of a one-per-mille solution of corrosive sublimate. The puncture is then covered with gauze and adhesive plaster. In a few days the sac begins to diminish, and finally contracts. J. von Bokay published three successful cases (*Arch. f. Kind.,* 1897, p. 310). The cases are rare, but may occur in everybody's practice. Cruveilhier saw one in an infant of twelve days. Finsen reported twenty-one cases between ten and fifteen years in a total number of two hundred and forty-five. The methods of operation have been puncture, puncture and injection of iodine preparations, puncture and drainage, simple incisions, the use of caustics followed later by incision, and two incisions, the second to be made after adhesion between the liver or sac and the peritoneum has been established. This method is the safest by far.

Cancer (mostly scirrhous) of the liver is rare. A case was observed at birth by Noeggerath and one by me. Twenty-one cases have been collected in early life. It may begin as an adenoma, with rapid

growth, tumor of the spleen, ascites, and hemorrhages. No treatment yet beyond that looking for euthanasia.

H. Peritonitis.

Whether acute, subacute, or chronic, it is a frequent occurrence at any age and quite common in the young. The several forms will interchange and combine or alternate with one another; the chronic variety may remain dormant through an indefinite period, and suddenly break out with full force. All the forms of septic and infectious diseases give rise to it, from the sepsis of the newly-born to scarlatina, erysipelas, variola, dysentery, and typhoid fever (much more frequently without than with perforation). Trauma and perforation from any source, straining and contusion, indigestion, diarrhœa, and constipation (less frequently in the young than in the adult) will lead to it. Diarrhœa is a frequent cause of local peritonitis, the process penetrating the thickness of the intestine. Local disintegration of the serous membrane, possible with unexpected perforation during any period of later life, may be its result. The same is observed as the result of a healed typhoid ulceration. Inflammatory processes in the neighborhood, such as pleuritis, or simply local irritation from incipient hernia or retained testicle, are among the frequent causes. Perhaps the most common origin is that from a previous attack which occurred at a period ever so distant. After all that has been said in these brief lines, it is easy to see to what extent preventive treatment may prove effective. The watching and mitigation of an infectious disease with a typical course, the speedy disinfection of the intestines in typhoid fever and dysentery, the prevention or cure of chronic constipation or diarrhœa, the proper attendance on appendicitis and pleuritis, the application of a truss and alleviation of the dangers of a strangulated testicle, are just so many safeguards against attacks of peritonitis.

When an acute attack of peritonitis, either local or general, has made its appearance, absolute rest is required by the whole body as well as the affected organs. No unnecessary exertion, no motion of the body, no sitting up to evacuate either bladder or bowels, and no straining are permissible; no food other than liquid; that is, milk and such farinacea as contain least starch,—viz., ground barley or oatmeal, preferably the former. Meat requires more pepsin and hydrochloric acid than a stomach at a temperature of 104° or 106° F. is competent to furnish, and the system has no worse enemy than half-completed or unabsorbed peptones. Peristalsis must be stopped, for any disturbance of the consolidation of beginning adhesion is followed by the

tearing of newly formed blood-vessels, the occurrence of hemorrhages, and the increase of danger. Opiates should be given by the mouth, rectum, or subcutaneously, or by combined methods, in doses sufficiently large not only to benumb pain or to procure occasional sleep, but to obtain a condition of constant drowsiness, even sopor, and an effect on the pulse. When there is much vomiting, food ought to be withheld for half a day or a day. There are cases in which even ice-pills furnish a new source of gastric irritation; still more frequent is the contraindication to carbonic acid gas, which, it is true, gives great relief in some cases, either in an alkaline water or in champagne. In the later stages of the disease, when the necessity of feeding becomes urgent, vomiting may often be avoided by giving, either subcutaneously or on the tongue, undiluted, one or a few drops of Magendie's solution five minutes before the partaking of food. In the first days of acute peritonitis water is a greater necessity than food. When it cannot be introduced into the stomach, an ounce or two may be thrown into the rectum every hour or two hours without annoying it and without inducing peristalsis of the intestinal tract. A drop of tincture of opium may be added to it.

Ice-bags, or, if they be too heavy, the ice-water coil, or iced cloths are applied to the abdomen; the former mainly while the inflammation is still local. When they are objected to, water of the usual temperature may be employed first and the latter reduced gradually. Cold must not be employed too long in very young or anæmic children; in these, indeed, warm applications are tolerated best. As long as an acute peritonitis is still local (pericystitis, perihepatitis), leeches may be expected to do good. No purgatives must be given. In children peritonitis caused by constipation is exceedingly rare, and the recommendations of magnesium sulphate given by gynæcologists in puerperal and other forms of peritonitis for the alleged reason that it prevents adhesions, though they may be considered justifiable in the adult, do not hold good for the infant or child. If it be desirable to relieve the intestinal tract to some extent, the incipient state of peritonitis may permit of a tepid enema gently administered, with or without the addition of a teaspoonful or half a tablespoonful of oil of turpentine added to half a pint or a pint of warm water, or a few ounces of olive oil may be injected. Rest to the intestinal tract is such an absolute indication that the locking up of the bowels for a week or ten days frequently become a necessity. The tympanites of peritonitis is not the result of constipation, but depends on the paralytic condition of the muscular layers of the gut, brought about mostly by œdematous effusion into its tissues. But when it becomes very annoying or

dangerous through pressure upon the diaphragm, relief may sometimes be obtained by introducing one or more tubes of India-rubber into the rectum. External applications must not be made because of the danger attending renewed peristalsis. The question whether puncture of the intestine is advisable, with a view of allowing gas to escape, cannot be answered for every case. Experience has shown that such punctures accomplished this purpose, but also that over-extension of the intestinal wall destroyed its elasticity and prevented the puncture from closing immediately. I have seen liquid fæces in the abdominal cavity which had escaped through the fine apertures made by the needle of the aspirator.

When the case proves to be one of suppurative peritonitis, the accumulation of pus may be circumscribed (a local abscess) or the whole abdominal cavity may be affected. In such cases there have occurred occasional perforations into and discharges through the intestine, ureters, bladder, or umbilicus, but it is not windfalls or godsends we have to calculate upon or look for. The choice is between an absolutely bad prognosis and the incision of the abscess, or laparotomy with proper after-treatment (p. 355). As to its performance, I refer to the recent books on surgery. If I have anything to suggest, it is that the incisions should not be too small. The latter operation has also been recommended as a curative agent in *tubercular peritonitis.* Tubercular peritonitis is mostly a disease of long duration. Its first symptom is quite often ascites, the effusion having a high specific gravity and containing much albumin. There may be swelled inguinal glands, which are of little account; hard masses in the abdominal cavity mean exudate, adhering intestines, and sometimes tubercular lymph-bodies of the mesentery. Pain, swelled lymph-bodies about the neck, pulmonary and pleural symptoms, and fever are bad complications. Many uncomplicated cases get well without special treatment; some with iodides or with general antitubercular treatment (p. 163). Caillé (Festschrift) asserts that medication is of no use, and that an operation should be made early. This much is certain, that it should not be delayed when there is a fever which persists, when medication is unavailing, when the ascites does not diminish, and when emaciation increases. Punctures and inflation of sterile air have been recommended by J. Duran; but laparotomy, with emptying of the abdominal cavity and immediate closure of the wound, is frequently made, and many successes are claimed. The alleged causes of the healing influence of laparotomy are many: the contact with chemicals, such as iodoform and other antiseptics, with air, with light, with bacteria entering from outside, or the removal of the exudate itself. It is very

probable, however, that the consecutive hyperæmia has the most beneficent influence.

Chronic peritonitis, whether the outcome of an acute attack or an independent affection, has its own indications. The majority of cases are either traumatic or the results of previous diarrhœa, typhoid fever, or tuberculosis. Exudates may be very bulky, and still the case may get well. Rest in bed, warm bathing, and warm poultices offer great relief. Baths containing iodine, such as St. Catherine, Kreuznach, and the internal administration of potassium or sodium iodide (of iron only when there has been no elevation of temperature for some time) will contribute to the absorption of part of the exudation, particularly when the latter is very massive. An occasional vesicatory will be found opportune. Iodoform may be used as an ointment, or be applied in collodion (1 to 8 or 12), twice daily, for a long time. Tincture of iodine is less efficient and more irritating. Ascites may require paracentesis, but I have seen many a case improved by iodides only, in connection with other diuretics. Sparteine sulphate (scoparius) is one of the best, in daily doses of, altogether, from one to four grains (0.06 to 0.25). It may be combined with the iodide, but not in the same mixture. When the solid exudation is obstinate, the blue ointment may be used in addition to the iodide; it may be rubbed into the inner aspect of the thighs or forearms, particularly the former, twice daily; not however, into the abdominal wall. Nothing is easier than to transform a mild chronic form into an acute peritonitis by friction and similar traumatism, and nothing more certain than that the modern "massage" craze has multiplied the cases and that every important massage case should be treated by a physician or a conscientious expert. On the other hand, there is no better means of alleviation and prevention than rest secured to the abdominal organs by the permanent wearing by the patients, or by those who ever suffered from peritonitis, of a bandage easy enough not to annoy, but sufficiently snug to hold in position the jumble of formerly diseased and still vulnerable adhering intestinal convolutions.

Ascites has been mentioned as the result of the local obstruction of the portal circulation (p. 369), of cirrhosis of the liver, and of acute and chronic peritonitis; the treatment depends on the cause. Cardiac and renal ascites require potassium bitartrate and other salines, now and then drastics, and those drugs which increase blood-pressure and diuresis; digitalis more frequently in children than in old people; sparteine sulphate, caffeine, abstinence from alcohol and, so far as possible, from water; tapping when indicated by dyspnœa. Ascites may depend on or be connected with congenital or acquired tumors of the

peritoneum. *Cystic tumors* may be chylous, lymphatic, sanguineous, dermoids, echinococcus, or cysticercus. *Lymphangioma* may be simple dilatations, through obliteration of the thoracic duct or other lymph-vessels, or neoplastic. Possibly now and then a mesenteric lymph-body may undergo cystic degeneration. The treatment is that of ascites (paracentesis), and causal if possible; that means extirpation.

Ascites chylosus is rare even in the adult; but the young are not exempt. Congenital weakness and fragility of the lymph-vessels, with or without their dilatation (cases originating from lymphangioma are known to have occurred in the adult), and the frequency of chronic peritonitis suggest the explanation of their occurrence. Of filariasis in children, I know of no case. Czerny had the case of a girl of ten years, in which the chylous ascites was due to the pressure on the ducts by ovarian and lymph-gland sarcoma, Wilhelms that of a child with a tumor in front of the vertebral column, in which the disease developed two months after recovery from whooping-cough.

VIII

Diseases of the Genito-Urinary Organs

1. *The Kidneys.*

THE preventive treatment of the *kidneys* ought to begin with the first hours of the newly-born. After the second day, and frequently through a period of some two or three weeks, the urine, usually thin and limpid in the infant, is liable to eliminate a large amount of uric acid and urates. They are deposited in the pyramids and papillæ of the kidneys, also in the straight uriniferous tubes, even in the epithelia, as orange-colored crystals and an amorphous powder, and are sometimes so copious as to accumulate in the pelvis of the organ and also in the bladder. Not infrequently these deposits are combined with some organic structure, which is dissolved by acetic acid, or with hæmatoidin crystals resulting from small extravasations. A frequent constituent of the deposits is bilirubin, which is soluble with difficulty only in alkaline fluids (blood). Orth and Neumann succeeded in obtaining crystallized bilirubin from the dead bodies of icteric infants. Quite often the dress of the baby is discolored by them. The presence of this *uric acid infarction* is due to the sudden change in the circulation of the blood; it causes an unprecedented elimination of nitrogenous material which cannot be kept in solution and easily removed, partly because the newly-born is not supplied with a sufficient amount of water. Its speedy expulsion is of great importance, for it acts as a local irritant, and may give rise to a slight or copious renal hemorrhage, to albuminuria (which is a frequent occurrence because of the defective construction of the epithelium of the glomeruli), and even to nephritis. Besides, its presence in both the kidneys and the bladder is a ready cause of the formation of renal calculi; indeed, the vast majority of renal calculi and the centres of vesical calculi consist of uric acid with some amorphous organic material. The consideration of these facts conveys at once the conviction of the necessity of supplying the newly-born with ample quantities of water. Much suffering and illness can thus be prevented.*

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* See my paper on Nephritis in the Newly-Born, N. Y. Med. Journal, January 18, 1896.

The *malformations of the kidneys* and their (mostly congenital) malignant *pseudoplasms* furnish but few indications for treatment. Abnormal shape and *unicity* of the kidney (sometimes amounting to *horseshoe kidney*), *cystic degeneration* of obstructed uriniferous tubes,* tubular *adenoma, carcinoma,* and *sarcoma,* including *rhabdomyosarcoma,* which is an early degeneration of the Wolffian body and contains cartilage and muscle, are, unfortunately, not uncommon. I collected nearly four dozen sarcomata in the fœtus and infant in my paper on the subject presented to the Eighth International Congress, 1884. From that time dates the differentiation between sarcoma and carcinoma of the kidneys, and the cases of the former have become very numerous. Pseudoplasms of the renal capsule are either *lipomata* or *sarcomata.* No treatment can be advised but that of removal before the tumor becomes too large and metastases have taken place; if they are observed at an early period, the case is probably one of carcinoma, not of sarcoma. (See H. Rehn in Festschrift, and Jacobi in *Trans. Tenth Inter. Med. Congress,* 1884.) If nephrectomy be no longer possible, Coley's subcutaneous injections of erysipelas antitoxin may be tried. Fortunately, the diagnosis can be made with satisfactory certainty, and besides, as a rule, but one kidney is affected. Metastatic deposits in the other kidney or in other organs take place, if at all, at a late period of the development of the pseudoplasm. In cases of sarcoma, the removal of the tumor as soon as the diagnosis (slow growth mostly, tumor painless, sense of semi-fluctuation, colon in front of the tumor, usually no hemorrhage, which is more characteristic of carcinoma, rarely any metastasis) is made yields sufficiently favorable results. Concetti (*Rif. med.,* 1898) has the following figures: forty per cent. died after the operation; forty-five per cent. died of relapses; seven per cent. were well two years after the operation; in eight per cent. the results were unknown. Schmieder (*Deutsche Zeitsch. f. Chir.,* vol. lxii.) concludes that nephrectomy, mostly performed for malignant tumors, has more favorable results in the young than in advanced years. Of three hundred and twenty-nine extirpations one hundred and seventeen were made on patients of less than fifteen years; most of these were quite young.

Primary tuberculosis is more frequent in the kidneys than in any other part of the urinary tract. It is more frequently descending

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* M. A. Couvelaire (Comptes-rend. de la Soc. d'Obst., Gyn., et Pæd., vol. iv. 1902) publishes a case of cystic degeneration of the kidneys, liver, and pancreas.

than ascending, and at first but one kidney is affected, afterwards both; it begins in the cortex, affects the base of the pyramids, and may terminate in abscess. There are enuresis and local continuous or paroxysmal pain; blood, pus, connective and elastic fibres are found in the urine, sometimes uric acid sediments or calculi. The diagnosis is difficult until bacilli are discovered. They are scarcely found except by centrifuging. Repeated examinations may be required. For the most careful and comprehensive presentation of the whole subject I advise to compare Fred. E. Sondern in Festschrift. Of fifty-four cases reported by S. M. Hamill (*Internat. Med. Journ.*, January, 1896) seventeen were operated upon; four nephrotomies cured two, improved one; one died. Nephrectomy was performed on nine; five were cured, one improved, three died. Nephrotomy and subsequently nephrectomy were performed on four; one died. Of Palet's one hundred and thirty-six nephrectomies only twenty-nine proved successful beyond a year's time. General antitubercular treatment with guaiacol, etc., should not be omitted. It is here that ammonium sulpho-ichthyolate is recommended. Of a solution in equal parts of water from ten to seventy drops (the latter to adults) were given three times a day.

Echinococcus and *hydronephrosis* furnish the usual indications. More than one-half of the latter are congenital, and therefore unfavorable. The secondary variety is caused by congenital hypertrophy of the bladder, pseudoplasms in the bladder or pelvis, calculi or abnormal valves obstructing a ureter, tuberculosis or shrinking, with partial obliteration, of the ureter, disease of the prostate gland and urethra and its neighborhood. Thus the prognosis of the causal treatment is very doubtful in most cases, and a direct surgical treatment—aspiration, drainage, and irritant injections—is demanded. A cystic tumor weighing three pounds was removed from a child of seven months by J. Campbell (*Br. Med. Journ.*, May 15, 1897). It was located in front of the left kidney, and contained three hundred grammes of a clear yellow fluid and a solid mass in which a cartilage and a piece of bone were embedded.

Most cases of *floating kidneys* in infants and children are congenital; in a few older children, of ten and twelve years, symptoms attributable to that anomaly originated in a fall or jump from a height. Fortunately, it is a rare occurrence in the first decade; still, I have met with at least a dozen such in the course of more than forty years. Among the dispositions I mention the large size of the adrenals and the congenital flatness of the paravertebral cavity, a flabby capsule and great length of the renal vessels, also a long,

narrow chest and generally weak muscles. Among the causes are rapid loss of fat, increased intra-abdominal pressure (cough, vomiting, constipation), trauma, and hydronephrosis. The right kidney is mostly affected, it being normally lower than the left. The left curvature of the colon is more closely attached to the ribs and less to the kidney. I never could advise anything better than a snug and well-fitting abdominal bandage. I have not seen a case in which I felt justified in advising an operation (nephropexy).

Among the symptoms connected with urinary disease there are two of such importance as to render a special consideration advisable, —viz., *hæmaturia* and *hæmoglobinuria*. The former is always the result of a rupture of blood-vessels, which may be occasioned by many causes. Hæmophilia furnishes a strong predisposition; so does heredity. Guthrie (*Lancet*, May 3, 1902) reports the occurrence during a number of years of hæmaturia in twelve members of a family. Calculus in a kidney or the bladder, nephritis and cystitis, neoplasms (mainly carcinoma, not often sarcoma), thrombosis of the renal vein, or infectious diseases, such as purpura, cerebro-spinal meningitis, and scurvy or malaria, are among the principal causes of hæmaturia. So is irritant medication with cantharides or turpentine. There are, besides, cases isolated, or recurrent, for which no tangible cause can be held responsible, not even sudden exposure of the surface or excessive amounts of uric acid or oxalates in the urine. The angioneurotic form I have not seen in a child. The indications furnished in renal hemorrhage by the presence of infectious diseases and thrombosis are clear, but the efficacy of the means considered appropriate is very doubtful. Stone in the kidneys requires flushing the organ with alkali according to the methods to be discussed below. The action of ergot or of hydrastis, either as a fluid or a solid extract, may be tried. If the stomach be rebellious the remedy may be administered in the rectum or subcutaneously. Heart stimulants are often indicated, but digitalis should not be selected, because of its possible local effect on the kidneys. Strophanthus or sparteine sulphate is preferable. Astringents such as are eliminated through the kidneys,—lead, gallic acid (eight to thirty grains = 0.5 to 2.0 daily),—with or without appropriate small doses of morphine, will render good service if given in more than the doses of the books. The temporary application of ice over the bleeding kidney is superior to any other remedy, even in the very young; it may be resorted to before or after the powerful derivant effect of a hot mustard-bath has been tried. Drop doses of adrenalin (Parke, Davis & Co.) may be given several times a day. Ten cubic centimetres (two and a half teaspoonfuls) of

a two-per-cent. solution of gelatin thoroughly sterilized may be used subcutaneously and repeated, also teaspoon doses of a ten-per-cent. solution internally, from time to time. Harrison (*Br. Med. Journ.*, 1896, No. 35) relieved hæmaturia by long incisions into the kidney. Israel's cases of the same kind have been in part successful. Even simple exposure of the kidney, and manipulation, had a similar effect in a number of cases.

Hæmoglobinuria, resulting from dissolution of blood-cells, is the occasional effect of extensive burns, overexertion, sudden exposure, intense cold, poisoning with potassic chlorate, phosphorus, and in scarlatina, syphilis, malaria, and sometimes paroxysmally without a tangible cause. In the urine, besides hæmoglobin, blood and casts may be found; in autopsies mostly blood in the capsule and in the canaliculi, besides detritus.

Nephritis, in the acute, subacute, and chronic forms, is a very frequent disease in infancy and childhood. There is an occasional hereditary tendency. Even in the newly-born it is not infrequent (*N. Y. Med. Journ.*, January 18, 1896). In these it is either congestive (from feeble circulation, congenital heart disease, asphyxia, or exposure to low temperatures), or obstructive (from the physiological rapid decomposition of the blood in the newly-born, the formation of hæmatoidin = bilirubin, from jaundice, from the production of methæmoglobin by potassium chlorate or by excessive heat, or from the presence of blood in the uriniferous tubes), or irritative (by uric acid or by hæmatoidin infarctions, by the presence of purpuric or other hemorrhages, or of microbes and toxins furnished by enteritis or by an infectious disease). As nephritis is not always primary, but quite often a secondary affection, it is liable to be overlooked until it is too late. When this excessive frequency is generally recognized, fatal results will become less common and prevention will be appreciated at its full value. The enumeration of the causes of nephritis will always be incomplete, but the list of those conditions and diseases leading to it comprehends the principal ailments of infancy and childhood. First of all, there are the acute infectious diseases: scarlatina, diphtheria, measles, rubella, varicella, vaccinia even, malaria, typhoid and cerebro-spinal fevers, amygdalitis ("tonsillitis"), parotitis, and pyæmia. No bacilli are required to cause a toxic nephritis; their toxins do it as well. Malaria is a frequent cause of nephritis in some countries or regions (Busey, *Am. Med. Asso.*, 1880): the South of the United States, the shores of the Baltic Sea and of the lower Danube. There are constitutional disorders, such as syphilis, purpura, and diabetes, also enteritis, extensive eczema, or impetigo, changes in the

superficial circulation resulting from sudden exposure, sometimes also from the persistent influence of a low temperature. The latter is not so ominous as the former. A fall into the water or exposure to a rain-storm may cause an acute nephritis (interstitial or hemorrhagic) which may prove fatal in a few days. The slow influence of cold temperatures is better borne, almost as well as compulsory overwork of a kidney (for instance, after the other has been removed). Stasis and thrombosis, depending on pulmonary and cardiac diseases and diarrhœa, have the same result. Irritation of the kidneys by medicinal agents also leads to nephritis; for instance, potassium chlorate, mineral acids, salicylic, carbolic, and pyrogallic acids, turpentine, naphtol, styrax, petroleum, tar,* large doses of lead, phosphorus, arsenic, mercury, and manganese,—part of which are used for internal, part for external medication; finally, irritation of the organ by the uric acid infarction of the newly-born, or by renal calculi, which are by no means rare in the very young, gives rise to inflammation. Most of these injurious substances exhibit their detrimental effect the more the younger the infants; in them a single external application of a solution of carbolic acid has sufficed to produce nephritis. The large number of causes of nephritis, as enumerated above, if heeded, teaches at least two lessons: first, that supine expectancy in the treatment of digestive and infectious diseases is very liable to become criminal; and, secondly, that the effect of every irritating remedy, both internal and external, must be carefully watched.

Nephritis should never be overlooked. Almost no diagnosis of any disease is complete without an examination of the urine. An elastic catheter is more easily introduced into the bladder of a male infant or child than into that of an adult, and in the other sex it is almost equally easy. If the catheter be not used, absorbent cotton will furnish a sufficient quantity of urine, or a rubber bag over the penis will secure it. The examination for albumin should never be omitted in a doubtful case or in any of the infectious diseases. Albuminuria should never be considered an indifferent matter, not even the "physiological" secretion of a faint trace of albumin in the newly-born. It certainly means an inefficiency of the glomerular epithelium. In nephritis of whatsoever origin it is one of the symptoms, no matter

* Balsam of Peru has also been charged with occasioning nephritis. Bräutigam and Nowack, after having made daily examinations of the urines of twenty-two patients, though administering internally fifty-two and eight-tenths grammes in eleven days and in another case eighty grammes in twenty-four days, found that it has no such detrimental effect, provided it be free of ethereal oils (Centralb. f. klin. Med., No. 7, 1890).

how trifling its amount in the chronic form, in which it may be absent for days or weeks. Toxins contained in the intestines will cause it; in many cases there is indicanuria at the same time. If the venous circulation is much obstructed during digestion, particularly when the efferent vessels of the renal territory are without valves, albuminuria may result. *Cyclic* albuminuria was first described by Pavy, 1885. It was given its name on account of its absence early in the morning (and late in the evening); as soon as the recumbent position is given up and the muscles become active, it reappears. As it points to some instability of glomerular circulation and to epithelial incompetency, it should not be made light of, for it may lead to nephritis. I think I have seen a good effect from gallic acid, which may be given a long time in daily doses of from eight to thirty grains (0.5 to 2.0).

When *acute* nephritis has been fully established, the first indication consists in the procuring of relief for the congestion of the kidneys. The child must be in bed, the skin warm. A hot-air bath, of a duration of from ten minutes to one hour, of the whole body with the exception of the face, will cause copious diaphoresis; a warm bath, with or without mustard, will fill the cutaneous blood-vessels and relieve the internal circulation; dry cups and hot poultices applied to the renal region will have a similar effect. The mucous membrane of the intestinal tract should be made to share in the action of the skin; therefore, magnesium sulphate should be administered in doses sufficient to produce three or four daily evacuations, or calomel in small doses frequently repeated. The arterial tension should be reduced by nitrites, particularly when there are cerebral symptoms; besides aconite in frequent one-quarter-drop doses, small doses of opium frequently given, or chloral hydrate may be tried for the same purpose. Digitalis should be avoided in acute cases, but when exhaustion is threatening, strophanthus or sparteine sulphate may be administered with the nitroglycerin. Potassium iodide acts favorably in the same direction; sodium sulpho-ichthyolate has been recommended for the same purpose by Senator, who gives to an adult pills containing from one decigramme (one and a half grains) to one gramme (fifteen grains) daily.

The greatest care must be bestowed on the diet of the patient. Whatever is irritating must be avoided; for instance, alcohol, spice, or iron. The food should be exclusively liquid, warm or hot, and compatible with the vulnerable condition of the kidneys. As the first products of the metamorphosis of albuminates are eliminated through these organs, and some of its products, such as phenol, creatin, and extractive materials in general, may become positively

poisonous, it follows that strongly nitrogenous foods—the opposite opinion of Oertel and Loewenmeyer and their followers notwithstanding—must be prohibited. No eggs should be given and, as a rule, no meat; now and then an exception may be made in favor of veal, spring lamb, chicken, fish, or oysters; but, as a rule, the diet in acute nephritis must be confined to milk and farinacea. Barley, wheat (stale bread), hominy, rice, and potatoes are permissible, also green vegetables and fruit. The beverage consists of water or an alkaline mineral water. Lemonade is permissible unless it interfere with the digestion of milk. Neither in the acute, nor subacute, nor chronic form of nephritis must muscular exertion be allowed, for this increases the metamorphosis of the albuminates. Moderate exercise, however, is not contraindicated in the chronic form; in the latter the elimination of albumin is not increased by exercise.

The surrounding air is to be fairly warm when the patient is in bed, quite warm when he is about. The function of the skin must not be suppressed; a moderate amount of perspiration is beneficial. Thus it is that there is constant indication for warm bathing and a warm climate, for both diminish the labor of the kidneys (as also of the lungs). As moist air interferes with the action of the skin, a dry climate is preferable. Hot bathing must be avoided except in the very beginning and in the occasional emergencies of uræmia.

Subacute nephritis, with its limpid and sometimes copious urine, changeable percentage of albumin, incidental œdema and gradual diminution of strength, occasional presence of arterial contraction and of cerebral symptoms, is often overlooked. It is a frequent sequela of scarlatina and diphtheria. Hot-air and hot-water baths, and iron, that is deposited in the epithelium of the uriniferous tubes (which is thereby subjected to premature elimination), should be avoided. Digitalis is contraindicated during high arterial tension; indeed, there are but few cases which permit its administration. Small doses of opium benefit the circulation in most cases of uræmia complicated with high arterial pressure; so do the nitrites (sodium nitrite from two to six grains (0.1 to 0.4) daily, nitroglycerin one-two-hundredth grain, more or less, several times a day, or the spirit of nitrous ether), chloral hydrate, and sparteine sulphate. Mercury in small doses (corrosive sublimate), from one-fifteenth to one-tenth grain (0.004 to 0.006), largely diluted (1 to 8000 or 10,000 at least), may be given daily, week after week, and may be combined, in afebrile cases *only,* with small doses of iron. The alleged irritation of the kidneys by mercury need not be feared in these doses and dilutions. The air should be warm, a dry, warm climate selected,

and a warm bath given every day, with gentle friction. Large quantities of water, both pure and alkaline, should be shunned, for the functional activity of the kidney must be diminished so far as compatible with a normal circulation and moderate metabolism. This rule is particularly stringent during the presence of local or general dropsy. Here the amount of liquid consumed ought not to be greater than the quantity of urine discharged. Mild diaphoretics and purgatives will also relieve the labor of the kidneys. When the amount of uric acid in the urine is persistently large (lithæmic disposition), sodium salicylate may be administered daily to the total (daily) amount of from ten to fifteen grains (0.6 to 1.0), or sodium bicarbonate in twice the doses.

Chronic nephritis is of frequent occurrence. The presence of occasional headaches, or of vomiting, or a slow convalescence from any ailment is suspicious, and calls for the examination of the urine. As albuminuria is not always present, and the amount of albumin very changeable, that examination must be repeated at short intervals and with the best methods; indeed, the use of the centrifuge reveals many a case of alleged trifling albuminuria, even of "transient" albuminuria, to be nephritis. That albuminuria should be differentiated from peptonuria (in the suppurations of empyema, bones, abdominal tumors, intestinal ulcerations, and in meningitis, sometimes in scurvy, rarely in syphilis, in phosphorus poisoning, and in acute rheumatism, also in leucocytosis of different origins) is self-understood; also that the albumin of pyelitis or pyelonephritis should not be mistaken for that of nephritis. The absence of dropsy or œdema proves nothing at all, particularly in the very young infant, in whom chronic nephritis without dropsy is a frequent occurrence after pleurisy, pneumonia, erysipelas, or in syphilis. Indeed, the most dangerous cases and complicated with uræmia are those in which no dropsical symptoms are apparent. Many a case of chronic nephritis could be prevented by the discovery of the acute or subacute stage preceding it, and by heeding its many causes. I have seen a number of cases complicating or rather depending on purpura, in which evidently the presence of small hemorrhages in the renal tissue gave rise to the initial irritation. In these cases the constant use of phosphorus (one-one-hundred-and-fiftieth grain twice or three times daily) during two or three months in succession added greatly to the final recovery.

Now and then a case of chronic nephritis will recover. The majority of those I have seen getting well took corrosive sublimate. The "poisonous" effect of the drug was not apparent in such cases, nor in any case where it was watched. Children of five years may

safely take one-fiftieth or one-sixtieth of a grain (0.001) in a tablespoonful of water three or four times daily for many weeks in succession. When its intermission is deemed advisable, or together with the mercury, potassium iodide may be given in doses of six or ten grains (0.4 or 0.6) daily. At the same time iron may be administered, the chloride (or one of the milder preparations), from ten to twenty drops of the tincture daily. A gentle stimulation of the kidneys by preparations of juniper or potassium bitartrate or citrate is advisable. Strong irritation of the kidneys must be avoided; digitalis is apt to do harm, except in complications with valvular lesions of the heart. To increase diuresis through strengthening the action of the heart, sparteine or caffeine renders better services; the latter, however, should be carefully avoided when there are any cerebral symptoms. Among the best diuretics, through relieving the heart while diminishing arterial tension, is nitroglycerin or other nitrites, the mildest of which is sweet spirit of nitre. Small doses of opium are often useful. In cases of obstinate vomiting it is often the only reliable remedy. Diuretin appears to act more on the renal epithelia, and may be given daily, in doses of from five to thirty grains (0.3 to 2.0), according to age.

The prognosis of chronic nephritis (and of many cases of the acute form) being bad or doubtful, the operative procedures advised by Harrison, Israel, and Edebohls deserve attention. Harrison divides the capsule in acute cases for the relief of symptoms and the prevention of chronicity; Israel in chronic nephritis for hæmaturia and renal colic; Edebohls removes the fat from the dissected capsule for the purpose of starting a collateral circulation.

The regulation of diet and hygiene is vital. No exposure to cold, no sudden changes of temperature; a warm and uniform climate. The chances of recovery diminish with the impossibility of obeying this rule. Sojourn in a hospital or refuge for the poor, as a makeshift. The proteids must be restricted, with the exception of milk. But it should not be forgotten that iron is almost absent from milk. That is why iron has always been recommended. Fruit and cereals contain it and should take the place of meat. Unfortunately (Van Noorden), the white meat contains almost as much extractive substance as the dark. Avoid alcohol.

Chronic nephritis may call for immediate and strong measures during some of its worst sequelæ. Uræmia (rarely preceded by aphasia, occasioned by the accumulation of urea in the blood, the presence of cerebral œdema and of arterial contraction and heightened blood-pressure, and by reflex irritation of the motory centres) results

in vomiting, diarrhœa, coma, and convulsions. Strong purgatives may be required at once (calomel, from five to ten grains; elaterium, one-twentieth grain; or croton oil, from one-twentieth to one-tenth grain every hour, to be followed by magnesium sulphate), or strong diaphoretics (hot-air bath, hot-water bath, hot-water pack, pilocarpine, subcutaneously, in doses of from a fifteenth to an eighth of a grain), and occasionally, when the symptoms of cerebral hyperæmia predominate, a few leeches to the septum narium (the preferable place) or the mastoid processes will save a case from imminent destruction. In older children a venesection may sometimes be required. If it is to be helpful it should not be deferred. When, however, much fluid is eliminated from the body through all these procedures, a new supply must be introduced either by the stomach or by the rectum. Injections into the subcutaneous tissue, or into a vein, of large quantities of sterile salt water may be life-saving. Other sequelæ or complications have each their own indications; œdema of the glottis cannot wait for the effect of the above medication, and demands either scarification, or tracheotomy, or intubation. Hydropericardium and hydrothorax require paracentesis when the symptoms are urgent. Ascites demands paracentesis to relieve dyspnœa and to facilitate the function of the abdominal viscera and of the circulatory organs. Quite often diuretics will begin their effect only after the pressure on the kidneys has been removed.

Hypertrophy of the left (and right) heart is in adults sometimes coördinate with chronic nephritis, in children it is almost exclusively secondary to it, "compensatory through the influence of the nervous system, also arterial change, irritated, it may be, by the later acquired toxic state of the blood due to defective renal function, but in part also to the primary cause which produced the primary renal disease, be it lead, gout, syphilis, alcohol, and the like" (Tyson in Festschrift).

The frequency of *renal calculi* has been alluded to before. Indeed, they are quite common, have been observed to occur in the fœtus, and give rise to many attacks of screaming, with dysuria, local pain, retraction of the testicles, to the occasional presence of pus, blood, and gravel in the urine, and to vomiting and convulsions. Most of them consist of uric acid, very few of oxalates, of cystin (several cases in a family), or of ammonium and magnesium phosphate, and derive their positive indications for treatment from their chemical composition. Unfortunately, however, the composition is mostly not uniform. Of forty-four cases of L. Spiegel (*Berl. kl. Woch.*, No. 27, 1900), two consisted of phosphates, one of uric

acid, one of xanthin, two of cystin, and the rest were of mixed consistency. Oxalates are frequent causes of stones in the kidneys of adults, rare in childhood. They are best dissolved by salts of magnesium, with a diet consisting of fish, fat, bread, rice, apples, and plenty of (soft) water. Calcareous deposits (carbonates or phosphates), which are found in the newly-born at the lower end of the straight canaliculi, near the papillæ, and also in epithelia, being whitish, have been mistaken for interstitial infiltrations. Calculi, however, are not exclusively anorganic. The first uric acid infarctions are covered with organic material, and the calculus is gradually formed of the mixture of both. Small hemorrhages also contribute to it. Indeed, hemorrhages may be both the results and the causes of calculi. Meckel spoke of a stone-forming catarrh in the kidneys, as we now know that a catarrh of the gall-bladder occasions the formation of gall-stones. Particularly in those cases which occur in gouty families the diet must be limited to a very small quantity of nitrogenous food. Meat may be permitted once a day, white rather more than black (see, however, p. 386). Celery, parsley, asparagus, and all irritants should be avoided. The patients should be encouraged to drink much water, alkaline waters to be preferred. All of these contain more sodium than potassium; this latter having a greater affinity to uric acid, potassium bicarbonate, in daily quantities of from ten to twenty grains (0.6 to 1.5), may be given in Seltzer, Vichy, Bethesda, Poland, or Waukesha water, large amounts of which ought to be administered. The natural lithia waters contain less lithia than the occasion calls for; the lithium carbonate taken during a day ought to amount to from three to eight grains (0.2 to 0.5). Thus the artificial lithia waters, if carefully prepared, are preferable to those furnished by nature. Piperazin (and lysidin) may be given in three daily doses of from two to five grains (0.125 to 0.3) each. Urotropin is credited with the greatest solvent powers of all. In the test-tube it certainly has them. I gave it a long time, at alternating periods, to a child of two years. Without it, the uric acid appeared in the urine as a powder, with it in copious accumulations of needles. Urea, in a five- or ten-per-cent. solution, from one-half to one teaspoonful three times a day, deserves a trial.

The presence of a stone in the kidney, besides giving rise to the symptoms enumerated above, may produce *renal catarrh*, and secondary *catarrh in the ureter* and the bladder. When it leads to *pyelitis* or *pyelonephritis*, the treatment directed against their cause should be continued. At the same time gallic acid in daily doses of from eight to twenty-five grains (0.5 to 1.5) should be given, and

balsamics (cubeb, copaiba) may be tried if the stomach permits. Methylene-blue (not pyoktanin) I have tried largely and persistently. It reduced neither the quantity of pus nor, whenever present, the alkalinity of the urine. In uncomplicated pyelitis the urine is apt to be acid. Saccharin deserves to be tried, from one to five grains daily. When the kidney is enlarged and pyæmia threatening, surgical interference is called for. Nephrotomy or nephrectomy may save life. Pyelitis, when resulting from tuberculosis, indicates nephrectomy as soon as the diagnosis is beyond doubt, and particularly when pus cocci are found, for they are more harmful than bacilli coli when causing pyelitis.

2. *The Bladder.*

Of *cystitis,* infancy and childhood exhibit every possible form, from the catarrhal to the ulcerous or diphtheritic; the tuberculous form is very rare in children. It is, however, more frequent than Ashby is willing to admit. Exposure to low temperatures, chilling of the parts by sitting on cold stones or wet grass, trauma, vulvo-vaginitis, the immigration of bacterium coli mainly during and after follicular enteritis, the administration of cantharides or other irritants, the drinking of beer, severe indigestion, constitutional diseases, such as pneumonia, gastro-enteritis, meningitis, typhoid fever, variola, or diphtheria, and the presence of stone in the bladder are just as many causes. Dysuria, retention or incontinence, vesical and rectal tenesmus, the presence of mucus, pus, and blood in the urine, fever, and secondary peritonitis or "typhoid" symptoms are among the possibilities. Trauma demands absolute rest in bed, and either cold or warm applications, besides opium, which may be administered internally or in suppositories; exposure ("cold"): warm bathing, diuretics and a narcotic; the cystitis of infectious fevers: rest in bed and tonics; that following the use of cantharides (administered internally or in vesicatories): from two to ten grains of camphor (0.125 to 0.6) daily, internally; severe indigestion: the correction of the alimentary disturbances by abstinence, purgatives, and plenty of water; hyperacidity of the urine: the use of alkaline waters; hyperalkalinity: that of hydrochloric acid; vesical calculus: its removal, preferably by the suprapubic operation. In most cases the patient ought to be kept in bed, apply warm poultices, drink plenty of carbonated alkaline water, abstain from cold beverages, live mostly on milk and farinaceous food, keep his body warm, particularly abdomen and feet, take a dose of calomel, and an opiate for occasional relief. But by far the best symptomatic remedy in the spasmodic pain of cystitis is hyoscyamus; from two to four grains (0.125 to 0.25) of

the extract may be taken daily for an indefinite period. The chronic cases of children of from three to six years require the internal use of boracic acid or potassium chlorate (from fifteen to thirty grains daily), turpentine, gallic or tannic acid, uva ursi, and salol or salicylates; the latter if there be no nephritis at the same time. Urotropin in daily doses of from ten to thirty grains (0.6 to 2.0) is highly extolled. In a number of instances the local treatment of the bladder is indispensable; the bladder may be washed out with sterilized warm water, or salt solution (6 to 1000), or a warm solution of boracic acid (two or three per cent.), or silver nitrate (one-quarter or one-half of one per cent.), or lysol (one-quarter of one per cent.). The silver nitrate irrigations should always be preceded and followed by those of warm water (not salt water), which are to be continued until it returns clear. This procedure requires sometimes, particularly in young children, anæsthesia by chloroform.

Some of the symptoms met with in cystitis may occur without the presence of the latter. Painful *spasm* during micturition, *retention* of the urine, or *incontinence* is very frequent under the influence of quite a number of different conditions; it is upon the causes that the treatment depends. Retention may be caused by a chronic spasm of the sphincter muscle, as in congenital or acquired stenosis. That, as well as paralysis of the bladder, may lead to retention, dilatation, and residual urine, with cystitis. Such a congenital stenosis bears the same relation to the bladder as the congenital stenosis (spastic or organic) of the pylorus to the stomach. The urine may contain besides a superabundance of uric acid, salts or bile, or irritants of a nature which cannot always be determined accurately. Thus, urticaria of the surface, when resulting from ingesta, is quite often complicated with vesical spasm, so that it appears that the same cause acts simultaneously on the external and internal integuments. *Dysuria* may also depend upon a painful condition of the urethra resulting from acidity of the urine, or the transmission of a vulvo-vaginitis, or congenital contraction of the urethral orifice, or adhesion (mostly acquired) of the labia majora, which is easily corrected, or a balanitis resulting from the irritating effect of urine retained round the glans penis by phimosis. The indications for treatment in all of these cases are so plain that the enumeration of the etiological factors seems to be sufficient. There are also cases of *irritable bladder,* as well in the young as in the adult, in which the result of the treatment gives sometimes the explanation of the cause. In a few cases the introduction of a catheter was sufficient to relieve the spasm of the neck, in others the administration of hyoscyamus proved satisfactory

(from one to three or four grains daily, according to age), or camphor with hyoscyamus or opium, or monobromated camphor, from two to eight grains (0.125 to 0.5) daily. A sufficient dose of codeine for the night. But the diagnosis of "irritable bladder" is too often made to cover ignorance of local diagnosis.

Retention of urine by local atony and paralysis is rare in children, except as the result of hyperextension during school hours; still, it may occur in the course of spinal diseases. Now and then there are mechanical obstacles. In the newly-born the colliculus seminalis is often quite large and requires the introduction of a sound. Large stones in the bladder, or a smaller one near the neck, or one impacted in the urethra, or a string tied round the penis and buried in the swollen tissue, or the epithelial closure of the urethral orifice, or an œdematous prepuce are more or less amenable to a diagnosis and speedy amelioration. The injection of warm or cold water into the bladder, warm bathing or hip-bath, the correction of the epithelial adhesion of the prepuce, and the use of the catheter or sound find their ready indications. Retention during infectious or cerebral diseases requires great attention. Unconsciousness is a frequent cause, and frequent percussion of the bladder ought to be resorted to when the brain becomes insensible to the expansion of the organ.

Evidently the causes of retention are very numerous; one of the most puzzling cases was that in which the accumulation of urine was very great. The introduction of an elastic catheter, though it entered to its full length, availed nothing; a metal catheter entered with difficulty until it suddenly appeared to overcome an impediment and the urine was expelled with great force. The autopsy gave the explanation of the singular occurrence. The whole bladder was lined with a thick diphtheritic membrane, which was easily detached but did not admit the elastic catheter. This was deflected along the wall of the bladder, while the silver catheter succeeded in perforating the pseudo-membrane of the diphtheritic cystitis.

The great variety of the causes of *incontinence of urine* requires tact and discrimination in the election of remedies. If there be an excess of urine, its cause (diabetes, brain disease) should be looked after. General anæmia and muscular debility, rhachitis, and tuberculosis indicate a diet carefully selected for its nutritiousness and digestibility. Gentle massage of the whole body, sponging with alcohol and water (1 to 6) or with water, and efficient friction with thick towels, sea-bathing, and the use of medicinal roborants, such as iron or arsenous acid, will always prove beneficial. The elixir pepsini, bismuthi, et strychninæ of the National Formulary is a good prepara-

tion in insufficient gastric digestion, with atony of the stomach; a child of three years may take a teaspoonful three times a day. Many a case, mainly in neurotic families, requires persistent treatment for neurasthenia; several continued to adolescence, and could not be cured until the young women were sent to strangers, away from the influence of their neurotic families. Many a case of incontinence, however, that appears to be functional only, is really the organic result of a local cystitis or urethritis (Fr. Bierhoff in Festschrift).

Attention should be paid to the capacity of the bladder. In every case, particularly in the evening, the quantity of fluids allowed should be restricted. The sigmoid flexure and the rectum should be empty at night, and the patient should be encouraged to evacuate both bladder and rectum before retiring. After a few hours' sleep the children ought to be taken up and roused sufficiently for both purposes.

Muscular debility of the neck of the bladder (sphincter) requires general and local stimulation. The child should be encouraged to hold the urine as long as possible. Strychnine or other preparations of nux vomica prove effective to a certain extent by improving both the general innervation and the appetite; in desperate cases an occasional subcutaneous injection into the perineum (from one-fortieth to one-sixteenth grain) has rendered good service; an ointment of one part of extract of nux vomica in from ten to sixteen parts of fat, introduced into the rectum (size of a coffee or lima bean) several times daily, will also act well and may be continued for some time. The same indication is fulfilled by ergot, the fluid or the solid extract of which may be employed internally. The interrupted electrical current is perhaps the most powerful local stimulant; one of the electrodes is applied to the perineum, the other to the hypogastrium or the lumbar region. Maybe the psychic effect of the application is as effective as the current itself. The advice to apply the negative pole to the interior of the urethra or bladder and the positive somewhere externally is bad because of the danger of urethritis and cystitis. It is particularly in those cases in which the sphincter is liable to be overcome that the raising of the pelvis (by pillows, by raising the foot of the bed) has been recommended. The method is quite clever from a mechanical point of view, but the patients are not patient enough to sleep that way.

Whenever there is oxalic acid or sugar, or an excess of urates and phosphates, or bacteria in the urine, the source of the disturbance should be attended to. Excess of uric acid (uricémie, Jules Comby in Festschrift) is often found in gouty, obese, asthmatic, diabetic, or neurotic families. A moderate diet of white meat, fish, eggs, milk,

farinacea, and fruit is recommended. No constipation must be permitted. Much water (alkaline) and hygiene of the skin (cold water). The digestive disorders forming the source of the anomalous condition require a corresponding change in the diet (diminution of nitrogenous food) or correction of the functional disorders of the stomach and liver by dilute hydrochloric or nitrohydrochloric acid and an occasional purgative. Until that can be accomplished the prognosis is very uncertain. Vesical catarrh, nephritis, and the presence of a calculus in either the kidney or the bladder have their own indications. From the latter it is removed by the suprapubic operation. The hyperæsthesia of the body of the bladder, complicated or not with catarrh,—it is often found without it,—requires belladonna or its alkaloid. Both belladonna and atropine are tolerated in much larger doses by children, in proportion to their size or age, than by adults. In many cases a single evening dose of extract of belladonna (gr. ¼ to ¾ to 1 = 0.015 to 0.06) or atropine sulphate (one-one-hundredth to one-seventy-fifth) answers well, sometimes to an unexpected degree. Potassium bromide (grs. 6 to 25 = 0.4 to 1.75), chloral hydrate (grs. 2 to 10 = 0.1 to 0.6), camphor (grs. 2 to 5 = 0.125 to 0.3), extract. humuli fluidum (minims 4 to 10), the elixir humuli of the National Formulary, in teaspoonful doses, given at bedtime, or tinct. rhois aromat., from ten to fifteen drops several times a day, answers a similar purpose.

Causes of *reflex contraction* located in the vagina, penis, or rectum require local correction. Vaginal catarrh is as obstinate because of its inaccessibility as it is frequent. Polypoid excrescences about the vagina or in the urethra (of the female) demand removal; if there be phimosis, circumcision is required. But a great many cases which are presented for that purpose can easily be remedied by gentle dilatation of the prepuce. Firm adhesion of the prepuce requires careful detaching. Pruritus of the sore surface, depending on rancid smegma or decomposing remnants of urine, requires bathing, cleanliness in general, and boric acid powder. Intestinal worms must be expelled, and the fact remembered that oxyuris has its original seat in the upper part of the colon and the lower part of the ileum, so that rectal injections have but a temporary effect in most cases. Fissure of the rectum, mostly of small size and located posteriorly, requires forcible dilatation,—a procedure which demands little time and generally no anæsthetic, but is very efficient.

Irritability of the neck of the bladder and the prostatic part of the urethra has been treated by Henry Thompson with cauterization by means of a two-per-cent. solution of silver nitrate. A solution of one

part in a thousand of distilled water will be found sufficient, or a solution of one or two parts of tannin or alum in a hundred. General urethritis does well with protargol (from one-half- to two-per-cent.) irrigations. Still, it is a better plan to introduce either an elastic catheter or a metal sound into the bladder, every few days, for two or four minutes. A few drops of a two- or three-per-cent. cocaine muriate solution instilled into and distributed in the urethra a few minutes before the insertion of the instrument will in many cases render general anæsthesia superfluous. The latter, however, cannot always be dispensed with. In the case of a girl of three years, with chronic catarrh of the bladder and incontinence, anæsthesia was required a dozen times, for two purposes,—first, to inject a solution of silver nitrate (1 to 1000) into the bladder, and, secondly, to dilate forcibly, with increasing amounts of water, the organ, which had habituated itself not to hold more than a few drachms of fluid at a time. This forced dilatation under anæsthesia I had to resort to in several cases, with fair results.

Masturbation, which is so frequently the cause of irritation of the prostatic portion and thereby of incontinence, has its own indications (p. 403). Bodily punishment will avail but little in the treatment of incontinence from whatsoever cause, except in the diurnal form, when the boy refuses to give up his game, being either too much interested or too indolent.

In a number of cases the removal of adenoid growths or the resection of greatly hypertrophied tonsils has relieved incontinence (F. Huber and others).

Tumors of the bladder (sarcoma, myxosarcoma, fibroma, dermoid) require suprapubic extirpation. The suprapubic operation has also superseded lithotrity in *vesical calculus* (incontinence or retention, sometimes sudden interruption of micturition, pain in rectum, perineum, or glans penis, rarely hæmaturia or cystitis).

3. *Other Organs: Anomalies and Diseases.*

The development of the genital organs begins in the sixth week of embryonic life; that of the urorectal septum, by which the urethra of the penis is formed, about the middle of the third month. About the same time the anterior part of the urethra is developed by the invagination of the epidermoid integument of the glans penis. This invagination extends backward to the valvula Guérin in the fossa navicularis. Here, where the two parts of the urethra are to meet, the opportunity is furnished for the occurrence of many anomalies.

The invagination may not take place at all. In that case there

is no indication of an anterior urethra. There may be a superficial epithelial obstruction of the urethra after it has been formed, with retention of urine behind it; or a partial contraction or narrowness of the external orifice, particularly in cases of genuine phimosis; or a genuine stricture in the pars cavernosa, of which instances have been reported by Guyon, Englisch, and Demme; or an extensive obstruction mostly complicated with rectal anomalies, and retention of urine, dilatation of the ureters and renal pelves; or, finally (in a few reported cases), obstruction of the neck of the bladder, with the same disturbances unless the urachus be forcibly kept open.

The emission of urine begins about the middle of fœtal life. Sometimes the connection of the two parts of the urethra has not been established; in that case there is a dilatation behind the fossa navicularis with a constantly growing lake of urine. Its pressure may succeed in breaking through the obstacle with or without the formation of a valve, or it will burst the lower wall of the urethra behind the obstacle and cause a mild form of hypospadias. If the urethra be perforated farther back, the hypospadias may be scrotal or perineal. That hypospadias may occur in this way, and not only by an arrest of development, is proven by the occurrence of cicatrices and such contraction as depends on cicatrization only.

Many of these anomalies are the subjects of surgical interference. Fortunately, all of them are rare, as the careful reports gathered by Kauffmann in "Deutsche Chirurgie," and Bohn in "Gerhardt's Manual" will prove. A double urethra was described by Englisch (1895). *Epithelial obstruction* of the external orifice can be remedied by puncturing and dilatation; one such case I have seen thirty-five years ago, and never since. *Membranous obstruction* in the fossa navicularis has been pierced; even a case of fœtal *imperforation of the whole glans penis* has been perforated by Rauchfuss with apparent success. Congenital *strictures* have been treated with bougies. The narrow orifices of *hypospadias* should be dilated with bougies, or the knife, or both, and laminaria tents used to render the effect permanent. And hypospadias has been greatly benefited by operative procedures, with better success in modern times than the plastic operations of Dieffenbach could boast of (Carl Beck).

The *prepuce* begins to be evolved about the end of the third and the beginning of the fourth month of embryonic life. Within a month afterwards it extends to the middle of the glans. Its covering epithelia are pavement. They form from six to eight superjacent layers, and extend as far as the urethra and sometimes into the fossa navicularis. They also constitute the more or less numerous accu-

mulations, principally near the corona glandis, which were formerly taken to be fat, the so-called epithelial pearls. They are met with as early as the fifth month of fœtal life. They are sometimes so large as to raise the adjoining part of the prepuce from the surface of the glans and to form small cavities around themselves, thus contributing to the spontaneous separation of the *preputial adhesions.*

These adhesions are vastly more frequently soft agglutinations than solid unions. The causation is simple: as the prepuce and glans are in close juxtaposition, the epithelia of both remain moist, and thus become coherent. It is only in those cases in which the prepuce does not snugly cover the glans—for instance, in hypospadias and epispadias—that no, or but partial, cohesion takes place. There are cases, however, in which the union of the two surfaces becomes quite firm, partly in consequence of the occurrence of an inflammatory exudation, and partly because of the existence of an extraordinary number of superficial papillæ, which, according to Englisch, grasp and join one another. Thus the soft cohesion of the prepuce and glans penis is a physiological condition, and therefore met with in almost every male child. The degree, however, to which it is developed is liable to differ. The prepuce of the newly-born being long, it may cover the whole glans down to the orifice of the urethra, and then by its overlapping adhesion give rise to retention of urine, and, in consequence of irritation by urine, and of the traction invariably connected with the slightest changes in the shape of the organ during micturition, to pain, redness, muco-purulent secretion, sometimes moderate extravasation, and erections which again produce a local irritation of the surface. It is the erections, when frequently repeated, and when occurring more normally in later years, combined with the effects of the cavities formed round the epithelial pearls, which usher in the gradual and final separation of the prepuce from the glans penis. That process takes place between about the ninth and thirteenth years of life. Thus, in the vast majority of cases, no interference is required. The more gradual the separation takes place the safer it proves. It is only artificial disjunction which may become a danger by secondary changes. The only reasons for interference are retention of urine and balanitis, both of which are often found together. In most cases the separation is accomplished quite easily by holding the glans gently but firmly between the fingers and pushing or pulling the prepuce in the direction of the corona. Towards the end of the operation the pearls make their appearance; the separation, however, must be completed without interfering with them, and the prepuce then carried forward again to avoid paraphimosis; for there will be

some slight œdema by which the latter might be occasioned. Before that is done, the application of vaseline, or zinc or lead ointment, or a dust of boracic acid, or bismuth subcarbonate, or a mixture of one part of salicylic acid, fifteen of bismuth, and twenty of talcum, is advisable. Carbolic acid is contraindicated because of its tendency to facilitate bleeding, though that be ever so slight. In most cases it is best not to repeat the procedure for some time, in order not to disturb the healing and hardening process. Every wound or tear may bring on cicatrization and secondary phimosis. In some cases the separation does not take place quite readily; in them a blunt probe introduced between the two layers will overcome the obstacle. Probe and fingers will succeed, if care and time be taken, not only in accomplishing the end in view, but also in avoiding tearing, bleeding, œdema, and inflammation. The occurrence of cicatrization is always a serious matter. I have succeeded without it in many more cases than I could take notes of; for the number of cases in which the medical man is consulted in reference to the advisability of circumcision—which is one of the modern onslaughts upon the genito-urinary organs—is very great. Twenty-nine out of thirty alleged cases of unconquerable phimosis are exactly of the kind in which a patient reduction and separation prevent both a surgical operation and a surgical fee. The solid cohesion which requires the use of the knife and a careful and expert operation is very rare; I have seen but few that were complete in a lifetime. I cannot imagine that a total synechia is curable without a plastic operation or, better still, the total removal of the prepuce after its separation; for new adhesion must follow the operative separation in the absence of mucous membrane.

From what I have said it follows that we cannot recognize the existence of an actual *phimosis* in the young before an attempt has been made to relieve the epithelial agglutination. The actual cases may exhibit a long or a short prepuce, be partial or total, congenital or acquired, atrophic or hypertrophic. The latter species is often dependent on changes in the internal lamina of the prepuce, which, when originally contracted and tight, is subject to inflammatory and exudative processes; the atrophic form is due more frequently to a defective development of the integument, which thereby becomes attenuated. Both of these forms are liable to be congenital, and either is found as well among infants and children as in later life. The degree of the phimosis depends upon the development of these anomalies, and also upon the degree of the presence of the elastic layer described by Reiner and situated between the two laminæ of the prepuce.

Phimosis may be acquired by pathological changes of the tissue depending on accidental morbid processes. Dropsy may so swell the prepuce as to result in it. The frænulum, congenitally short or otherwise, may suppurate and cicatrize. Inflammation and ulceration from whatever cause, irritation and tears following inconsiderate or unsuccessful attempts at separating epithelial adhesions, and the cicatrization of circumcision wounds are apt to render the edges of the prepuce unduly rigid.

The symptoms of phimosis may be both local and general. Irritation by contact with urine and pouching of the prepuce by mechanical retention are quite frequent. Smegma becomes rancid when the original epithelial adhesion has been separated. Retention of urine, or incontinence, or both combined, is often met with. The former and the spastic dysuria produced thereby result in straining, vesical symptoms resembling those met with in vesical calculus, prolapsus of the rectum with more or less constant tenesmus, the protrusion of hernia, and the formation of struma. Like balanitis, which is frequent, cystitis and hæmaturia will occur. The local irritation gives rise to erection, sexual excitement, and masturbation in the youngest of infants. Headaches are said to be frequent but mostly temporary, and permanent nervous symptoms in great numbers have been attributed to phimosis. It has become quite customary, though less so to-day than ten years ago, to attribute severe nervous derangements to it. A London neurologist has gone so far as to make the statement that in twenty-five cases of epilepsy he found congenital phimosis eleven times. Probably it was the spurious variety of "phimosis," which may be reduced. The so-called reflex paralysis from genito-urinary causes has played and is still playing an important (?) part in American pathology. Numerous cases of infantile poliomyelitis and cerebral paralysis, spastic paraplegia and paralysis, chorea, epilepsy, contractures, and idiocy have been explained (?) by the presence of phimosis. The numerous cases alluded to above of alleged phimosis, in which the separation of the preputial adhesion and apparent phimosis was easily accomplished, were frequently such as had been condemned to be operated upon for a serious spinal or cerebral disease. There was a time when, in a New York medical society, one of the sponsors of the theory of genito-urinary reflex paralysis and consecutive poliomyelitis related cases of contracture and convulsions. When reminded that his cases were convulsive and not paralytic, he retorted that he was no physiological theorist, but he cured his patients. In another meeting, years afterwards, I stated that I had never seen a case that

obliged me to assume a causal connection between paralysis or contraction on the one hand and phimosis on the other, and was sustained by neurologists of rank, who also denied ever having seen a case which necessitated the assumption of a genito-urinary etiology. Still, the bugbear is alive, many a prepuce is sacrificed, many a fee pocketed, many a diagnosis not made, and many a case either procrastinated or not cured.

Most instances of moderate phimosis are best treated by the gentle method of gradual retraction, some are improved by the normal erection occasioned by micturition and other causes. For these reasons dozens of years ago an experienced pediatric surgeon (Guersant) stated that he seldom operated for phimosis before the fourth or fifth year. Forcible dilatation, if resulting in fissures of the edge, must be frequently repeated to avoid hard cicatrization and consecutive contraction. Many such cases, however, are served better by circumcision. Those which are not amenable to mechanical treatment require the knife. The incision of the inner lamina alone, which has been recommended, is very apt to be incomplete, though painful, and to lead to swelling and imperfect results. The atrophic variety requires a dorsal incision by either a knife, carried on a director, or a pair of scissors; the inner lamina is often not thoroughly divided, and requires the repetition of the incision; when the scissors cannot be carried over the whole length of the glans, it has become necessary to first cut down on the corona glandis to enable the operator to carry the scissors over the entire length. The cut edges are mostly subjected to Kocher's continuous suture, and the whole surface treated antiseptically with bismuth (dermatol) and an aseptic dressing kept moist with a mild antiseptic, boric or boro-salicylic (Thiersch's) solution. Iodoform and carbolic acid should be avoided. The lower corners are mostly rounded off. This is particularly necessary in the cases of hypertrophic phimosis which are subjected to the same surgical treatment. Most of this class, however, demand complete circumcision, care being taken that more is removed of the dorsal prepuce than of the opposite side, that the inner lamina is separately divided afterwards, and that the epithelial adhesion is carefully separated. The prepuce must be drawn forward sufficiently to protect the glans against being injured; more than once I have seen it mutilated. In one case the mutilated glans became infected with diphtheria. The wound must be sutured and treated antiseptically. One of the saddest cases of my whole life, and one of persistent distress, was the death from erysipelas from that simple operation performed on a boy of three years. Infections of circumcision wounds by bacteric poisons

are quite frequent; cases of diphtheritic invasions I have published in my treatise on diphtheria (1880), and before that in the second volume of "Gerhardt's Manual" (1876); many more I have seen since; and syphilis and tuberculosis have been known to follow many instances of either surgical or, more frequently, ritual circumcision.

Diphtheria of the prepuce, or rather of the genito-urinary organs in general, the female included, may occur as an originally local affection —such as those alluded to—or as a part of the general infectious diseases. The latter are mainly diphtheria, scarlatina, and measles. The last named is the very malady which appears to predispose the system to the most vehement forms of local invasions. The *aphthous vulvitis* of little girls, and noma, are mostly found after measles; and diphtheria, when found after the same eruption, is more apt to destroy life, with general symptoms, than under ordinary circumstances. In many cases of localized diphtheria, however, the constitutional symptoms are but few, provided effective local treatment is immediately resorted to. Absolute cleanliness of the parts (sponging and bathing) is first in order; after that, local disinfection. Applications of lime-water will suffice for mild cases; solutions of one or two parts of zinc sulphocarbolate in one hundred of water, or from one- to five-per-cent. solutions of aluminum aceto-tartrate in water, will act well. These two may be used to advantage as a vaginal injection in the case of the smallest girls. The nozzle of a small hard-rubber or glass syringe should be lengthened by a thin India-rubber tube, from half an inch to an inch long, which passes the hymen easily and permits an irrigation of the otherwise inaccessible parts. In many cases solutions of mercuric bichloride proved successful: for occasional applications, of one in from three to five hundred of water; for frequent use, of one in from two to five thousand. In exceptional cases, however, it is not well borne and frets the surface. Iodoform as a powder, or in from eight to fifteen parts of vaseline, has rendered very effective services. Boracic acid avails but little.

Noma of the vulva and vagina requires more determined local treatment, besides assiduous roborant and stimulant administrations. Mineral acids in full strength or strong solutions of corrosive sublimate have proved efficient in many cases in which the progress of the disease was not too rapid. I have had most successes with the actual cautery. Pyoktanin, when used in cases of noma of the face and of the vulva, was absolutely worthless.

Paraphimosis results from manipulation. The separation of the epithelial congenital adhesion and the dilatation of a phimosis are liable to be followed by œdematous swelling. In both cases the pre-

puce should be replaced over the glans. If that be omitted, the prepuce—relatively long in the child—will swell, and may become gangrenous. Fortunately, the penis itself is not often drawn into that process. For the purpose of reduction, the glans penis, which is considerably swelled, is persistently compressed while the prepuce is drawn forward. A good deal of force is sometimes required, and not infrequently an anæsthetic. Sometimes gradual compression by bandages (cotton or rubber) must precede the attempt at reduction; in some cases, however, a careful incision of the prepuce, the more careful when no director can be introduced between the glans and prepuce, is unavoidable to relieve the constriction.

The treatment of the more common forms of *balanitis* and *balano-posthitis,* occasioned by the decomposition of smegma, or by masturbation, or gonorrhœa, or trauma, such as the constriction of the organ by a string, is not always quite simple. When there is much œdema it may become necessary to incise the prepuce to get at the sore surface. In most cases, however, astringent or disinfectant solutions can readily be applied either directly or through a small syringe. Solutions of lead acetate, zinc sulphate, alum, tannin, zinc sulphocarbolate, or aluminum aceto-tartrate can be employed in different strengths, also potassium permanganate (1 to 1000 or 3000). Among the poor, when assiduous attention is out of the question, ointments or powders are preferable. Ointments for this purpose are best made with vaseline. Warm bathing and sponging with moist absorbent cotton will improve the chances of a rapid recovery.

A similar local treatment is adapted to the *vulvar and vaginal catarrh* of both the adult and the infant or child. It is very common among the latter, and quite obstinate because of the comparative inaccessibility of the parts, no matter whether the catarrh is simple or specific. The latter occurs even in the newly-born; the causes of the former are very various. A predisposition may depend on that structural debility, with chronic inflammation of most tissues, which we are in the habit of calling scrofulous. Local exposure to cold, sitting on house-stoops, the irritation brought on by masturbation or by foreign bodies,—mud, cotton, carpet-fuzz, glass, wood, all of which I have found in the narrowest vaginæ; also oxyuris emigrating from the rectum, the use of soiled cloths and towels, and the gross neglect of the most urgent cleanliness, with the possibility of directly importing bacteria coli, are among the most frequent causes of vaginal catarrh. Specific vaginal catarrh (gonorrhœal colpitis with its diplococcus and others) is by no means rare. The infection, though most often indirect, and conveyed by towels, bed-sheets, but

also by immediate bodily contact (mostly in institutions which furnish those cases in large numbers as a dispensation of providence), frequently gives rise, even in the smallest children, to glandular swellings, endometritis, parametritis, salpingitis, oöphoritis, and peritonitis, also to urethritis, though the latter appears to be less common in children than in adults. Endometritis with its results is liable to be very obstinate; for while the cervix is growing in length up to the fifth year, the endometrium remains folded upon itself many times. Only between the ninth and tenth years (not always then, so that dysmenorrhœa may depend upon this infant condition of the uterus) are these folds smoothed out. Thus the great danger of a gonorrhœal endometritis becomes evident. The treatment of urethritis is not necessary when (as happens frequently) the urethra takes no part in the gonorrhœa of the vagina. That contagion should take place through the air, according to Bouchard, I have never been able to observe. Besides the local treatment, in conformity with the details given above, absolute cleanliness of the body and clothing and frequent (general and hip) baths are required. Masturbation must be guarded against and foreign bodies sought out and removed. Rectal oxyurides require injections with water, vinegar and water, garlic decoctions, or cod-liver oil. They must be resumed after an intermission of weeks because of the repeated immigration into the rectum from the upper parts of the intestine, where the nematoid has its habitat. In gonorrhœal cases the transmission of the virus to the eyes and to other persons must be guarded against. To reach the recesses of the vagina, partial or total removal of the hymen has been advised; but I have met with no such brutal indication. Besides the solutions enumerated above, silver nitrate has been advised. I have used it, in solutions of one in from five hundred to a thousand, in a number of cases of ulcerative catarrh, also argonin in from one- to three-per-cent., or protargol in one- to two- or more per-cent. solutions. In some the restitution of the superficial losses of substance appeared to be more rapid. In stronger solutions and solid it has been employed in tubercular ulcerations, in reference to which I have no experience. In many cases of vaginal catarrh the surrounding parts are sore and suppurating, or eczematous. Lead or bismuth ointments, or bismuth powder, with or without salicylic acid, will effect a cure in that complication.

A frequent result of vaginal catarrh of long standing is a moderate degree of *atresia* of the vagina. It is usually of a superficial character only, and can be remedied by tearing the adhesion with both hands, or by piercing with a probe and dilating the artificial

opening. Astringent applications, or those of dermatol ointment (1 to 6 or 8), will prevent the renewal of the closure. Diphtheritic inflammation of the vulva and vagina I have known to result in pretty firm occlusion. In one case the reopening required some force and the continued use of bougies and astringent applications to prevent a repetition of the union. The *imperforate condition of the hymen,* mostly congenital, is often the same process of epithelial and inflammatory cohesion accomplished during fœtal life. According to its early or later formation, and according to the presence or absence of vaginal complications, it requires either the probe or the knife. Such a complication is mostly the result of either an arrest of development or an inflammatory malformation. An early adhesive inflammation of the vagina will obstruct it in its entire length, or a transverse obstruction of the ducts of Müller may result in an absence of the vagina below the external os uteri.

Vaginal hemorrhage of a mild degree has been observed in the newly-born, without any complication, least so with bleeding from other organs. It is mostly very slight. In masturbating infants and children, and in some of those who suffer from a severe vaginal catarrh, some blood may be noticed. It requires no special treatment; nor was there an indication or an opportunity to interfere in the very rare cases of genuine menstruation in the very young which have been reported.

In connection with vaginal catarrh I mentioned *masturbation* as one of the causes. Still, it is not only a cause in some cases; in many others it is its effect. Indeed, masturbation is so frequent that a few words on the subject may be deemed permissible at this place, in addition to my former discussion of the subject (*Arch. Ped.,* April, 1890, and *Amer. Journ. Dis. Ch. and Women,* 1875). That habit, like its precursor, the sucking of fingers, often semi-conscious, is very frequent in infants and children; more in girls of the earliest infancy, more in boys of advancing years, and there is a variety of causes leading to it. Such are local irritation (sometimes by nurses) of the genitals in the very youngest, excitation in those older, feather-beds, excess of animal food and stimulating beverages, rancid smegma under a long or a narrow prepuce, eruptions on the penis, vaginal and vesical catarrh, renal calculi, cryptorchis, preputial adhesion, phimosis, oxyuris, and constipation. Among remedies, I recommend the relief of the causes as enumerated and partly alluded to on previous pages: cooling diet and cool coverings, attention to the kidneys, bladder, and rectum, relief of external irritation caused by clothing, mainly by misfit trousers, immediate removal from the bed

upon awakening, no sleeping with bedfellows, cold bathing and sponging, mechanical prevention, and timely punishment. Long school hours and study, without long recesses, should be avoided. Allow no child to remain in his seat during recess; see that he has his hands on the table and that his body is visible. Give him no side pocket in his trousers. Teach him with an occasional remark, but do not harp on the subject to any length. Watch protracted convalescence with its constant lying abed while awake. Those who ride on horseback or on the bicycle should be watched; some will have erections at once. Goltz places the erection centre about the fourth lumbar vertebra, others in the pedunculi cerebri and medulla oblongata. When there is a central disease, treatment may be useless. Even operations like clitoridectomy, or the application of vesicatories, have no effect on them. A girl of nine years was masturbating almost constantly by directing her mind to her voluptuous sensations, and admitted that she would not stop. Such bad cases cannot be reached by medication. It consists in ample doses of camphor, monobromated camphor, lupulin, bromides; also in a sufficient dose of chloral hydrate for children that sleep interruptedly (hypnotism?).

Cryptorchis is the absence of the testicle from the scrotum. Normally it descends in the ninth month of utero-gestation, or during the first weeks of extra-uterine life, but sometimes at a later period, or not at all. In the latter case, particularly when incarcerated in the canal, it is apt to undergo in later life malignant degeneration. When in its descent it gets under the femoral arch, resembling a crural hernia, or to the perineum, it is subject to inflammation, and requires the application of ice, and occasionally a local depletion, or a puncture for the relief of effusion, and sedatives for the removal of reflex convulsions. In most cases of incomplete descent the testicle is found in the inguinal canal, and slightly movable; it may be complicated with hernia. No matter whether this complication is present or not, the treatment consists in the application and constant wearing of a truss so adjusted as to keep the testicle below and the intestine above. Its effect can be enhanced by frequent and gentle massage. This simple treatment, if started very early, I have found effective in so many cases that Ashby and Wright's advice—not to rely on it, but to operate and either fix the testicle below or remove it altogether—appears to me inappropriate in the very young. If, however, a result has not been accomplished in time, or if no attention was ever paid to the anomaly, it should be urgently advised to perform orchidopexy between the tenth and fourteenth years (before puberty), or earlier if there be a hernia. If that be done, the testicle will develop;

if not, its atrophy is inevitable, or malignant degeneration may take place.

Orchitis is occasionally found in children. The acute form is either traumatic or alternates, even in the infant, with parotitis, or no cause is obvious. The treatment must be conducted on general principles, and consists in the local use of ice, of purgatives, and, occasionally, of antipyretics and narcotics. Leeches resulted, in a few of my cases, in extensive swelling of the scrotum. Chronic orchitis is mostly combined with epididymitis, the result of trauma combined with a scrofulous disposition. It is apt to lead to induration, caseation, and tuberculization. If that occurs, the organ ought to be removed to avoid general tuberculosis.

Primary *tuberculosis* appears to begin mostly in the epididymis, and requires removal, as well as *dermoids, sarcomata,* and *carcinomata.* Of the latter, I saw a case in a boy of four years. It was removed and no new local trouble arose; not even in the lymph-bodies of the neighborhood. But the disease reappeared in the lungs. Both testicles and ovaries are more subject to congenital tumors than perhaps any other organ, with the exception of the kidneys. Wolff (*Deutsche Zeit. f. Chir.,* 1899, vol. liii) collected two cases of sarcoma of the prostate under one year, three from one to ten, three from twenty to thirty. Secondary (?) miliary tuberculosis was observed by Neureutter (C. Springer in *Zeit. f. Heilkunde,* 1902) in the vagina complicated as follows: with universal tuberculosis (girl of fourteen), with tuberculosis of the uterus and tubes (girl of eight), with that of the uterus, tubes, lymph-bodies, intestines, lungs, and larynx (girl of eight).

Syphilis of the testes requires a strict antisyphilitic treatment. There is the indication for the internal administration of mercurials and iodides; in the first few weeks a daily hypodermic injection of a soluble mercurial salt will improve the chances of recovery.

Hydrocele is of frequent occurrence. A few drops of serum are normally found in the tunica vaginalis propria. Larger accumulations of serum are met with in more than ten per cent. of all male infants,—mostly on the right side, seldom on both. In the majority of cases there is no longer a communication with the abdominal cavity. When it remains, a hernia may complicate the hydrocele, and the diagnosis may be more difficult because, in such a case, the fluid is apt to return occasionally into the abdomen. Spontaneous absorption is not very rare, but suppuration uncommon. I have injected alcohol and diluted tincture of iodine, and setoned the scrotum with either silver wire or silk. All of these methods are bad to begin

with. Simple punctures, one or more, made once or repeatedly with a sterilized needle or trocar, will allow the escape of the fluid, which frequently does not return after the first procedure. It is best to dislodge the integument a little, so as to have no direct escape of the serum. If there be a relapse, however, after a number of punctures, the injection of a small amount of tincture of iodine, or of Lugol's solution, or of two or three drops of carbolic acid, after the fluid has been withdrawn, will prove successful. Radical operations are rarely required. The cases in which the communication with the abdominal cavity is still patent require the application of a truss after the serum has been allowed to return to the abdomen, or a radical operation (Bassini).

A *hydrocele of the spermatic cord* is either congenital (the result of non-conglutination of the pars vaginalis peritonæi) or caused by an inflammation of the tunica vaginalis, of the testicle, or of the spermatic cord. It may be let alone or the fluid aspirated.

The *pseudoplasms* of the young female urogenital organs offer no special indications of their own. Tumors of the ovaries were mostly found, on operation, to be *dermoid* cysts, and very rarely *carcinomatous* or *tubercular*. The latter and *sarcoma,* of which d'Arcy Power collected from literature twenty-five cases (*St. Barthol. Hosp. Rep.,* vol. xxxi), are rare occurrences in the young vagina. *Cysts* have sometimes been found above the hymen, and soft *polypi* more frequently in the *urethra*. They are either easily recognized or mistaken for a simple prolapse of the urethral mucous membrane. They sometimes give rise to vesical tenesmus and dysuria, and also to (mostly slight) hemorrhages. Evulsion, chromic acid, the scissors, and the actual cautery, now and then two of these means combined, have been used. Ligature never succeeded in my hands. It would always cut through at once, produce some bleeding, and necessitate some other method.

IX

Diseases of the Respiratory Organs

1. *The Nares.*

Acute nasal catarrh * (acute catarrhal rhinitis) is found either as a sporadic or an epidemic ailment; the latter rarely depends on erysipelas, still less frequently on gonorrhœa, more frequently on influenza, measles, or whooping-cough. The mere presence of numerous microbes of different varieties is of no account; so long as the surface is fairly intact, the nasal mucus is bactericide to a great extent, and invasion does not mean infection. The sporadic form is sometimes local and unilateral; in that case it has a local cause, such as a traumatic lesion or a foreign body; when bilateral and general, it is mostly the result of sudden thermometric or barometric changes, or exposure to dust, impure or dry furnace air, etc. In rare cases the irritation of trifacial branches of the maxillæ will, when dentition is really abnormal or unusually difficult, give rise to vasomotor and secretory changes of the nasal mucous membrane, which is supplied with ramifications of the same nerve. Acute nasal catarrh may be attended by high temperatures, considerable swelling, and obstruction (thus rendering respiration extremely difficult, particularly when the patient is newly-born or quite young), and by secondary affections, such as swelling of the cervical lymph-bodies, acute pharyngitis, amygdalitis, conjunctivitis, otitis, headaches, and sleeplessness. The indications for treatment are various: the local hyperæmia and swelling are to be reduced, the secretion removed, the fever

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* According to R. O. Neumann (Zeitsch. f. Hyg., vol. xl., 1902), the normal nose contains a large number of microbes: micrococcus pyogenes albus in from eighty-six to ninety, and the bacillus pseudodiphtheriæ in ninety-eight per cent. of all cases. In nasal catarrh there is a relative increase of the bacillus pneumoniæ of Fraenkel and of Friedländer, of streptococcus pyogenes and of the bacillus of diphtheria. The bacillus pseudodiphtheriæ is a saprophyte only, and has no relation to nasal catarrh; but virulent bacilli of diphtheria (and those of Fraenkel) may cause it. Thus my statement that many cases of nasal catarrh during an epidemic of diphtheria were diphtheritic—first based on clinical observations in 1860 (Amer. Med. Times)—is confirmed by the most recent bacteriological researches.

There appears to be no specific cause of nasal catarrh, as might be expected.

relieved, and secondary affections either prevented or treated, among them all those occasioned by the unfiltered condition of the air admitted to the respiratory organs through the mouth.

Hyperæmia and swelling may prove dangerous to very young babies. In them the nasal cavities are narrow, and so easily obstructed by an acute catarrh that now and then a newly-born infant that has not yet learned how to breathe through the mouth, in which the tongue is curled up, is in danger of suffocating. That narrowness is universal. In the newly-born and the infant the lower concha closely hugs the lateral wall and contracts the lower nasal meatus. The middle nasal duct is somewhat larger and straight, almost obstructed in front, and circular (very much smaller and more irregular than in the adult); the anterior blunt end of the middle concha lies on the upper margin of the lower. The whole nasal cavity is narrow. At the level of the eyes the latitude of the nasal cavity compares with the width of the face as one to three and a half in the adult and only one to four and a half in the newly-born. In him the septum is more horizontal, in the adult almost vertical. The antra are scarcely perceptible, with a narrow slit in place of the nearly spherical orifice of the adult. Of *congenital obstruction* by ossification of the posterior nasal orifice Boulay collected sixty cases (*Rev. Mens.*, 1901). The only relief is by operation at a rather later period of life.

Some of the cases of acute rhinitis require constant attention; day and night the mouth must be kept open by gentle pressure on the chin to enable the little patient to breathe through the mouth until the nares become pervious. Particularly in cases in which the mucous membrane is thickened from birth, or a nasal polypus is present, or a swelling of the pharyngeal or the palatine tonsils, and adenoid enlargement, the danger of suffocation is great. In a single case I have been compelled to repeatedly apply the galvano-cautery to the left nasal cavity of a newly-born whose acute catarrh obstructed the narrow channel. Astringent solutions are indicated for a similar purpose, or ointments which may be applied by means of a camel's-hair brush. Still, I cannot express much satisfaction at the effects obtained, for the reason that whatever is not quite indifferent to the mucous surface will irritate and increase the trouble. That is what is done by high or low temperatures of an injection —a good medium is about 90° F.—and by most astringents unless in a very mild solution. Better is a two-per-cent. solution of cocaine hydrochlorate, which may be applied with a brush or by means of the atomizer, from time to time. A freshly prepared solution (suspension) of adrenal powder in water (from five to ten per cent.)

will not cause the secondary hyperæmia following the use of cocaine. Camphor inhalations have been praised, and powder containing a few per cent. of menthol. The secretion must be removed now and then by wiping out the nose and bringing on sneezing. The wiping out may be done with a probe covered with absorbent cotton, the latter to be introduced horizontally, either dry or moistened with an alum or cocaine solution. The passage may also be kept open by a physiological salt solution (1 to 150), or an astringent, or a disinfectant wash of alum, zinc sulphate, bismuth subcarbonate, or boracic acid. The latter is not always satisfactory. In most cases, it is true, it acts very mildly, but now and then I have seen catarrhal secretions increased by it. These applications may be made in different ways. An atomizer, when the nozzle is lengthened with a short piece of India-rubber tubing, will do no harm; nothing that is hard or pointed should be used for a nostril; injections should be made very gently and slowly, else they are liable to injure the ear; irrigation by merely emptying a pipette or a small spoonful of a solution into the nostril will prove uninjurious, but not very efficient. As a rule, I prefer a nasal cup, which should not be emptied at once, so as to allow ample breathing time. In the newly-born, on account of the low condition of its reflex activity, snuff does not act so readily as it does in more advanced age; but it may be tried for the purpose of emptying the nares. Otherwise the rational general treatment of a catarrh may be resorted to: moderate temperature of the room (from 68° to 74° F.), moist air when the secretion is thick and viscid or scanty, an occasional warm bath, a dose of quinine about noon if there be a considerable rise of temperature in the afternoon, an occasional dose of phenacetin or antipyrin during the day or small doses of the tincture of aconite at intervals of two hours; probably a single dose of opium as a sedative and diaphoretic, late in the evening. Dover's powder, from one to two milligrammes (one-sixtieth to one-thirtieth grain).

Chronic nasal catarrh derives its therapeutical indications from its many occasional causes; for instance, frequent returns of acute catarrh, dusty, cold, and moist air, also dry furnace air, the presence of a foreign body, or the deviation of the septum. This latter condition may be congenital, even hereditary, due to unequal development of neighboring, mostly the turbinated, bones. The vomer does not fully ossify until puberty, and is therefore long dependent on the facial bones, " whose evolution leads to irregularities in the higher races, less in the negro" (Kohts), or due to a fracture of the septum, or to its disruption from the ethmoid, or vomer, or superior maxilla. It results in

obstruction, and behind it in accumulation of mucus which is disintegrated and irritates. Other causes of chronic nasal catarrh are enlarged tonsils, chronic pharyngeal catarrh, and adenoid vegetations, with their damaging influence on respiration, digestion, the sense of smell and taste, and intellectual development. Scrofula, tuberculosis, and syphilis, with their effects on mucous membranes, bones, and cartilages, are frequent causes of chronic nasal catarrh. Less frequent are the effects of furunculosis, which here is rarer than in the adult; of croupous inflammation; of diphtheria of the nose, which may be met with independently of pharyngeal diphtheria or may usher it in; or of eczema of the upper lip.

Syphilis, tuberculosis, and scrofula have their own indications. Thus, a chronic rhinitis occasioned by them demands mercury, arsenic, creosote, cod-liver oil, iron, or phosphorus, according to general rules. Abscesses are to be opened, the small necrotic bones removed, furuncles incised. They should be treated early, for cerebral embolism I have known to come from them several times in my life. The vascular connection is very intimate, for the anterior and posterior ethmoid veins enter the cavernous sinus either directly or by means of the superior ophthalmic vein. Foreign bodies must be extracted, adenoid vegetations removed, and hypertrophied tonsils resected or —in occasional cases—treated with the galvano-cautery. Many a case of chronic nasal catarrh will be relieved, or nearly cured, by these measures, or, on the other hand, there is many a case of chronic pharyngitis which gets well through the treatment of the nasal catarrh. Indeed, there are very many of these complications in which the determination of the primary seat of the affection is very difficult or even impossible. If there be a considerable deviation of the septum, not to speak of the excessively rare cases of bony union, it must be corrected. In very young infants that correction can sometimes be accomplished by manual pressure. The cleansing of the nasal cavities is of at least as much importance as in acute catarrh. They must be washed out from two to four times a day with some warm fluid. According to the case, this may be salt water, or a solution of boracic acid (from two to four per cent.), or alum (half per cent.). The same precautions should be used which were advised above. If larger quantities of the fluid be used, the injection should be made very gently and the child taught to keep his mouth comfortably open. Potassium chlorate has been employed in solutions of from one to three per cent.; resorcin, of two per cent.; creosote has been applied similarly; iodine or tannin in combination with glycerin. Cocaine solutions have been employed with good results.

Their immediate effect is evident, and they are better than a merely temporary makeshift. What I have seen do a great deal of good is silver nitrate. A solution of 1 to 250 or 2000 may be sprayed into the nasal cavity once a day or every other day. When a carious bone is underlying the chronic catarrh, an iodoform ointment (1 to 8 or 15 vaseline) may be applied several times a day to advantage. Hypertrophy of the mucous membrane and submucous tissue, with ulcerations or granulations, adds greatly to the difficulties of the case. Lactic acid in powder or in strong solutions has the reputation of destroying morbid tissues, mainly granulations, and of leaving the healthy tissue intact. Still, I cannot say that it has rendered me very appreciable service in cases I considered adapted to its alleged powers. The exuberant tissue will, however, be beneficially influenced by an application every few days of a solution of iodine (1 to 8 or 1 to 4), of iodol or aristol, of bismuth subcarbonate, of a strong solution (ninety per cent.) of carbolic acid every four or five days, of chromic acid once every week or ten days, and last and best, of the galvano-cautery under cocaine anæsthesia. For the purpose of compressing the swelled soft tissues and correcting a deviation bougies are also used, made of zinc, tannin, or carbolic acid. Chromic acid and the galvano-cautery are my preferences in the worst classes of cases; for instance, those of *ozæna* even in children, sometimes complicated with antrum disease, and very commonly complicated with or depending upon an excessive width of the posterior nares, like *atrophic rhinitis,* attributable to or connected with undue patency of the nasal orifice and of the naso-pharyngeal vault (Lennox Browne, *Philad. Med. Jour.,* August 26, 1899), do well under their influence. Others require the frequent use of stronger solutions of silver nitrate as a spray, or potassium hypermanganate solutions (1 to 1000 or 2000), or iodol or aristol insufflations, or a combination of a few of these remedies. For the purpose of cleaning the nasal cavities docile children may learn how to employ the nasal douche for copious irrigation. The douche (fountain syringe) should never be raised more than a foot above the level of the nose, the fluid should be mild (salt water) and nearly of the temperature of the body, the head gently bent forward, the teeth parted, and respiration should not be interrupted by swallowing or coughing. If this happen, the tubing of the instrument should momentarily be compressed. Docile children may be taught to permit the flow of the fluid during inspiration only, the tube being compressed during expiration. The nozzle should be introduced horizontally into the narrower nostril. If sneezing comes on, it should take

place while the mouth is kept open, and blowing the nose should be done with one nostril open.

Polypi, either congenital or acquired through chronic catarrh, though not frequent, will be met with in every medical practice. They are either soft and consist of mucous membrane, or harder and composed of dense connective tissue. Those with an admixture of sarcomatous tissue (not often round cells, more frequently spindle-shaped cells with copious stroma) are relatively rare. (Of *primary sarcoma* of the nose, Th. J. Harris (*Phil. Monthly Med. Jour.,* June, 1899) quotes one hundred and three cases. Of sixty-two cases whose ages were known, one was four, four were nine, two eleven, and two sixteen years of age.) The cold or galvano-cautery snare is required by those which have a rather bulky pedicle. Evulsion with a common polypus-forceps suffices for those which are distinctly pedunculated and for such as consist in the main of mucous membrane. A firm tampon is seldom required by excessive hemorrhage after evulsion. In most cases the bleeding ceases spontaneously; or a tampon of moderate size covered with powdered alum or tannin is demanded; or the cauterization of the stump with chromic acid, either dry or in a concentrated solution, by means of a camel's-hair brush or a probe covered with absorbent cotton. This application may be repeated after a while to guard against a return. Or a watery antipyrin solution (from twenty to fifty per cent.), or a spray, or the application of the powder of adrenals, or their solution in water.

Foreign bodies are often found in the nasal cavities of babies and older children. Paper balls, shoe-buttons, dry peas and beans, flies and bugs, cherry-stones, and beads are readily admitted. Their diagnosis is by no means always easy. Chronic catarrh, being their usual result, gives rise to the mistaken diagnosis of caries, syphilis, or tumor. The cases in which the presence of a foreign body causes delirium and convulsions, and may be taken for meningitis, are, fortunately, rare. In many, chloroform anæsthesia is required to ascertain the nature of the difficulty. The consecutive catarrh and ulceration require mild or disinfectant washes or injections. The ear-spoon, or Daviel's spoon, or a woman's hair-pin will generally suffice to dislodge the foreign body. While the child is firmly held, the operator, standing a little behind and on one side of the patient, introduces the instrument from above downward, the cavity looking forward. In this way the foreign body is easily scooped out. When the symptoms are urgent (convulsions, high fever), an ala nasi has been incised to facilitate the required extraction. Dr. G. Bieser recommends the following method (*Ped.,* July 15, 1897). The child

is placed in the ordinary position for intubation, the assistant holding his hand firmly over the child's mouth. One end of a piece of rubber tubing is snugly inserted into the nostril opposite the one holding the foreign body, the other end is taken in the operator's mouth. The operator then blows suddenly and vigorously into the nostril and dislodges the foreign body. This method should not be employed, however, if it be too firmly impacted; for in that case forcible insufflation might injure the middle ear. In every case the mouth should be tightly closed.

Epistaxis depends on the rupture of one or more blood-vessels, either large or small, normal or abnormal. The Schneiderian membrane is succulent and replete with blood; that is mainly so in the respiratory part about the lower and middle conchæ, where the cavernous tissue is located, and the large veins are controlled by the spheno-palatine ganglion. A normal blood-vessel may bleed in consequence of a traumatic injury, or of an erosion by chronic catarrh, ulceration, diphtheria, or syphilis. Bleeding from the nose may point to the presence of a polypus, or be the indication of obstruction in distant parts of the circulation in the abdomen, the lungs (chronic pneumonia, emphysema), the thyroid body, or by cardiac disease. The compression of the abdominal viscera by enforced confinement in the school-room, overheated and ill-ventilated at that, and consecutive constipation are frequent causes of epistaxis. Blood-vessel walls become abnormally fragile in constitutional and infectious diseases, such as early chlorosis, tuberculosis, hæmophilia, leucocythæmia, general amyloid degeneration, purpura, scurvy, and typhoid fever. Perhaps the most obstinate form of epistaxis, which is, fortunately, infrequent, is that which depends on the congenital incompetency of the heart combined with smallness of the large arteries, and results in the most serious cases of chlorosis. All these different causes of epistaxis suggest their own indications. The constitutional diseases resulting in local hemorrhage demand such management as has been indicated in other parts of this book. All of them may require local treatment besides. It is obvious that in every case of epistaxis the congestion of the nasal mucous membrane must be diminished if possible, and the formation of a clot should be facilitated. By raising the arms over the head, and by forced inspiration, the chest is expanded and a large amount of blood accommodated in it; hot hand- and foot-baths have been resorted to for a similar purpose. Ice may be applied to the neck and throat, and pieces of ice introduced into the bleeding nostril. The local use of water (injection, washing) is not desirable, inasmuch as it is liable to prevent the coagulation of

the blood on the bleeding surface. Solutions of alum or tannin will answer a little better. The use of a tampon is often required to stop the loss of blood. The introduction of a wick of absorbent cotton or lint, by means of a pair of fine pincers, or, better, by loosely wrapping it round a smooth probe (whalebone or other), or of the same covered with alum or tannin, or soaked in a solution of iron perchloride or subsulphate ("hæmostatic cotton"), combined with pressure from outside, or in an antipyrin solution (from twenty to fifty per cent.), with or without tannin, will sometimes prove satisfactory. So will applications of adrenal powder in substance or in solution, or the local application of a thoroughly sterilized ten-per-cent. solution of gelatin. In but a few will it be found necessary to close the whole cavity from either side by means of a tampon introduced through the mouth into the posterior nares, at the same time obstructing the nose anteriorly. Bellocq's tube should not be used for that purpose, as it tears or cuts the tissue. An elastic catheter is easily carried through the nose and mouth, and the tampon attached to it. This procedure is not so annoying and irksome as it appears to be, because it is in few cases only that nose-bleeding is bilateral. In rebellious cases of older children the local cause should be looked for,—viz., an ulceration extending into blood-vessels. Ulcerations of the septum narium are not frequent in children, but they will occur.

Chronic catarrh and *ulceration* of the nares must be treated according to the principles taught above, and the most frequent causes of epistaxis among children attended to according to their own indications. Local ulcers may be reached with silver nitrate, the stick or a solution. I cannot impress too much the necessity of attending to the intestinal congestions and disorders of school-children. Constipation of a lifetime is often the result of the cramped position on an improper chair or bench, and of the inability to evacuate the bowels at the proper time. Children suffering from constipation, particularly those who are affected with what I have described as congenital constipation, may require a daily injection and may be benefited in urgent cases by an occasional (vegetable) purgative. This is sometimes all that is required to relieve their epistaxis. That many are relieved only when taken from school and allowed the free use of their limbs in the open air is self-evident. Another large class of nose-bleeders is that which originally suffered from chronic pneumonia or chronic heart disease with general and persistent anæmia. Very many of these cases improve instantly under the sufficient use of digitalis, in efficient doses, and iron.

2. *The Larynx.*

Acute laryngeal catarrh (*acute laryngitis*) is too common a disease to justify a discussion here of its etiology or diagnosis. In regard to the latter, I refer to a single point only,—viz., that of the temperature, which is always elevated. An *uncomplicated* acute laryngeal catarrh is always attended by fever, while an *uncomplicated* laryngeal diphtheria ("pseudo-membranous croup") is not so accompanied. Dozens of years ago I brought out this fact, and a large experience has since confirmed that observation. The other symptoms are unmistakable, from the different degrees of dyspnœa to those of hoarseness or aphonia, and the barking cough, which is quite characteristic and easily differentiated from that of other diseases of the respiratory apparatus, or from the reflex cough caused by foreign bodies in the naso-pharynx or in the ear. The treatment requires the most perfect rest. Talking must be prohibited, crying avoided, if possible. For that reason, if for no other, opiates are indicated; partly to relieve the local irritation which produces cough, and partly to secure sleep for the purpose of equalizing circulation and resting the excited muscles. The temperature of the room ought to be equable (from 68° to 75° F.), the air moist. The latter eases the large windpipe and procures rest, while dry and cold air increase the irritation. Whatever beverages are given should be warm. A general warm bath, warm applications (hot water, poultices, cold applications which are permitted to become warm and are then changed), are both pleasant and beneficial. Plenty of water ought to be furnished, mild alkaline mineral water by preference. An infusion of ipecac with sodium bicarbonate, in small and frequent doses, will aid in liquefying a viscid mucous secretion.

The worst form of acute catarrh of the larynx gives rise to attacks of intense dyspnœa ("croup"), which occur quite frequently in the night after the children have been asleep for some hours. The drying up of the pharyngeal mucus is very apt to give rise to both cough and dyspnœa, and therefore it is a good plan to wake the patient suffering from pharyngeal catarrh from time to time sufficiently to make him drink. Average moisture of the air may not be enough. Water ought to be kept boiling constantly, so as to fill the air of the room (or a tent, which ought to be spacious) with steam. Spraying the throat with cold water is useless compared with the effect of warm vapors. That leeches, which I used sometimes in bad cases of feverish and croupous catarrh forty years ago, ever resulted in any good I am not prepared to say; but a promptly adminis-

tered emetic (ipecac, zinc or copper sulphate, turpeth mineral, apomorphine) has often relieved the spasmodic dyspnœa accompanying these (mostly nocturnal) attacks of "pseudo-croup." The effect of emetics, however, and their indispensability have often been exaggerated. Usually they are less required for the relief of the babies than for tranquillizing the fears of the mother and allowing the family physician to stay in bed.

Chronic laryngeal catarrh may develop out of a protracted acute catarrh, or the affection may be primarily mild, but result at an early period in the thickening of tissue. Even at the earliest age this process may be observed. One such case I saw with Dr. Hopkins, of Brooklyn, in a newly-born baby, which got well after the daily administration of a few grains of potassium iodide, continued for several months. Constant warm applications, or cold ones which are permitted to become warm, will favor absorption. Cases which are complicated with, or perhaps dependent upon, a chronic pharyngeal catarrh are often favorably influenced by the use of tincture of pimpinella saxifraga, half a drachm or a drachm of which may be taken daily, in ten or twelve doses, in a solution of potassium chlorate, in such a way that the dose of the latter be a cautious one and the dilution (in water) of the tincture be not excessive. This drug has long been "obsolete," but deserves to be reappointed to its former place in practice. The majority of such cases will do well when treated with solutions of sodium bicarbonate or potassium iodide, also of ammonium chloride in daily doses of from eight to thirty grains (0.5 to 2.0).

Diphtheritic Laryngitis, Pseudo-Membranous Croup.—It is not necessary to discuss here pathological questions, or to reassert the histological identity of diphtheria and "croup." When pharyngeal diphtheria has reached the larynx in its descent, or bronchial diphtheria resulted, in its ascent, in sudden laryngeal stenosis, the usual antidiphtheritic treatment avails but little. That neither general nor local depletion has any effect, except that of hopelessly reducing the patient's strength, has long been recognized; also, that vesicatories add a new diphtheritic membrane on the surface to those on the mucous membranes. Emetics are of no use unless a peculiar flapping sound betrays the presence of half-detached membrane in the air-passages. In such a case they are apt to save life. At all events, I have never been so fortunate as to observe the universally beneficent effect which has been attributed to their frequent administration in an average case. Massage of the larynx has been recommended by Bela Weiss. I cannot say that the few cases in which I advised the

procedure were successful; it may be that the constant repetition of the advice to use mercurial or other ointments over the larynx is based on the observation of an occasional good effect of the friction ("massage") attending their employment. Locally, lactic acid, in more or less saturated solutions, has been eulogized as a solvent of the membranes in the larynx, when often applied either by brush or spray. Most of the cases in which I have seen it used were not successful, but this untoward result is, unfortunately, not exceptional. I have seen, or believe I have seen, papayotin (1) dissolve membrane when applied in a mixture of glycerin and water (āā 2). Particularly would that occur in pharyngeal diphtheria slowly descending. Lime-water is still used as a spray and has its admirers. Lime slaked in a small room or under a tent is decidedly more effective, for during that process a large quantity of lime is carried up and inhaled; at the same time the softening and solvent effect of the steam is obtained. The latter is not always as beneficent as it appears. In many the application, externally, of cold water or ice-bags to the neck is vastly preferable. But in most cases of anæmic and highly nervous children the latter are not tolerated. Constant inhalations of turpentine, or eucalyptol, or (in older children) carbolic acid, from a kettle containing boiling water, have impressed me as beneficial in a large number of cases. Inhalations, in a small room or under a tent, of calomel, which is sublimated in doses of eight or ten grains (0.5), every hour or at longer intervals, are certainly effective.

The patient remains in bed as much as possible, and may continue such expectorants as he perhaps took for previous catarrhal symptoms; may also take diaphoretics and warm beverages, and an occasional opiate for that indication and to procure some rest. The continuation of potassium chlorate when the invasion of the larynx is complete is rather superfluous. Antipyretics are out of the question unless there is a very high temperature depending on a complication (general diphtheria, pulmonary inflammations). Pilocarpine injures by debilitating the patient; the cases which are really benefited by it are excessively rare. Mercurials have resulted in more actual recoveries than any other internal treatment. The cyanide and iodide have been recommended. For twenty-five years I have employed the bichloride in doses of a milligramme (one-sixtieth grain) or more once every hour. The smallest babies easily take one-fourth or one-third of a grain daily for days in succession. Almost never will a stomatitis follow, and no gastric or intestinal irritation, provided the dilution be in the proportion of at least one in eight or twelve thousand. An occasional slight diarrhœa may require the

addition of a few drops of camphorated tincture of opium. I will repeat a former statement, that never have I seen cases of croup getting well in such numbers, either without or with tracheotomy or intubation, as with mercurial treatment. When this treatment proves unsuccessful, intubation or tracheotomy must be resorted to. A small, frequent, and intermittent pulse, aphonia, cyanosis, and marked retraction, with every inspiration, of the supraclavicular fossæ and the epigastrium are the indications for the operative procedure. I shall not here be tempted to defend the two operations; I shall not even stoop to discuss the criminality of allowing a child to suffocate without resorting to mechanical relief, or to compare the two operations with each other. I can only say that for years I have not seen a case in which intubation would not take the place of tracheotomy, and have therefore not performed the latter. Intubation has come to stay; it is not one of the many temporary devices which have been brought out to be instantly forgotten. In most cases it takes the place of tracheotomy; in none does it make it impossible when, in the opinion of the operator, required. The latter operation may be preferred or become necessary for the purpose of getting at the trachea and bronchi for the mechanical removal of membrane and for other local treatment, rare though the cases be in which such procedures are attended by success. It is probable that the many secondary tracheotomies which are still performed by some in Europe, when intubation is alleged to be insufficient, will not be considered requisite in the future.

In the consideration of pseudo-membranous laryngitis it should not be overlooked that in the vast majority of cases the Klebs-Löffler bacillus is found; and that all of these are, therefore, fit subjects for the use of the diphtheria antitoxin. Since its introduction both general and local (laryngeal) diphtheria have been greatly benefited. In its Washington meeting of May, 1897, the American Pediatric Society received the "report of its committee on the collective investigation of the antitoxin treatment of laryngeal diphtheria in private practice." Its salient points are as follows. The number of cases reported during the eleven months ending April 1, 1897, was 1704, mortality 21.12 per cent. The cases occurred in the practice of 422 physicians in the United States and Canada. Operations employed: intubation in 637 cases, mortality 26 per cent.; tracheotomy in 20 cases, mortality 45 per cent.; intubation and tracheotomy in 11 cases, mortality 63.63 per cent. Number of States represented 22, besides the District of Columbia and Canada. Non-operative cases 1036, mortality 17.18 per cent.; operated cases 668, mortality 27.24

per cent. Two facts may be recalled in connection with these statements. First, that before the use of antitoxin 90 per cent. of laryngeal diphtheria required operation; under the antitoxin, however, 39.21 per cent. Second, that the percentage figures have been reversed; formerly 27 per cent. represented the recoveries, now, under antitoxin, the mortality. The committee expects still better results when antitoxin is administered earlier and in larger doses, and recommends that all cases of laryngeal diphtheria, the patient being two years or over, should receive as follows: two thousand units at the earliest possible moment, two thousand units after twelve or eighteen hours unless there be an improvement, and the same dose twenty-four hours after the second dose if there be still no improvement. Patients under two years should receive one thousand or fifteen hundred units.

Dr. Dillon Brown's personal experience being unusually large and carefully recorded, I add without comment the following figures reported by him. He divided his cases into three classes: previous to November, 1890; from November, 1890, to September, 1894 (calomel sublimation period); from September, 1894, to April 1, 1897 (antitoxin period). Of 442 cases of intubation without calomel sublimations and without antitoxin, 27.3 per cent. recovered; of 295 cases of intubation with calomel sublimations, 41.6 per cent.; of 69 cases of intubation with antitoxin, 67.8 per cent. recovered. Without sublimations, 10.1 per cent.; with sublimations, 13.2 per cent.; with antitoxin, 23.3 per cent. recovered. During the first year with antitoxin there were recoveries after operation in 38.4; during the second year, 62.9; during the third, 94.7 per cent. The apparently bad results during the first year were probably due to two causes: inferior antitoxic serums and insufficient doses.

The doses have been considerably increased of late. There can be no conscientious objection so long as mishaps after the use of antitoxin do not result. Altogether, the American results are confirmed in Europe, where O'Dwyer's intubation has conquered the field. Von Bokay, Widerhofer, von Ranke, Ganghofner, Heubner, Baginsky, lately Trumpp and Siegert; in fact, everybody favors the combination of antitoxin and intubation in pseudo-membranous laryngitis.

Stenosis of the larynx and trachea, after ulceration and cicatrization by diphtheria, by spontaneous gangrene, or by pressure caused by tracheotomy or intubation tube, may cause great difficulty. Among the recommendations given for such occurrences are: intubation with or without the division of the stenosis; excision of

the obliterated and contracted part, and suture; plastic operation with the aid of a skin-periosteum-bone-flap or a skin-cartilage-flap taken from the thyroid cartilage; excision of the cicatrix and transplantation (Thiersch) of a skin-flap to cover the artificial defect of the mucous membrane.

Neurotic affections of the larynx of infants (and older children) are quite frequent, particularly *spasm of the glottis,* under the influence of the inferior laryngeal nerve, which controls both the contractors and the dilators of the glottis. The treatment is directed by its manifold causes. Indigestion, both chronic and acute, is a frequent cause and should be relieved; particularly in neuropathic families the diet and hygiene of the infant are of the utmost importance. Fresh air, cautious exposure to cool or cold water, and early addition of liquid animal food to mother's milk or to the artificial feeding are of importance. Rhachitis, being the most frequent cause of laryngismus stridulus (p. 132), requires early attention; digestive disorders must be corrected, and the general irritability relieved by bromides or camphor. Monobromated camphor may be given for weeks in daily doses of from one to three grains (0.05 to 0.2). Emotional disturbances, which will affect neurotic children at an early age, should be avoided. A screaming spell and fright will act as proximate causes. The attacks (some beginning with apnœa, mainly those of laryngismus stridulus) must be watched, the baby taken up so as to ease the larynx, the head raised, the tongue (if aspirated and doubled up) drawn forward, the throat tickled, water dashed into the face, and chloroform inhaled if the local spasm be followed by a general convulsion. The influence of the thymus gland was discussed on page 146. Spasm of the glottis is, or may be, one of the constituent symptoms of stammering (p. 308).

Paralysis of the glottis is not so frequent; in the infant quite rare, and very rarely congenital. Diphtheria, hysteria, and cerebral diseases, also whooping-cough, which should be relieved as much as possible, may give rise to unilateral or bilateral paralysis, anæmia may create a predisposition, glandular swellings prove a proximate cause. Hysterical paralysis with aphonia appears quite suddenly, sometimes as the only symptom of hysteria, sometimes in combination with others. One of them is anæsthesia and absence of reflex of the fauces. Complete paralysis depending on that of both posterior muscles, which contract the glottis, produces a very severe dyspnœa, which is relieved during expiration but cannot be tolerated long. Intubation or tracheotomy may be demanded for immediate aid. Otherwise, attention to the predisposing causes, reduction or

removal of glands, and mainly the systematic application of the interrupted current through the breadth of the larynx will offer relief and gradual, sometimes rapid, recovery.

Neoplasms of the infant's or child's larynx are by no means rare. Many of them are congenital; mostly so the numerous *papillomata. Fibromata* and *enchondromata* are also met with, and *epithelioma* has been observed. Sometimes they develop their first symptoms after an incidental inflammatory affection, or after an acute exanthema. Laryngoscopy is very difficult in the young. It can rarely be done without general anæsthesia and drawing the tongue out. I saw pulse and respiration stopped and tracheotomy necessitated to save the child's life. (Alcohol applications have been recommended for their removal.) The rules for their removal are about the same as in the adult, only the latter are more amenable to operations through the mouth. Indeed, none but older children can be thus treated. A. Rosenberg collected two hundred and thirty-one cases of laryngeal papillomata in children (*Arch. Laryngol.*, vol. v.). Laryngotomy gave thirty-seven per cent. recoveries. In 38.5 per cent. there occurred relapses. In the practice of a single surgeon there were seventeen operations for rapid recurrences within three years. Mere tracheotomy was performed in thirty-four cases; four recovered spontaneously afterwards. That is the plan followed by G. Hunter Mackenzie (*Br. Med. Jour.*, May 20, 1899), who asserts that when tracheotomy alone is performed, papillomata will disappear within a few months or a year. Of Rosenberg's cases, endolaryngeal treatment after tracheotomy resulted in a permanent cure in twelve, temporary improvement in one, and relapses in three cases. Exclusive endolaryngeal treatment gave a complete cure in fifty per cent. of children under four years, seventy per cent. between four and eight, and fifty per cent. of eight years and older. According to these figures, endolaryngeal treatment is preferable unless there be a dangerous degree of dyspnœa, which can be treated by intubation; tracheotomy with subsequent endolaryngeal treatment will be the next choice, and laryngotomy will be reserved for very serious and unusually urgent cases. Still, it appears that the latter will be preferred by all who do not claim great specialistic skill and have no hospital at their disposal. Laryngotomy is performed after (or without) tracheotomy, according to surgical rules, exactly as for the extraction of foreign bodies. There is one danger more urgent in infants and older children than in adults,—that is, hemorrhage, slight or copious. Blood flowing down into the narrow air-passages, even in small quantities, is liable to result in lobular pneumonias of a dangerous character. The operation should, therefore, not

be performed without a thermo-cautery or electro-cautery ready for immediate use. *Foreign bodies* in the larynx, more frequent in the young, though with less mortality than in the old, but more fatal than even those in the trachea and bronchi, should be removed through the mouth, if possible; if not, by laryngotomy. Laryngoscopy should precede it, when possible. In order to facilitate the exit of a foreign body from the trachea or the bronchi, tracheotomy is demanded, after which it is best not to introduce a tube, except temporarily. The trachea may then be sewed to the integuments, or may be kept open by hooks joined by an elastic band, according to A. Caillé.

Congenital stricture of either the larynx or the trachea (rare, fortunately) may be mistaken for laryngeal tumor.

3. *The Bronchi.*

Bronchial catarrh (*bronchitis*), in all its localizations, from the windpipes of large size down to the capillaries, requires an equable temperature of about 70° F., moist air, and rest in bed, though there may be no fever except a slight one towards evening. Plenty of water,—no ice,—preferably alkaline mineral waters, should be given; older children may be prevailed upon to take gum-arabic water, flaxseed tea, or other glutinous decoctions which relieve the accompanying pharyngeal irritation. Mitigated mustard-plasters (mustard 1, flour 4 or 8) or embrocations of turpentine are used to advantage. Underclothing must be changed when moist with perspiration. A cotton-batting wrapper round the chest (the sheet spread out and two arm-holes cut into it) acts favorably both by keeping up a uniform temperature and by gently irritating the surface. As a rule, it acts better than warm poultices, which are liable to moisten the clothing and bedding, and thus add discomfort and the danger of a new attack. Where, however, the surface is dry, they may be applied, or, better still in most cases, a sheet of one or two thicknesses well wrung out of cool water, wrapped round the chest and changed every hour or half-hour after it has got hot. Sodium bicarbonate from ten to fifty grains (0.6 to 3.0) daily, according to age, and an equivalent of a grain of ipecac distributed over the day, or (and) from ten to twenty grains (0.6 to 1.5) of ammonium chloride with equal parts of extract of licorice daily, divided into many doses during a day when expectoration is viscid and requires liquefying, will answer in most cases. Apomorphine one-one-hundred-and-twentieth grain (0.0005) every two or three hours will act as an expectorant, so will terpin hydrate in frequent doses of from one-quarter to one-half grain (0.015 to 0.03), particularly in chronic catarrh.

Complication with asthma and insufficient expectoration is benefited by potassium iodide in daily doses of four or fifteen grains (0.25 or 1.0), refracted. Insufficient expectoration with general debility demands ammonium carbonate (gr. ¼ to 1 = 0.015 to 0.06), in anise-seed tea or in milk, every half-hour or at longer intervals, aq. camphoræ (one-half to one teaspoonful) often, or camphor (gr. ⅙ to 1 = 0.01 to 0.06) every half-hour to every two hours in diluted mucilage. The German preparation of liquor ammon. anisatus has been introduced into the Formulary of the American Pharmaceutical Association; from two to six drops may be taken every hour or two hours. Accumulation of mucus in the bronchial tubes, with inability to expectorate and danger of suffocation, may demand an emetic, and asphyxia cold affusion and raising the infant and carrying him about: frequent change of position is advisable in every severe case. When, in bad cases of capillary bronchitis, cyanosis is on the increase, and the voice has not been heard for some time, it is absolutely necessary to make the baby cry. Slapping with a wet handkerchief, swinging, or closing the nares for a few moments, and all the means recommended for the asphyxia of the newly-born, are demanded. The interrupted electric current may be used with the rules and restrictions recommended above (p. 84). Cough, when irritating and harassing, requires narcotics. Small doses of an opiate at regular intervals, or (and) a larger one at bedtime, or repeated doses of extr. hyoscyami (grs. 1 to 1½ = 0.06 to 0.1 altogether through the day), and an opiate for the night, act very beneficially.

The *chronic* form of bronchial catarrh demands similar medication. Preventive measures are the habitual use of cool or cold water and the treatment of such constitutional disorders—for instance, rhachitis—as are known to create a predisposition. Plenty of water, or alkaline water, will dilute expectoration. When this is very copious and difficult, and the cough most annoying in the morning, the patient should be kept lying down for several hours, with the trunk raised. Terpin hydrate and terebene, ten or twenty drops daily, will act well. Ammonium chloride may be evaporated on a hot stove or tin, enough to penetrate the whole room (no tent required), and inhaled. Turpentine inhaled with steam or spread on sponges or towels is also useful. The pneumatic treatment (inhalation of compressed air) has been recommended again by Biedert and Quimby; it finds its principal indications in atelectasis and peribronchitis. The frequent complication with pharyngeal catarrh demands the local treatment of the fauces; a mild solution of silver nitrate (1 to 500) may be used as a spray once every day or every

two days. When tuberculization is feared, the protracted use of cod-liver oil, guaiacol several times daily in two- or four-drop doses, or creosote, or their carbonates, which are taken so much more readily, together with a change of climate, preferably moderate altitudes, are indicated.

Fibrinous bronchitis is by no means so rare as it was formerly reputed to be. Indeed, during epidemics of diphtheria it is not uncommon. Still, the pseudo-membranes found in the bronchi are not always of the same nature. While some are diphtheritic, others consist of dry and coagulated mucus resembling the membranes of "enteritis membranosa." In accordance with this difference of the prevailing condition, a case may last days or months. Antipyretics are still less indicated than in the common forms of bronchitis. Mercurial treatment like that required in diphtheritic laryngitis of every variety (p. 417) is the most reliable internal remedy. Inhalations of steam, frequently repeated or kept up constantly in urgent cases, inhalations of turpentine with or without steam, of ammonium chloride, often repeated, and fumigations through one or two days of from five to fifteen grains (0.3 to 1.0) of calomel (when dyspnœa is urgent, every hour or every few hours, under a tent) will act well. The internal use of potassium iodide in daily doses of from ten to fifty (0.6 to 3.0) grains, and, in cases of undoubted bacillary diphtheria (p. 245), antitoxin are indicated and useful.

Bronchial catarrh, croup, and some forms of pneumonia are proximate causes of a collapse of pulmonary tissue (*atelectasis*), the congenital and postnatal varieties of which have been treated of before (p. 86). The predisposing causes are general atrophy with its muscular debility, and rhachitis through its narrowing the thorax. In this condition, replete as it is with imminent danger, the baby must be carried about, the posture in bed must be changed frequently, he must be made to cry, electricity should be used, and, besides an occasional emetic, stimulants, such as alcohol, camphor, ammonium carbonate, and musk, should be employed frequently and copiously.

Bronchiectasis may have one of several causes. The bronchial wall may be feebly developed at birth; it may become weakened by the degenerative processes of an acute or chronic bronchitis; or it is acquired by the traction of cicatrizing pulmonary tissue, resulting from the effects of a protracted interstitial peribronchitis ("pneumonia"). Arsenic and phosphorus treatment is indicated when the former conditions, iodides when the latter can be diagnosticated.

The nature and symptoms of *asthma* do not differ from those

of the same affection in adults; nor does the treatment. It is a spasm of the circular muscle of the bronchi (not the diaphragm). When a catarrh (bronchitis) precedes or follows it, the feebler longitudinal fibres of the muscular layer lose in strength compared with the circular, and prolong the attack. During the attack proper there is very little expectoration, the bronchioles being filled with lymph exudate and large cells and the Leyden crystals. Its neurotic character is illustrated by those cases which are accompanied by urticaria (internal urticaria? A. Packard). Swelling of the mediastinal glands, adenoids, hypertrophy of the tonsils, flatulency which impedes the free movements of the diaphragm ("asthma dyspepticum"), peribronchitis, emphysema, which is by no means rare, and nasal reflexes are the main causes, and should be attended to. In the latter class of cases brushing the mucous membranes of the nose and pharynx with a cocaine solution of from two to ten per cent., or the use of cocaine spray, may, in appropriate cases, relieve an attack; the cauterization (actual or chromic acid) of the hypertrophied tissue and the removal of a polypus may occasionally be the only things required for an actual cure. Unfortunately, this class of cases is not so numerous as it was believed to be a number of years ago. Those depending on peribronchitis and emphysema are more frequent. In them the protracted use of three daily doses of from two to five grains (0.125 to 0.3) of potassium iodide, together with a sufficient bedtime dose of chloral or of an opiate to meet the night attack, will have favorable results. Tincture of lobelia, two or three drachms (eight or twelve cubic centimetres), fluid extract of quebracho or of grindelia, one or two drachms (four or eight cubic centimetres) daily, will often have a beneficial effect in distressing dyspnœa. The inhalation of stramonium, of potassium nitrate paper, or of pyridin vapors is often resorted to; unfortunately, with so little permanent result as to give any number of proprietary medicines and nostrums a large field of activity. The treatment of enlargement of mediastinal glands, of tonsils, and of flatulency has been discussed in other chapters.

The *periodic night-cough,* described as a special variety in some of the books, is either a mild attack of asthma or is pharyngeal or tubercular; most pharyngeal coughs, however, are met with in the morning, after waking up. These nocturnal attacks may be obviated by a drink of alkaline water at bedtime, to be repeated at every waking up, by a dose of a bromide, or of chloral, or of an opiate at bedtime, and by attention to indigestion and constipation. Quinine is useless. A *reflex cough* may depend on changes or a foreign

body in the external ear, the septum or the conchæ of the nose, or on a neurosis of the stomach. A careful examination with otherwise negative results will direct attention to these localities and indicate the treatment.

4. *The Lungs.*

Pneumonia.—There are three anatomical varieties of pneumonia in infancy and childhood: the catarrhal or lobular, the fibrinous or lobar, and the interstitial. Nearly two-thirds of the cases belong to the first, one-third to the second, and a limited number to the third class. Not one of them, however, is always found pure and uncomplicated. Indeed, complications of the lobular with the lobar, of either of them with the interstitial, and possibly of each of the three with pleurisy are quite numerous. The lobular form is almost always, the lobar quite frequently, preceded by bronchial catarrh, which has its well-understood sources in previous attacks, in exposure, sudden changes of temperature, local irritation by foreign bodies, rhachitical or tubercular mediastinal and bronchial glands, diphtheria, measles, influenza, typhoid fever, whooping-cough, etc. Thus, the preventive treatment of pneumonia has its positive and distinct indications. Nasal catarrh is never so slight as not, possibly, to endanger the lungs. Rhachitis, glandular tuberculosis, measles, and whooping-cough must not be let alone to find their slow road to their legitimate termination for better or for worse. Every child, while well, should be armed against the results of exposure by regular invigorating ablutions and frictions with cold water, and when exposure has taken place and the consequent fever made its appearance, a warm bath, ammonium acetate, camphorated tincture of opium, tincture of aconite, hot drinks, sodium salicylate, or another one of the antipyretics and diaphoretics, with uniform temperature and rest in bed, may be the means of preventing pneumonia.

The treatment of pneumonia is not yet much influenced by modern views on etiology. The attempts at procuring immunity in animals by the blood-serum of pneumonic patients, thus establishing a serum-therapy, may prove more successful when more is known. The large number of microbes which are found in pneumonia—pneumococcus, diplococcus lanceolatus, streptococcus, staphylococcus, and others, which are found as well in other parts of the body and in other processes—do not yet justify the removal of pneumonia from among pulmonary diseases and its exclusive classification among infectious fevers. The assertion that it is only a process of germ-culture in which the air-cells act as culture-tubes and the exudation as a culture-medium, while the nutrient circulation maintains the integrity

of structure without taking an essential part in the pneumonic process, has been ably defended by A. H. Smith, who explains the pneumonic crisis by the death of the pneumococcus and the formation of an antitoxin when the culture-medium is exhausted, and finally by the fatal influence on the pneumococcus due to pneumic acid (which normally binds carbonic acid in the lungs), which meets no longer with carbonic acid.

Both the infectious and the contagious character of pneumonia were observed by Sir Hermann Weber in 1869. He describes (Festschrift, 1900) cases of a "pneumonic fever as an infectious fever, the prominent symptom of which is a lobar pneumonia." His cases ran, after an incubation of from eleven to thirteen days, an acute course of four to six days, were located in the lower lobe, very contagious, and exhibited a rapid decline. One developed afterwards great weakness of the heart, one neuritis, and one a peculiar delirium such as he has frequently met with in the rapid decline of febrile diseases.

On the other hand, lungs of children who did not die of pneumonia, also those of recently killed domestic animals (Dürck in *Deutsche Arch. klin. Med.*, 1897, vol. lviii.), contained the diplococcus pneumoniæ and the mixture of bacteria met with in pneumonia. Pure cultures of bacteria blown into healthy lungs gave Dürck no pneumonia, irritant dust did; so did cultures and dust mixed. Here, as almost everywhere in bacteric etiology, it is not the presence of ever so many highly virulent microbes, but their fixation and their ability to generate toxins, which deserve credit for morbid tissue changes.

Acute lobular pneumonia is less a systemic disease than is the lobar form; its direct and immediate influence on the nervous and muscular, inclusive of the cardiac, systems is less marked; it is not so frequently complicated with pleurisy. Thus, there is less danger at first in lobular pneumonia; there is more at a later period, because its duration is liable to be so long as to make the prognosis uncertain. The danger may come from the heart, but it mainly lies in suffocation, which depends less on the extent of inflammatory exudation than on collateral congestion and œdema.

Interstitial pneumonia runs the most protracted course. Fever is liable to be high and prolonged over weeks and months; recovery is rarely complete, induration and retraction of the pulmonary tissue, with bronchiectasis, being quite common. Bronchitis is often early and extensive, mainly when there is pleuritis also, and liable to become chronic.

Thus, it becomes evident that no uniform course of treatment can be dictated either for all forms of pneumonia or for all cases.

The former are several, the latter are individual. After all, the patient is to be treated, and not the Greek name of his disease. Still, there are certain rules which ought to be enforced in every case.

Insist upon absolute rest of body and mind, exclude visitors, light, and noise.

Keep the temperature of the room between 68° and 72° F. and the air moderately moist.

Let the patient select his own position.

Isolate a lobar case.

Give liquid food and plenty of water, or lemonade, or hydrochloric acid and water.

Relieve the circulation from accessory incumbrances; a dose of calomel will facilitate the action of the diaphragm by emptying the bowels and relieving flatulency, and will diminish the tension of the arteries.

The main dangers in acute pneumonia are: high temperature, heart-failure, and suffocation, which may result from the condition either of the lungs, or of the right heart (the left not being at fault so often as it is in the adult), or of both; also complications like that with nephritis, which is either a coincident or the result of toxic (pneumococcic?) infection.

Which degrees of temperature may be allowed to last and which are to be interfered with? Is it 103°, 104°, or 105° F.? It is well understood that persistent high temperatures disintegrate tissue, but this effect is not equally observed in all cases. Many a child bears 104° quite easily, while others succumb to 103°. Moreover, a temperature which is badly borne the first day or two appears to be an indifferent matter afterwards. Thus, an antipyretic treatment may be indicated at first and be no longer required later, particularly in those cases which exhibit a decided morning remission; for it is mainly a persistent height of temperature that is injurious, not its occasional, though regular, rise. That is why, for instance, relapsing fever, with its enormous temperatures but complete and long intermissions, has only a small mortality.

The custom of depressing temperatures in all cases which exhibit 103° F., or thereabouts, is bad; it is not the temperature that is, by itself, injurious, but the absence or insufficiency of resistance that the tissues offer to its action. To lower temperature we have a number of remedies. The latest additions to our antipyretic treasures are very well known and too universally employed. Phenacetin, antipyrin, etc., have more frequently lowered temperatures than they have saved lives. Their doses, uses, and dangers are well understood by all prac-

titioners. Whenever they are found incompetent, their combination with quinine has proved more effective. The latter, by itself, is, however, no longer the *sine qua non* which it was formerly believed to be. In all cases with marked remission it acts well, but it should be given only during the remission. From half a gramme to a gramme (eight to fifteen grains) may be thus employed. It may be used internally or hypodermically. Now and then injections into the rectum, or suppositories, are required or advisable when the stomach cannot be relied upon. The preparation to be used in the rectum must be one of those which are most soluble: the bisulphate, muriate, bromide, or carbamide. No acid should enter into the solution; large quantities of glycerin are objectionable. The rectal dose should be at least fifty per cent. larger than that employed internally (p. 67).

The best antipyretic is cold (p. 57). Its use has been praised and condemned, as everything deserves to be that is employed either properly or thoughtlessly. Most cases will do quite well with sponging, or with friction by means of wet and cold towels. The latter plan acts both as a refrigerant and a stimulant. Cold bathing was once eulogized immensely, then rejected and warm bathing substituted. The rationale of cold bathing is the cooling of the surface (that is, of fourteen square feet or more in the adult; more than proportionately that in the young) with its immense surface circulation. So long as this circulation continues active, new blood will come to the surface every moment, and the whole body is thereby cooled. When it is no longer active, the heart weak, and the extremities cold, cold bathing is dangerous. The rule I have always followed is this: no cold bath for cold extremities; no more cold bathing when once, after it, the extremities remain cold or cool. In these cases after a cold bath the surface becomes colder than before, it is true; the interior, however, warmer than it was. I reported the case of a little child, thirty years ago, that was the first to teach me that lesson. A few cold baths had reduced his temperature and his tendency to convulsions. Then another seemed to be indicated. It appeared to render the required service, but the baby became convulsed. The temperature in the rectum had risen from 104½° to 106° F. A hot bath, instantly given, restored the external circulation, and ten minutes afterwards the rectal temperature was below 102°.

A great promoter of circulation, and thereby of radiation from the skin, is surface warmth, and particularly warm extremities. Warming-pans ought always to be applied to the feet and legs when

cold is to be employed on the rest of the body. In place of cold bathing, I have mostly employed cold packing from the chest down to the thighs, the arms usually outside the pack. Nothing is easier than to wrap a baby up in a single wet towel, which is covered by a small blanket; in an urgent case it should be replaced by another one (spread out beforehand) every two or five minutes. From twenty to forty minutes' packing will reduce the temperature from 106°. to 101° F., and below. In many instances the rapidly falling temperature demands artificial warming immediately afterwards. When the frequent changing of the pack is undesirable, the cloth may be allowed to remain, and is frequently cooled by rubbing a piece of ice over the whole surface. If water collect under the patient, it can easily be absorbed by towels or sponges. A temperature of 108° in a baby of four months, suffering from pneumonia, was reduced to 104° in twenty-five minutes; after that it sank rapidly to 94½° F., and artificial warming of the surface was required.

From what has been said it is evident that very feeble and anæmic babies do not tolerate cold, though their temperatures be ever so high; in such cases a warm bath, or tepid packs either with water or alcohol and water, or a warm bath gradually and gently cooled down while the little body is constantly being rubbed, should take the place of the cold pack; or cold applications to a part, perhaps the anterior aspect of the chest, are found to suffice. They both reduce temperature and relieve local pain. In many cases a light ice-bag over the heart acts both as a refrigerant and a stimulus to the organ at the same time.

The acceptance of these views I urgently recommend to those to whom they are in part new. Before and after 1870, when I recommended (*New York Medical Record*) cold water in typhoid fever, scarlatina, variola, ophthalmia, diphtheritic conjunctivitis, diphtheria, lobar and other pneumonia, heart disease, local inflammations, phlegmon, synovitis, and peritonitis, I had ample opportunities to test what I am here advocating. Those who want to inform themselves thoroughly on matters connected with this subject I refer to Dr. Simon Baruch's well-known book, and other writings.

The heart furnishes urgent indications for treatment in many cases of pneumonia. When in a healthy condition, its innervation and force are not easily disturbed; still, every pulmonary disease taxes its powers. Lobar pneumonia requires cardiac stimulation at an earlier period than the lobular kind. There is none, however, that does not demand it at some time or other. That being the case, I earnestly advise *not to wait,* for heart-failure is more easily pre-

vented than cured. Be our treatment ever so expectant, it must not be indolent and indifferent. In order to correct the faulty pulmonary circulation the heart should be stimulated at an early period; but how?

Alcoholic beverages are employed for this purpose by many, for alcohol is certainly a cardiac stimulant; it is believed by most to lower arterial tension,—a function which is doubtful, at least in pure "inflammatory" disorders; in most infectious fevers arterial tension is reduced by toxins which cause a vasomotor peripheral paralysis. That would militate against the use both of alcohol and of nitrites in the early part of an infectious disease. Moreover, alcohol is believed to be an article of food. In the small quantities in which it is administered it certainly is not. Four per cent. of it is eliminated unaltered through the lungs, which are thus burdened with that additional labor while in a condition of congestion and incompetency. Besides, kidney complications, which are not rare in pneumonia, and brain affections, which are frequent, particularly in small children, contraindicate the use of alcohol. I dare say that the pneumonia of a fairly developed infant or child contraindicates rather than demands the administration of alcohol at an early period of the disease. Later, when the conditions change, alcohol may be required in large doses, always, however, much diluted.

Digitalis stimulates and contracts the heart, but *also* the arteries, both the largest and the very smallest, and thereby increases the peripheral resistance (more in the old than in the young). A few large doses may restore the equilibrium of the faltering circulation, and should then be stopped. I have not infrequently given the equivalent of from one to four grains of digitalis (0.06 to 0.25) in a single dose, which was repeated one or more times. This mode of administration insures all the coveted effect on the heart and pulse without any irregularity, and gives both a result in a few hours and the indication to cease, while the usual small doses exhibit their action after days only. We may afterwards continue its use in small doses, either alone or in combination with strophanthus, sparteine, or caffeine, all of which have no such disagreeable effect on arterial tension as digitalis; or we may give them without digitalis. To give doses of tincture of strophanthus of less than a drop, or sparteine sulphate of less than one-quarter or one-eighth of a grain, every hour or two, is useless. Such effect as we require we have a right to demand *speedily*, and the doses should be large enough to enforce it. During the last year I made systematic bedside experiments with digitalis in acute pneumonias of babies from four months to two years of

age. I take it for granted that the patient should be spared useless doses. If a rapid effect is to be obtained, the dose should be just short of the over-effect, the symptoms of which can be judged nowhere better than when giving digitalis. A reliable tincture was given in doses of from one to four drops every hour or every two or three hours, with an effect that became marked enough in one or two days, and mild enough to allow ample time for a modification of the dose. Let it be plainly understood that digitalis is a useless drug when given in the small doses recommended by the books.

Whenever the peripheral circulation becomes insufficient, with small pulse, digitalis alone must not be continued; it should be combined with nitroglycerin or sodium nitrite, the former in hourly or bihourly doses of from one-five-hundredth to one-one-hundredth of a grain, the latter in doses of from one-tenth to one-quarter, or these remedies may be given alone until the pulse is revived, but no longer. They are principally required when the feebleness of the heart is mainly perceptible in the right ventricle. There are cases of pneumonia in which the arterial pulse is good, but the external veins large, the nails blue, the skin cyanotic, with great dyspnœa and pulmonary œdema, together with perspiration, increased cardiac dulness, enlarged liver, intestinal oversecretion, and albuminuria,—symptoms which point directly to incompetency of the right ventricle. In these cases the external circulation must be restored at once, and the nitrites will contribute to fulfilling that indication. So will diuretin in doses of from two to ten grains (0.125 to 0.6) administered from three to five times a day. Besides, local depletion by leeching will sometimes do good. In the adult we should open a vein; a child of advanced age may also be saved in this way. It is in these cases also that the inhalation of oxygen (better through the nose than the mouth, best through a paper bag) and artificial respiration will contribute a great deal towards saving time and life.

The distressing cases of catarrhal pneumonia engrafted upon the extensive bronchial catarrh or capillary bronchitis of the very young will sometimes get well only after we have succeeded in making them cry, together with artificial respiration, inviting the respiratory muscles to reflex efforts by dashing cold water on them, using for brief moments the interrupted current, etc.

Direct stimulation of the heart may require the use of strychnine in small and frequent doses (a baby of one year not often more than a thirtieth of a grain = two milligrammes during twenty-four hours), and ammonium carbonate one-half of a grain or a grain (0.03 or 0.06) in anise-seed water or in milk every half, one, or two hours.

In cases of urgent necessity the stimulants should be used subcutaneously, the strychnine sulphate in repeated doses of one-one-hundredth grain at least, the sodio-salicylate (or benzoate) and sodio-caffeine in doses of from one to five grains (equivalent to one-half of that amount of caffeine) every one or four hours; camphor will serve the same purpose. Its solutions in alcohol or ether are quite painful. I always employ it in four or five parts of sweet almond oil; of this I inject from six to twenty drops, according to indications; very slowly, because it passes through a fine needle with more difficulty than does a watery solution.

In connection with these remarks we are enabled to judge of the claims of the routine treatment with strychnine, digitalin, and aconitine which was imported a few years ago. It is easily perceived that it finds its indications like a ready-made coat which fits many, but not all, and would not be worn unless first tried on. But a coat is not so easily believed to fit everybody as is a newly eulogized treatment.

During the last few years creosote carbonate ("creosotal") has been recommended in pneumonia as almost a specific. More than a dozen cases were treated in a hospital ward. The patients were infants from one-half to two years old, and the daily doses amounted to twenty or thirty grains (1.5 or 2.0). I cannot say that the cases ran a more favorable course than under other treatment; in some I was compelled to resort to active cardiac stimulation.

When, during hepatization and the period of incipient resolution, expectoration is insufficient, the remedy is inhalation of steam, with or without turpentine. The latter may be spread through the room by means of large sponges, or on towels which are soaked with it, or it may be evaporated on boiling water. The easiest way is to fill the whole room with the vapor. Inhalers are insufficient and annoying. Give camphor, aqua camphoræ in teaspoonful doses or more, or one-quarter- to one-grain doses in diluted mucilage, or benzoic acid powders in the same doses, or ammonium carbonate. Ipecac may derange the stomach, senega is either an adjuvant or a placebo. Drinking of plenty of water, mainly alkaline waters,—Seltzer, Vichy, Poland,—also doses of sodium bicarbonate or potassium iodide, will increase and liquefy the bronchial secretion. Ammonium chloride is of but little use in hepatization; but evaporated in amounts of ten or twenty grains every few hours on a hot stove or over a flame, it fills the room with a white cloud which greatly stimulates the bronchi. Warm poultices will serve the same purpose. Their place is during hepatization for the purpose of aiding absorp-

tion, not in the first stage of pneumonia. When nursing is insufficient, and there is danger of wetting the clothing and bedding, it is best to substitute for them a cotton-wadding jacket, covered or not with oil silk or, better, flannel, which protects against exposure and keeps up a uniform temperature of the skin. When hepatization is completed and absorption is slow, the indication is to give iodides a long time.

Pleural pain is relieved by gently strapping the chest, when tolerated,—it mostly is,—by sinapisms, which must be kept on a few minutes only and repeated from time to time; warm poultices; a few doses of sodium salicylate or phenacetin; in urgent cases by a subcutaneous injection of morphine. Vesicatories are injurious; they chafe, irritate, and annoy. Their only—rare—indication is in the long persistence of hepatization, with or without chronic pleurisy.

Irritating, hacking cough demands small doses of opium. Much of this cough is pharyngeal, and is relieved by frequent drinking of small quantities of water. Sleeplessness and great general irritation require a dose of opium for the night. A sleep of an hour or two affords great relief to the cough and to all the symptoms. As a general rule, however, the habit of giving opium in the first stage of pneumonia is a bad one. Rest should not be bought with death.

The bad odor of complicating gangrene indicates inhalations of turpentine, eucalyptol, or carbolic acid; the presence of abscesses in the lung demands surgical interference, unless there be a spontaneous rupture through a bronchus. Most abscesses are within reach of the knife and actual cautery, for generally there is a sufficient amount of pleural adhesion to render access devoid of much danger.

The prognosis of operations on pulmonary abscesses depends on their age and nature. Acute abscesses give a better prognosis than chronic, simple abscesses (though complicated with bronchiectasis) a better one than those which are putrid. Those depending on foreign bodies are not favorable, those originating in tuberculosis still less so. The latter are frequently multiple. Operation on the lung should be preceded by the resection of a rib. It is facilitated by pleural adhesion, but rendered difficult by the uncertainty of localization through percussion and auscultation. Deep-seated abscesses should be reached with the actual cautery, to avoid hemorrhage. On a colored girl of four years, however, I operated for deep-seated gangrene of the lung with the knife, being sure beforehand that the lung between the abscess and the chest-wall was carnified, though the expectoration was very bloody.

Complication with malaria, which is mostly rare, but was quite

frequent in New York in 1898 and 1899, requires quinine, best during a remission; intermittent pneumonia, which is also uncommon, quinine and ergot; complication with nephritis contraindicates digitalis and alcohol, and suggests the substitution therefor of sparteine, camphor, and nitroglycerin; in atelectasis the stronger stimulants are required, and artificial respiration by the different methods; the patient should be made to cry; cerebral disease, when acute, indicates ice and purgatives and bromides; when chronic, potassium iodide.

Hypostasis and *hypostatic pneumonia,* so common in infectious diseases and in conditions of great debility, require frequent changing of position from one side to the other and the early administration of stimulants in large doses, together with friction of the entire surface with cold or hot water or with alcohol and water. The most powerful of all internal stimulants—musk—should be given frequently,—viz., every half to one or two hours,—in doses of from one-half to two grains, until from six to fifteen grains (0.4 to 1.0) have been taken in the course of half a day.

Interstitial pneumonia is treated on the general principles laid down above. Later, potassium iodide in sufficient doses, a mild tincture of iodine externally, and an occasional vesicatory. When it has become chronic, digitalis may be given for months in small doses to keep up both a sufficient circulation through the indurated lung and a competent nutrition of the heart muscle, and potassium iodide alternating with iodide of iron. Persistent and careful pulmonary gymnastics should be continued for years.

Non-tubercular pulmonary phthisis should not be considered a nosological entity; it is the result of a variety of causes, such as primary bronchiectasis, or fibrous, syphilitic, or actinomycotic degeneration (p. 439). The fibrous degeneration is mostly due to protracted or repeated pneumonias terminating in carnification, multiple cicatrices (which may surround either healthy or atelectatic pulmonary tissue), and in many cases of pigmentation. Bronchial and pulmonary ulcerations are met with after both fibrinous influenza and pneumonia. Hansemann states that one of the principal causes is chronic lymphangitis.

Emphysema of the infant lungs, sometimes not easily diagnosticated because of the size of the liver and of abdominal tympanites, and never unless percussion be performed very, very gently, is often overcome by the elasticity of the pulmonary tissue, and therefore its prognosis, no matter whether produced by forced inspiration (in pneumonia) or by forced expiration (severe attacks of coughing), or even that rare form which results from ill nutrition of the alveoli,

is not so bad as it mostly is in adults. Its treatment is that of chronic catarrh, and by gymnastic exercise of the respiratory muscles and general roboration. Besides, forcible expiration ought to be practised extensively; during expiration the chest-wall ought to be well compressed. Snuff should be used half a dozen times daily, and copious sneezing procured. Expiration into the rarefied air of one of the many pneumatic apparatuses is also recommended. It may be tried on tractable children.

Pulmonary œdema requires the causal treatment of its origin, which can be traced to cardiac, pulmonary, or renal disease. Urgent cases—for the disease may prove fatal in a short time—require dry cupping, now and then the emptying of the lungs by an emetic (apomorphine subcutaneously when vitality is low and the expelling muscles are unable to act), and stimulation of the excreting organs and of the heart. A powerful purgative—calomel, croton oil, or elaterium—is an active derivant. Digitalis in large doses (a few minims of the fluid extract at once) will stimulate the heart. Sodio-caffeine salicylate or benzoate, in subcutaneous injections, from one to five grains (0.05 to 0.3), repeated five or six times at intervals of fifteen minutes, acts beautifully. Lead acetate stops oversecretion in a good many instances. Pilocarpine (from one-twentieth to one-sixth grain) subcutaneously has relieved, and saved, many a case resulting from renal disease.

Pulmonary hemorrhage is not frequent, for tuberculosis of the young lung produces induration and vascular obstruction rather than cavities; and though whooping-cough gives rise to hemorrhages, they are tracheal and bronchial rather than pulmonary. Cardiac diseases may lead to venous obstruction and thereby to hemorrhages. Digitalis, lead, alum, ergot, narcotics (mainly opiates in quieting doses), and ice temporarily to the chest, with a hot (mustard) bath of the lower half of the body, as well as absolute physical and mental rest, are indicated. Demelin collected twenty-two cases occurring in the newly-born (*Rev. Obst. Internat.,* January 1, 1897). They were either speedily fatal or gave rise to alleged melæna (blood swallowed).

Infarction, with its sudden onset and vehement dyspnœa (sometimes chill), is, in the newly-born, the result of embolism from the umbilical vein or the ductus arteriosus; later from a marantic thrombosis of the sinus, the renal, femoral, or portal vein, or from caries of the petrous or some other bone, from valvular disease, from an infectious malady, or from an extensive burn. The causal indications must be obeyed, if possible. Ice applications to the affected part,

opiates and digitalis, and stimulants when required, symptomatic treatment afterwards (antipyretics).

Some of the cases are followed by *gangrene*. This condition, however, generally results from the presence of foreign bodies, from acute infectious diseases,—diphtheria, measles, noma, typhoid,—or from (mostly lobular) pneumonia, also after infarctions. A few cases are also on record as having resulted from careless pneumatic treatment. Mineral acids largely diluted with water, as also quinine and lead, have been copiously used. Besides stimulants given to the required extent, I have relied mainly on inhalations of turpentine, either from a paper bag in which a sponge was kept soaked or from a kettle with boiling water, or of terebene; internally, of terebene, from twenty to fifty drops daily, or creosote a few drops daily. Latent pulmonary gangrene, not connected with a bronchus, may exhibit no odor, but great general asthenia (Martinez Vargas in Festschrift).

Such *pseudoplasms* as have been or may be observed in the young lungs demand treatment on general principles. *Carcinoma* has been noticed a few times, also in the mediastinum. *Sarcoma* is more common, mostly in the pleura. The treatment should consist in increasing doses of arsenic, and in the injection, according to Coley, of the toxin of the coccus erysipelatos and bacillus prodigiosus. *Echinococcus* of the lungs and pleura (fluid without albumin and sodium chloride, and with scolices) demands free incision, resection of a rib, and drainage. Puncture and the injection of Lugol's iodine solution do not suffice. J. von Bokay (Festschrift) performed Baccelli's operation between the fourth and fifth ribs in the left axilla. He removed thirty cubic centimetres of the fluid, injected twenty cubic centimetres of a one-per-mille solution of corrosive sublimate, and repeated the operation after four weeks. Recovery. *Actinomycosis* has been reported by Soltmann: the case occurred in the posterior mediastinum of a boy of six years; also by Karewsky. It may remain unrecognized, "latent" inside the lung, may perforate to the surface and through the chest, or may gain access to the abdomen and cause metastases. Potassium iodide and operation.

Hernia of the lungs has been observed below the clavicle and on the back. The soft, elastic tumor changes its size with respiration. In such cases the lung is either normal or emphysematous. The cough disappears after the application of proper bandages. *Deformities* of the chest-wall, with or without a *defect* in bones (*ribs* or *sternum—fissura sterni congenita—*) or *muscles* (pectoral), particularly the *funnel chest,* in which the lower part of the sternum is, by an arrest of development occasioned by the pressure of the em-

bryonal head while amniotic liquor is scanty, so drawn in as almost to touch the vertebral column, can never be removed, but the consecutive contraction of the intrathoracic space can be partially counterbalanced by systematic gymnastics and functional improvement of the lungs at an early age.

5. *The Intrathoracic Lymph-Bodies.*

In close connection with the congestive and inflammatory diseases of the thoracic organs are many changes in the *bronchial* and *mediastinal lymph-bodies,* which can more easily be prevented than cured. A protracted catarrh of the bronchi results in glandular hyperæmia and hyperplasia; a nasal catarrh of the newly-born and the nursling descends rapidly with the same effect, or the consecutive glandular tumefactions of the submental and submaxillary regions implicate the adjoining tiers of lymph-bodies; rhachitis, scrofula, and tuberculosis are also causes of bronchial and mediastinal adenitis. Bacilli may reach the lymph-bodies through the mucous membrane of the bronchi, though its epithelium be intact. Pressure on veins and nerves, occasionally with dilatation of one or both pupils, also on the trachea; attacks of coughing without crowing inspiration; fremitus, feeble or increased; respiration, increased and bronchial or feeble; dulness over the sternum down to the second rib, but not extending to the exterior margin of the lungs; dulness posteriorly about the hilum of the lungs, more marked to the left than to the right (location of thoracic duct on the left), are among the principal symptoms. Pressure on the trachea or on one of the large bronchi may be such as to cause an actual stenosis and suffocation. Fever, if present, depends on complications or on absorption from the glands while undergoing changes. Abscesses may cause pyæmia, or perforate into the œsophagus, or the trachea, or a lung. Antirhachitical, antiscrofulous, and antitubercular treatment are the indications. Mercurial ointment, potassium iodide ointment, inunction of green soap, potassium iodide internally, iodide of iron, increasing doses of arsenic, ice externally if there be any local pain, and the treatment of sequelæ or complications (catarrh, lobular pneumonia, dyspnœa, protracted fever) are demanded, but will not always prove successful.

6. *The Pleura.*

Pleuritis is of frequent occurrence during the first decade of life; empyema is, indeed, more common during infancy and childhood than in advanced age. The majority of cases of pleuritis which occur in the newly-born are secondary, of pyæmic origin, and depend

mostly on umbilical phlebitis; still, cases with serous, and the usual forms of purulent, secretion are not uncommon in the very young. Pleuritis may be the direct result of exposure ("cold"), of contusion, of broncho- and fibrinous pneumonia, of pericarditis and peritonitis, or of a neoplasm (then the effusion is mostly hemorrhagic). It frequently accompanies pulmonary tuberculosis (often "dry," rarely serous, more frequently sanguineous), diphtheria, acute rheumatism, and eruptive fevers. Thus, there is but rarely a causal indication for treatment; prevention is best secured by giving the utmost care to the management of those diseases which cause its outbreak. Its symptoms are often deceptive, for even pain is not always present, though it is one of the most frequent occurrences. The pain is sometimes quite local; at other times, however, it extends over a large surface. Its locality does not always correspond with the seat of the pleuritis. For instance, the extension of the peripheric ramifications of the intercostal nerves is so great that the children often complain bitterly of epigastric pain down to the umbilicus on the affected side. The disease requires absolute rest and immobilization of the chest. Broad strips of the usual varieties of adhesive plaster, which irritate the surface and render local applications difficult, are inferior in value to the plasters prepared with zinc. A broad bandage or a moderate-sized towel fastened round the chest with safety-pins is more appropriate and is well tolerated. An ice-bag applied to the diseased region will often render the best service; it must not, however, come in contact with the bare skin. When no bandaging is required, a cloth well wrung out of cold water, of the size of half a square foot, more or less, or surrounding the whole chest, may be applied every fifteen or thirty minutes. It should be covered with rubber cloth and flannel. In very bad cases the pain should be relieved by a subcutaneous injection of morphine; its internal administration is generally useless and sometimes hurtful. Local depletion by cups or leeches I have rarely used these thirty years; dry cupping may relieve such children as are old enough and intelligent enough not to get excited and not to harm themselves by screaming and active resistance. Mustard-plasters must not remain longer than a few minutes, and may be repeated every few hours. Warm fomentations will relieve anæmic and feeble children; they ought, however, to be avoided in the beginning of the disease, when the indication to limit congestion and secretion is paramount. A dose of calomel sufficient to relieve the bowels (sometimes followed by an opiate) and sodium salicylate in doses adapted to the age of the patient are the remedies which will bring relief. The salicylic acid

in the latter is not present in sufficient doses to lower blood-pressure to an uncomfortable degree. Vesicatories are much less indicated in the first stage of pleuritis than perhaps later; they always irritate both the skin and the patient, cause sleepless nights, and add to the discomfort of the patient, and discomfort and sleeplessness impair the prognosis. If there were a benefit to be derived from blistering, the condition of the pleura might be improved, perhaps, but the sick injured, probably.

If the temperature be so high as to injure the patient, antipyretics should be given. Probably from three to ten grains of quinine administered before noon will lower the afternoon rise. If required, a dose of phenacetin, with or without a moderate dose of codeine, may be given at eight or ten o'clock at night.

When the fever decreases, or when the heart begins to get weak previously, digitalis, strophanthus, sparteine, or caffeine, with or without ammonium carbonate or camphor, is indicated; no improvement, either through diaphoresis or diuresis, need be expected so long as the heart remains weak. The choice between the caffeine preparations is a matter of indifference. The salicylic acid in the double salt (Na + Caffeine) is not sufficient to depress the heart's action. At the same time an acetate, or a citrate, or an iodide may be given. Pilocarpine, which has been recommended, is a two-edged sword, and requires a stronger constitution than almost any baby and most older children can boast of; in pleuritis there is no vital indication that can be fulfilled by pilocarpine to such advantage as may be derived from it in certain cases of acute pulmonary or intracranial œdema. Externally, at this period, tincture of iodine diluted with alcohol may do some little good, particularly in cases of "dry pleuritis." It is this form mainly which will be benefited by warm fomentations and the use of iodides. When the main indication is to absorb effusion, abstinence from drinking, and the use, in fair doses, of table salt, which increases diuresis, will be found useful. Diuretin, in four daily doses of from two to five grains (0.125 to 0.3) or more, may stimulate the action of the kidneys to such an extent as to result in the absorption of the pleural effusion. Milk-sugar in drachm doses, as much as an ounce daily, may be given as an adjuvant to increase diuresis.

The indications for operative interference with the pleural effusions, no matter of what description, are various. It is demanded when the difficulties of either respiration or circulation, or both, require immediate relief. The latter may suffer even without the participation to a great extent of the former. Indeed, Trousseau

describes a case of fatal collapse due to nothing but disordered circulation. Among the symptoms urging the operation are intense dyspnœa, cyanosis, diminution of the renal secretion, anasarca and ascites, and a considerable dislocation of the heart or the liver. In many cases the intercostal interstices are no longer visible, either on inspiration or expiration; they are even found bulging. Not in every case are the consecutive disorders proportionate to the amount of effusion; indeed, this may be small compared with its effects when the pleuritis is complicated or secondary to a disease of either heart or kidneys, or both. Still, the quantity of fluid contained in the pleural cavity is more frequently underestimated than the reverse, no matter whether the healthy lung is pressed upward and is floating on the liquid in a compressed condition, or whether, congested or inflamed, it is swimming in the midst of the fluid or adheres in places to the chest-wall. Thus, it is impossible to exactly gauge the indications for the operation according to the amount of effusion. Potain's assertion, that when the latter reaches the level of the clavicle the operation should be performed, is justified by the fact that the consecutive symptoms in the majority of such cases are very urgent. In most cases we should not wait quite so long. In such persons as do not subjectively complain, indifference is mostly due to lack of cerebral perception,—in conditions of unconsciousness during meningitis, typhoid fever, or idiocy. When the dulness extends high up both anteriorly and posteriorly, and no absorption takes place within a few weeks, the operation is required. The longer the compression of the lung has lasted the smaller will be the chances of its reinflation. It is true, however, that now and then it will re-expand after compression has lasted two or three months. Another serious danger accompanying the pressure produced by the liquid is the inactivity of the blood- and lymph-vessels of the walls of the cavity; for in such a case total compression means absence of function (absorption). Thus, even a partial removal of the fluid, with partial relief to the vessels, is quite often the first stimulus to absorption and the commencement of recovery.

In order to either make or confirm the diagnosis of exudative pleuritis, an explorative puncture is often resorted to; for, in spite of a number of rational symptoms, the positive diagnosis of a pleural effusion or exudation is sometimes impossible without its ocular confirmation. The puncture is made near the upper edge of a rib to avoid the course of the intercostal artery, while the hand of the diseased side is carried to the opposite shoulder to widen the intercostal spaces. The pain of the little operation is diminished by the

quickness of its performance; besides, a slow introduction of the needle—particularly when of larger size—may peel off the pleura from the chest-wall. In many cases of copious exudation the place selected, within certain limits, is a matter of indifference. The puncture is mostly made where there is bulging, or a high degree of dulness, or more or less complete absence of respiratory murmur, frequently in the sixth intercostal space posteriorly to the axillary line. When these spaces are narrow, or when the patient is restless, it is not always easy to penetrate them; these are the cases in which, now and then, the intercostal artery has been wounded, or pain resulted from hitting the periosteum. When the point of the needle is not carried far enough, it may land in the chest-wall or in the thickened pleura; when too far, it reaches the lung; when in a wrong direction, it may be fastened in the liver or in the spleen. In such cases the needle is liable to participate in the excursions produced by inspiration and expiration, and, when withdrawn, will carry blood instead of the contents of the pleural cavity. In rare cases it is possible, however, to exhibit the latter and still wound the lung. It has happened to me to extract pus from a pyothorax. On the very spot of the puncture the incision was made and a rib exsected; when the incision through the pleura was made, there was bleeding from the lung. The wound was closed with iodoform gauze, a new puncture was made at a different locality, pus was found, the rib exsected, and again there was, on incision, pulmonary hemorrhage, which also was stopped by compression with iodoform gauze. A third puncture and a third excision at last led directly into the empyema. The failures were due to extensive pleural adhesions, and the deceptive results of the exploring punctures to the fact that the needle did not reach pus until it had perforated the adhering and twisted lung. Punctures of the lung need not result in hemorrhages, but there are enough cases of the kind to enforce the greatest care.

While an absolute diagnosis cannot always be made without a puncture, the results of the latter are sometimes not conclusive. Though there be plenty of liquid (serum, pus, blood) in the cavity, it may not always follow the sucking piston. The point of the needle may first land in the lung after passing through liquid; this will enter the instrument only while the needle is being slowly withdrawn, provided again that it has not been closed by a blood-clot. Therefore, when the puncture is futile, the needle ought to be carefully examined as to its perviousness; or the needle is too thin for the contents; pus is quite often present where serum was expected; or the needle is caught in thick fibrinous deposits. That

may happen time and again, and lead to serious miscalculations and mistakes. Or the pleuritis may be localized, and result in an encysted empyema instead of a general pyothorax. Such localized empyemata are more frequently met with posteriorly, and upward (but sometimes anteriorly), than low down, where they are usually expected, on account of the fact that it is there that free pleural fluids are found. They are quite small sometimes, and not infrequently multiple, and therefore hard to find. Puncture after puncture must be made in such cases as yield all the rational symptoms of pyæmia, including leucocytosis in examinations of the blood, and when no pus can readily be detected. When finally found, it is not always certain to come from a pleural abscess, after all. It may be derived from a small pulmonary abscess, or from a pyopneumothorax. In the latter instance, however, and sometimes in the former also, there is often air (or gas) found mingled with the pus.

There are other possibilities of mistake. The needle may have withdrawn serum only, and yet pus or blood may be present; for in patients who have been in a recumbent or semi-erect position, as usual with pleuritics, the solid constituents of blood and pus will be deposited near the diaphragm. Thus, a microscopic examination ought first to complete the diagnosis of the nature of the pleural contents. When pus has been found, there is an urgent indication not to procrastinate the radical operation, for the puncture channel may become the cause of pus-infiltration, and possibly of pyæmia. Particularly is this so when the pus is discolored and malodorous, as it is apt to be in cases of pyopneumothorax, or in those which are complicated with caries. The latter cases are apt to be attended by high temperatures (still, there are exceptions), the fever being either continuous or irregularly intermittent. Such fevers require an exploring puncture at an early date; it is mostly delayed too long. Indeed, every case of *uncomplicated* pleuritis in which a high temperature is incessant for four or five days, mainly when complicated with much pain or local œdema, becomes suspicious. Even as early as the fourth day I have met with large amounts of pus, not only in infants and older children, who are more apt to develop pleural suppurations, but also in adults. These are sometimes instances of double empyema. Though it is not frequent, it should be thought of in cases of unusual severity. Moderately high temperatures, however, do not necessarily indicate the use of the needle, for through periods of weeks temperatures of 100½° or 101° F. may persist without meaning anything but the systematic irritation caused by a perpetual process of absorption and elimination. Thus, after

all, there is no positive certainty that can be conveyed to the unthinking; here it is, as everywhere in medicine, that experience comes handy, when guided by brains.

Before the operation of puncturing is performed, the skin must be thoroughly washed (and disinfected); after the needle has been withdrawn, iodoform gauze, or bismuth subcarbonate (or some other disinfectant powder), or a sterile gauze is applied to the wound and covered with adhesive plaster or a bandage. If there be pain, ice is applied. At all events, the chest ought to be at rest; the patient, if possible, in bed; no exercise or work permitted for a day. As a remedial agent a simple puncture is of no account. When recovery follows an exploring puncture, it is spontaneous, and not induced by it; for spontaneous absorption of the pleural fluids, both of transudations and exudations, is quite frequent. That is mainly so when the liquid is serous only and not too excessive; in the latter case, absorption begins only when, by means of an aspiration, the pressure by which blood- and lymph-vessels are hampered has been in part relieved. Nor is it infrequent for hemorrhagic exudations, or even extravasations, to be absorbed after the solid constituents have been deposited on the surfaces of the pleuræ. Even the results of tubercular pleuritis may disappear, just as ascites caused by tubercular peritonitis is apt to get well whether or not tubercle bacilli are found in the fluid. As a rule, in most of the cases of spontaneous recovery no microbes are present; if they be found, they are mostly the short-lived cocci of Fraenkel. No such favorable event, however, need be looked for when the long-lived streptococcus and staphylococcus are present; still worse is the influence of proteus vulgaris and mirabilis in putrid empyema. Simple encysted empyema, however, may finally heal without any operative interference, through a process of gradual inspissation and absorption; but it is not advisable to expect it or to wait for it.

Spontaneous perforation of pyothorax, either through the lungs or through the chest-wall, may lead to recovery; but it is slow, and takes place at the expense of much time, suffering, tissue, and usually of future health and vigor. It should never be wished or waited for. Other perforations may take place into the œsophagus, the pericardium, or the abdominal cavity. Thirty years ago I saw, with Dr. L. H. Sayre, an empyema we had to open in the right gluteal region.

Thoracocentesis ought to be performed soon after the exploring puncture. In many cases, when a mere aspiration is made, the operation appears simple enough; but it ought to be considered serious in all cases, as in many it is. The patient must rest quietly and be

well supported in the position recommended for a simple puncture, and so that respiration and circulation are not unduly interfered with. The needle is inserted with the precautions detailed in the remarks I made on puncture; if it be caught by a fibrin clot, the latter may be detected by a probe introduced through the needle, but a second insertion may be required, probably anteriorly and superiorly to the first one. Aspiration alone will not cure empyema, except occasionally in infants, whose ribs are flexible and whose chests can be compressed more readily so as to approximate and adjust the walls of the abscess; even in them, however, the same operation must not be repeated after pus has again been formed, but a more extensive and radical operation is to be undertaken. Aspiration is always contraindicated in the empyema of adults, except in a vital indication for temporary relief, or when the fluid is hemorrhagic in character, or in cases absolutely inoperable by a more radical method.

During the operation the patient, if it be feasible, ought to be kept as much as possible on the diseased side, so as to avoid the dyspnœa due to the compression of the lung of the opposite side and the molestation of the heart. The fluid may be permitted to flow so long as the current remains equable during inspiration and expiration; the discharge must be stopped when the current begins to cease during inspiration. The relief given by the removal of a half-pint or a pint is sometimes considerable; but in young children, with their compressible chests and corresponding facility of accommodation to the expanding lung, it is safe and advisable entirely to empty the cavity. If the operation—because of the urgency of indications—be performed while exudation is still progressing, and dyspnœa return, another thoracocentesis may become necessary within a short time. I had to operate twice within a day. If the contents be hemorrhagic (from tuberculosis, carcinoma, alcoholism, nephritis, a rare occurrence in childhood), as little as possible should be withdrawn.

The operation requires time. It is advisable to interrupt the discharge from time to time; for the too rapid entrance of air into the bronchi causes violent attacks of coughing (erroneously attributed to the needle irritating the pulmonary pleura), or the sudden rush into the expanding lung may give rise to large quantities of serous, strongly albuminous, bronchial secretion, or to copious pulmonary œdema, or to hemorrhages with slight surface lesions, or even to considerable rupture of pulmonary tissue. Fainting spells are also frequent during a rapid escape of serum, sometimes through psychical influences, sometimes from cerebral anæmia. In other cases (fortu-

nately rare) thrombi formed in the compressed lung, or in the impeded heart, or in the torn surface of the bronchi may be carried into distant blood-vessels; thus, emboli are known to have been swept into the pulmonary artery or into the artery of a fossa Sylvii.

After the operation the wound must be cared for as I suggested above, when speaking of the treatment of a mere puncture made for the purpose of a diagnosis. In addition, it is advisable to enforce absolute rest and to apply for some time an ice-bag to the part. This is particularly necessary when there is acute pain. Should this be severe, morphine may be used subcutaneously, but in uncommonly small doses, because its absorption is very rapid and its effect much more marked here than under ordinary circumstances.

The simple operation of aspiration does not suffice in cases of exudative pleuritis in which the pleural contents hold, or consist of, pus, either laudable or putrid. As I mentioned before, pus may be found as early as the fourth day, and then it is often on both sides. When high fever attends such cases, far from contraindicating a radical operation, they require it for immediate relief. If such relief be not obtained after a reasonable time, it is either because of a complication, such as pneumonia, pericarditis, or peritonitis, or of some pus concealed in a recess. The latter ought to be looked for and made to discharge; Nelson employed a metal sound for the purpose of breaking up adhesions and facilitating the escape of pus.

The radical operation consists in the making of a large aperture, either by a simple incision between two ribs, if possible, in the fifth or sixth intercostal space between the mammillary and axillary lines, or by incision with the exsection of a piece of rib from one-third of an inch to an inch in length, large enough to admit two fair-sized drainage-tubes. The opening is insufficient so long as it gives no exit to the clots of fibrin, which are sometimes as large and perplexing as their presence is unsuspected. It is on their ready and speedy removal that the duration of convalescence or the favorable or fatal termination depends. Therefore, they should be removed at the time of the operation. There is no better means than to dislodge them from the surface of the lung and of the chest-wall by the index-finger introduced into the cavity. During the following irrigation they are washed out or appear at the opening and may be caught in a forceps. There are those who, as the presence or absence of these large masses cannot be diagnosticated, insist upon exsection in every case of empyema, no matter whether of recent date or of long standing. At all events, whenever there has been a continued or a pyæmic fever, a great deal of pain, an intercostal œdema, or a complication with

infectious embolism, pyopneumothorax, tuberculosis, or superficial pulmonary or hepatic abscess, the exsection of a large piece of rib is indispensable. After the operation has been completed, the cavity may be thoroughly washed with quarts of warm saline (6 to 1000) or of Thiersch's solution. Stronger antiseptics should be avoided, or used only—largely diluted—when the fluid is decomposed. In the latter case irrigations are indispensable; they may be dispensed with altogether when pus is absolutely laudable and the patient in a low condition. The dressing should be soft, thick, and aseptic. The frequency of the removal of this dressing and the number of injections depend on the nature and quantity of the pleural secretion. In the majority of cases it is safe to wait until the dressing becomes moist. When the lungs expand readily, many days may elapse before the first dressing is removed and another one substituted. In most cases no irrigation is required after the one which terminates the operation. For the sake of thorough drainage, the patient should, however, be placed horizontally (the incision being the most dependent part) with raised hips, at least three times a day, and ordered to cough as hard as possible (Koenig). When, however, the pus is putrid, and in cases of complications such as are mentioned above, a daily change of dressing and daily irrigations, with occasional short interruptions, should take place. To expand the lungs and to promote the required adhesion between the pleuræ, the child should amuse himself with blowing soap-bubbles, trumpeting, or with W. T. James's entertaining exercise. He is made to blow air into a bottle and dislodge the water (colored with fuchsin, methylene-blue, or such like) into another one by means of a simple system of rubber tubes. When fistulæ remain behind, or the abscess cannot close because of the lung being kept from expanding by pleuritic thickening over it, larger pieces of one or more ribs must be removed to enable the chest-wall to sink in and thereby facilitate the approximation of the walls of the cavity. In these, as in many simpler cases, it is necessary to keep the opening patent for a long time; this is readily accomplished through the slowness of the growth of callus in that region. To render the expansion of the lung possible, J. D. Bryant (Festschrift) exhausts the air and empties the contents of the cavity by means of a closely fitting rubber apparatus, aided by adhesive straps.

The hemorrhage complicating the operation for empyema is rarely copious; but it should be stopped, as the patient is not in a condition to lose blood. A severe hemorrhage coming from numerous granulations on the pulmonary pleura I had to stop by filling the cavity immediately with large quantities of sterile gauze.

Other *hemorrhages of the pleura* may be due to the presence of neoplasms or to grave septic fevers. In variola and lead or phosphorus poisoning they may be complicated by fatty degeneration of the liver, the kidneys, the heart, and the pancreas. Others are angiopathic,—in hysteria, in obstructed general circulation, and in suffocation.

Hydrothorax (fluid with a low specific gravity, less than 1015, and from one to five per cent. of albumin) depends on or is complicated with malaria, nephritis, cardiac disease, anæmia, or cachexia. The cases resulting from scarlatina are among the most favorable. Besides the indications afforded by its cause, and good nutrition, hydrothorax demands diuretics, such as digitalis, sparteine sulphate, caffeine, diuretin, and potassium bitartrate. The less such patients drink the more readily will the fluid be absorbed. Plenty of sodium chloride in food and drink will increase renal action. If no reduction of the fluid take place, paracentesis is demanded.

Pneumothorax is a complication or a result of the perforation of a cavity, of pulmonary gangrene, of pleural infarction, or of perforating empyema, and in many cases of this kind *pyopneumothorax* will be observed. Foreign bodies are more apt to produce pneumothorax than whooping-cough, which is liable to tear the mediastinum rather than the pleura. Ice will relieve local inflammation and pain, so will opium, which, moreover, modifies the perturbed respiratory movements. Cases of pyopneumothorax which do not readily discharge their pus through the lungs demand a counter-opening of the chest-wall, which should be made, not under a general but a local anæsthetic. *Subcutaneous emphysema* is occasionally observed in pyopneumothorax; it is a disagreeable but not dangerous complication.

X

Diseases of the Organs of Circulation

1. *The Heart.*

Both in *acute* and in *chronic diseases of the heart* the amount as well as the quality of food require some modification. In many cases the loss or diminution of appetite will regulate the former. As a rule, however, the amount taken ought to be much less than the same person would take when in health. Not only ought the total quantity to be less, but also that consumed at each meal should be comparatively small. It is best, therefore, to divide the meals into halves and even thirds, so as to cause the patient to eat every two or three hours. Digestibility must be improved by slow eating. The diaphragm should not be annoyed by large quantities of food or by the evolution of gases. Therefore but few carbohydrates (very little fat) are to be given at one time, and the digestion of nitrogenous foods, such as meats (eggs) and milk, with or without cereals, ought to be aided by pepsin and dilute hydrochloric acid. The latter is an excellent adjuvant to the digestion of milk prepared according to J. Rudisch's formula (p. 34). Or it may be modified or mixed according to other rules given by me in the first chapter of this book. At all events, milk is the main food to be given in cardiac ailments. Its digestion has a further advantage in this, that it does not result in the physiological congestion of the stomach, liver, and spleen, which becomes irksome after large and heavy meals by disturbing circulation and thereby adding to the labor of the heart, and that it does not contain the large mass of fat-forming elements present in the mixed food of healthy advanced childhood or adult age. Altogether, it is best to slightly underfeed the patient; thereby the action of the heart is facilitated,—an object which must never be lost sight of. For the same reason fast drinking, even of water, must be avoided, for its sudden absorption fills the blood-vessels too suddenly for comfort, and its speedy elimination does not diminish the momentary overwork. This warning is of particular importance as regards iced liquids, which act both by their bulk and by reflex. This advice is by no means superfluous, either to medical men or to the sick. It was urged by Williams more than fifty years ago. Stokes prohibited the use of large quantities of soups or milk. And it has been again

introduced by Oertel with such impressive emphasis that thirsting has become almost fashionable and a craze among the fanatics.

That stimulants, such as coffee, tea, and alcoholic beverages, must not form part of the regular diet in cardiac disease is self-understood. They may be required as medicinal agents, however, upon positive indications.

In every form of cardiac disease absolute rest both of body and mind is among the very first indications. The latter is just as important—perhaps more so—here as in diseases of the nerves and nerve-centres. Fretting, worrying, crying are detrimental, and must be avoided. Thus, it may become necessary to take a child out of bed, temporarily, to gratify and quiet him; or to change his position, for the recumbent position of an hypertrophied heart may cause dragging of the phrenic nerve or of the sympathetic plexus; or to raise the trunk and head to relieve intracranial hyperæmia and the consecutive irritation of the pneumogastric nerve; or to give a mild opiate or a dose of potassium bromide to insure quietude or sleep. The child must be permitted to select his own position; he knows best where he is most comfortable; but rest he must. The diseased heart is in its most favorable condition when working least; the number of heart-beats is reduced by ten or twenty-five in the recumbent position. Rest is not only a curative, but a preventive agent. Many a life-long cardiac affection could be warded off if care were taken in time. We are becoming more and more aware of the frequency of affections of the heart muscle. Myocarditis in a chronic, subacute, and acute form is of very frequent occurrence. In or after every case of typhoid fever, scarlatina, diphtheria, or small-pox we should be prepared to be overtaken by some cardiac disease, either interstitial myocarditis or parenchymatous degeneration. Rest in bed or on the lounge (the former is better) will act as a preventive. It ought to be continued for weeks in almost every case. Like the paralysis consequent upon infectious diseases, which develops after weeks, heart disease may occur from the same cause, partly as a consequence of actual primary alterations, partly of nerve exhaustion. So long as the pulse becomes more rapid on exertion, or on getting out of bed, absolute rest is the best remedy and safeguard. In these cases it is not always possible to distinguish between functional debility and actual disease. Autopsies too frequently tell us of our mistakes. Trifling changes in size cannot be measured by percussion, feeble murmurs cannot always be estimated according to their exact value. Functional murmurs are not so frequent in the child as in the adolescent or the adult, and exceptional only in the infant. On

the other hand, organic cardiac diseases have a better chance to be cured—really cured—in the young than later. So much the greater is the responsibility of the medical man in cases of preventable or remediable cardiac disorder. Even patients suffering from the very worst forms are apt to feel better within a very few (hours or) days after being confined to bed, with strict diet and loose and comfortable clothing. These cases teach us the lesson of what can be accomplished through the same *régime* in milder or incipient forms, by reducing the labor of the heart and at the same time of the voluntary muscles, with their influence on circulation and blood-pressure, and by diminishing the overactivity as well of the general innervation as of the cardiac nerves, both exciting and inhibiting.

It is difficult to decide to what extent exercise should take the place of rest in individual chronic cases. The hearts of patients are as little alike as are their noses and finger-tips, and their treatment ought to be as individual as the size and shape of their gloves. Neither fit everybody. Nor is the rule adopted to-day that which will accomplish the best end in a month or a year for the same patient. The heart is neither in health nor in disease a uniform body. Its innervation may change from minute to minute, its nutrition is dependent on sudden or gradual alterations. A heart muscle is influenced in its arterial supply, venous discharge, and lymph circulation not only by its own health or disease, but by the ever-changing conditions of the other organs. Thus, many of the rules given one day may not remain valid another. Still, after a fair time has elapsed since the occurrence of an acute myocarditis or endocarditis, exercise should be recommended. The child may get up and have his quiet play sitting at the table, may begin to walk on the level floor, and may indulge in mild gymnastic exercise. More must not be permitted until the mucous membranes become a little more tinged, the arteries fuller, the heart quite regular. The systematic rules recommended by Stokes and by Oertel refer more to adults, with their incipient fatty degeneration and chronic myocarditis, than to children. In these, while they bear the imprint of cardiac changes, no iron-clad rules hold good. Gentle exercise and long rest should alternate.

Gentle exercise may be replaced or complemented by massage of the skin and the muscles, both of which are so essential for circulation and metabolism. The blood circulating in a resting muscle during one minute amounts to 17.5 per cent. of its weight; in a contracting muscle to five times as much. It is easily seen to what extent massage, hydrotherapeutic irritation of the whole surface, and excitation of the muscles by the interrupted current must do good

without an exertion of the heart muscle. The avoidance of the latter, while the muscles are gently exercised by "resistance movements," is the peculiarity of the Schott treatment at Nauheim. It is indicated in a great many cases; in others it is Oertel's climbing exercises. In all it is the judicious mind and common sense of the physician in charge of the individual case.

The skin requires judicious attention. Exposure to cold, with its consecutive contraction of the cutaneous blood-vessels, overloads the viscera, retards circulation, and increases the labor of the heart muscle. A cold general bath, therefore, is dangerous (as also in the atheromatous degeneration of the old) in acute carditis (where *local* application of cold to the heart region acts quite favorably) or in extreme muscular weakness of the heart. On the other hand, a brief cold sponge-bath or wash, with thorough friction, is an intense stimulant and may be used to advantage for a weak heart, unless the extremities be cold and the mucous membranes cyanotic. In these latter conditions, hot washes and frictions, with or without alcohol, should take its place. In the average condition of the diseased heart general hot bathing must be avoided. It overstimulates and paralyzes, and proves an actual danger in both acute and chronic cases. Newspaper readers will remember the reports of people who go to the hot or "Turkish" bath with their heads erect and full of their own therapeutical wisdom, and leave it with their feet forward. A warm bath, the temperature of which ought not to be over 90° or 92° F., is often relished. In fact, both the talking child and the infant will soon tell you the exact temperature best adapted to their wants. In these cases actual want and comfort are identical. The baths, particularly the first, must be limited to a few minutes; at all events, they should never be continued after the slightest weakness of the pulse is noted. The debilitating or fatiguing effect of the bath must be avoided.

The mineral springs which have obtained a reputation in the treatment of chronic heart disease, like the German Nauheim and Oeynhausen, owe their effect to the stimulating action of the salts and of the carbonic acid contained in them. It should be remembered, however, that not infrequently carbonic acid, both internally and externally, may cause tachycardia and arrhythmia.

Like hot water, hot air is contraindicated in heart disease. The wilted forms of the little ones soon show the effects of summer heat. A temperature of from 65° to 70° F. and fairly dry air are best for them. High altitudes do not agree with cardiac disease, particularly when no compensation has facilitated the heart's action. Com-

pensation is not complete until the hypertrophied left ventricle, having become so by mitral incompetency, transmits as much blood into the aorta as the pulmonary artery does into the lungs. Until that stage has been reached, the lungs are comparatively hyperæmic and subject to catarrh, œdema, or bleeding. In this condition, therefore, the influence of the rarefied air of high altitudes should be avoided; as a rule, I recommend an altitude of not more than from one thousand to fifteen hundred feet to children affected with chronic endocarditis.

In the therapeutics of the heart it is most important not to mistake a functional disturbance of the heart's action for the immediate result of heart disease. The contractions of the heart (the pulse), as to number and rhythm, are more frequently influenced by disorders of other organs or of the organic economy in general. The pulse may become arrhythmic from cardiac (mainly myocardial) disease, but also from meningitis, from neuroses (chorea, hysteria, epilepsy), from anæmia in convalescence after grave diseases, in chlorosis, in universal obesity, even in the apparently healthy; from the auto-infection caused by constipation or by jaundice; or from the effects of medicines. It is self-evident that all these different causes, and not their common symptom, should be treated.

The functions of the heart and blood-vessels are best considered together, from a clinical point of view. Together they control the normal blood-pressure and circulation; when these are disturbed, it is mostly (not always) the same remedies or drugs that influence at the same time the heart and the arteries. Such disturbances are either an increase or a lowering of blood-pressure, and alterations in the circulation which are characterized by slowness or frequency of the pulse. In the diseases of the young it is mostly cardiac stimulation that is required with a view of contracting both heart and arteries. Its indication is furnished by primary feebleness of the heart muscle, or by that which is secondary to acute or chronic inflammatory or infectious diseases, or meningitis; sometimes by congenital under-size; by impaired brain function after hemorrhages, in syncope, or in chronic cerebral anæmia; in tedious convalescence; by insufficient diuresis; by pulmonary œdema; by reflexly lowered blood-pressure in shock, in colic, or after extensive burns; by hemorrhages; or by toxic dilatation of blood-vessels caused by chloral hydrate, nitrites, pilocarpine, or muscarine. Angina is, fortunately, very rare, for acute or chronic aortitis is very uncommon. Whenever it occurs it may cause a neuritis of the cardiac plexus near the coronary artery and under the influence of peri- or (and) myocarditis.

Blood-pressure and circulation are improved by physical means,

such as transfusion, salt-water infusion, lowering the head and raising the feet, ligature of the extremities, manual compression of the abdominal aorta, and hydrotherapy in different forms. The centres of the medulla and of the spinal cord are influenced by strychnine and ergot; the vasomotor centres and the heart by caffeine, camphor, ammonium, and musk; the vasomotor centres and the peripheric vasomotor nerves by hydrastis; the heart by alcohol, atropine, and sparteine; the heart and arteries by digitalis, strophanthus, adonis, convallaria, hellebore, and apocynum.

Among the principal remedies employed for the purpose of reducing blood-pressure and dilating peripheric vessels are warm baths, or foot-baths with or without mustard, warm clothing, rest in bed, narcotics, such as morphine and chloral hydrate, acids and alkalies, and the nitrites.

At the head of the list of heart and blood-vessel stimulants stands digitalis. It increases the action of the heart muscle and thereby increases cardiac pressure. It is indicated in all conditions of weakness of the heart muscle so long as the latter is not decomposed and the arteries are in their usual structural condition. Primary changes of the heart muscle hardly ever occur in childhood, for uncomplicated fatty degeneration, in which digitalis is contraindicated, is almost unknown at an early age. Secondary parenchymatous degeneration is, however, a frequent occurrence in and after infectious diseases, such as typhoid fever, dysentery, rheumatism, scarlatina, diphtheria, and others. Digitalis is useless and sometimes worse than useless in nervous affections, such as the palpitations of Graves's disease, of neurasthenia, or of hysteria. In all probability the effect of digitalis is mostly felt at first in the left ventricle, which is more muscular, but in the right ventricle almost as soon. By acting on the left ventricle it regulates the general circulation and facilitates aspiration of the venous blood and the circulation in the lungs and in the right heart. It strengthens the systole and lengthens the diastole. During its administration the contractions of the heart become more vigorous and less frequent, the arterial pulse slower and fuller, the urine increases in quantity, cyanosis and dyspnœa diminish, and dropsical symptoms gradually disappear. When large doses have been given for some time, accumulation of the effect takes place. The pulse becomes quite slow and irregular, and vomiting sets in. If possible, this effect should be avoided.

For how long a time may digitalis be administered when given in moderate doses? This question has often been asked and as often answered. Unfortunately, the preparations sold in the markets are of

different strengths and vary too often; so it is best to rely on preparations which are not liable to spoil on one's hands. With that proviso, I can say, from an experience of several dozens of years, that I cannot agree with those who stop the administration of digitalis after a few days, to begin again after an intermission. Moderate doses may be given day after day for months without any ill effect and with great benefit. Nor is it necessary to alternate between cardiac stimulants so long as no uncomfortable effect of digitalis makes its appearance. Only when the patient cannot be seen for many weeks in succession, the practitioner may feel like alternating digitalis and strophanthus weekly.

In practice we are often disappointed. The preparations are as various as are the firms of wholesale, or sometimes retail, manufacturers or tradesmen. The United States Pharmacopœia is, after all, the best stand-by of the practitioner, and its list of drugs and that of the National Formulary of the Pharmaceutical Association are sufficiently large to suit any taste. The infusion of digitalis, when reliable, may be given to a six-year-old child in doses of a teaspoonful two or four or five times a day, the fluid extract (I have often expressed my predilection for "Squibb's") two or three minims daily, the solid extract from one-half to one grain daily (0.03 to 0.06). They are not equivalent, the infusion being weaker by containing the digitonin, which is highly soluble in water and acts rather as an antidote to digitalin and digitoxin. The tincture of digitalis, when reliable (not fixed up by mixing a poor "fluid extract" with alcohol), ought to be a competent equivalent of the fluid extract, if both be made of the English leaf gathered in July. It has been found that when digitalis, though English and gathered in midsummer, is kept, the preparations made of it later lose in strength, so that those made nine months afterwards display only one-third or one-fourth of their original power. The main constituent is digitoxin; of it there is less in sunless summers, to such an extent that it varies from 0.1 to 0.62 per cent. of the herb. Görges (*Berl. klin. Woch.*, August 13, 1902), for that reason, recommends a dialysate (made by Golaz in Saxon Switzerland) of digitalis purpurea and grandiflora, of which children of two or three years are given from two to six drops three times a day. Indeed, children bear digitalis and cardiac stimulants generally better than adults, and in comparatively larger doses. Digitalin I have used a great deal. Unfortunately, the wares sold by that name are very unequal: they are resinoids, not alkaloids. I have used ten or twenty times the doses recommended in books and price-lists without any effect whatsoever that could be relied

on. For many years I have given it up. In urgent cases a six-year-old child must take from one to five minims of the fluid extract at once. That dose may be repeated after a few hours, and perhaps again, until the effect is perceptible. Then it is time to slacken off or stop altogether. It is particularly in those cases in which the pulmonary circulation is obstructed, either by local pulmonary inflammatory processes or by cardiac incompetency, that this mode of proceeding is advisable (p. 431).

The effect of digitalis is not limited to the heart; the arteries are also affected by it. On this account digitalis is often contraindicated in senile affections of the whole vascular system. As they (atheromatous conditions) are not found (except in a few cases of the literature) in infancy and childhood, this contraindication is rare in early age. There is a single exception, however, to this rule, —viz., in abnormal congenital smallness of the arteries, which is not so excessively rare as may be presumed, and is a frequent cause of life-long migraine, neurasthenia, hysteria, and chlorosis. In these conditions, thus caused, digitalis is not so well tolerated when given by itself. It acts better when combined with a nitrite.

In those cases in which the effect of digitalis appears to be retarded, or the practitioner has "reason to doubt the qualities of his drug," another one may be substituted for it or combined with it. I plead for occasional combinations of drugs. The "simple prescription" flag of the "one drug only" fanatics waves over a childish affectation. They forget that they are prescribing half a dozen different constituents in their "one drug" digitalis. Moreover, when the heart requires stimulation, we should remember that it is a composite organ; the muscle, the ganglia, the pneumogastric, sympathetic, and vasomotor nerves are suffering simultaneously. The tincture of strophanthus may be taken by the same child to the daily amount of from six to twenty-five minims; the fluid extract of convallaria majalis in the same or somewhat larger doses. Again I suggest that in most cases it is best to ascertain the moderate dose to be administered a long time in succession by giving a good dose from the very beginning and watching its effect. Of sparteine sulphate (better than other preparations of scoparius) eight or ten doses are required daily, altogether amounting to from one-half to two and a half grains (0.03 to 0.15). Caffeine from two to ten grains, or sodio-caffeine salicylate (or benzoate) from four to fifteen grains a day, are fair doses, the effect of which will be pleasant in most cases. In a former chapter of this book (p. 70) I alluded to the subcutaneous use of the latter; it dissolves readily in twice its weight of water

and is not a local irritant; it is therefore easily employed. The effect of these injections is often marked. Nearly twenty years ago I published a case of cardiac pulmonary œdema, among others, in which recovery was the undoubted result of their use. There is, however, a positive contraindication to the use of caffeine (and coffee),—viz., cerebral hyperæmia, either active or passive, or a tendency to convulsions. The same contraindication holds good for strychnine sulphate, which has conquered a trusted place as a cardiac stimulant. If there be time, it may be given internally, daily, to the amount of from one-sixtieth to one-twentieth of a grain (0.001 to 0.003) for many days or weeks in succession. Urgent cases require its subcutaneous administration. Large doses, up to one-fourth or one-third grain (fifteen or twenty milligrammes), may be given to a child of ten years, in emergencies of collapse and sepsis, in a day, but such doses must not be continued, except in thorough sepsis. Sodio-theobromine salicylate has been introduced (as "diuretin") by G. Sée. It is a diuretic rather than a cardiac stimulant, and, unlike the former, is often found wanting. It appears to act principally on the epithelia of the uriniferous tubes. Calomel in small doses is certainly a cardiac sedative, and, as it is surely a diuretic, it is entitled to the many praises bestowed on it by the older rather than by modern physicians. Salines owe their effect upon the heart mainly to their action on the digestive and the urinary organs, with the exception of the bromides and iodides, the former of which act as sedatives, and thus save labor and soothe irritation. Potassium iodide has a more direct effect. It dilates arteries, diminishes arterial tension, and aids elimination through the bronchial mucous membranes and the kidneys. Obstructions of the pulmonary circulation depending on the heart are its appropriate indication. Sclerosis of the coronary arteries is not, or hardly ever, found in the young; therefore this is an indication exclusively belonging to advanced age. A child of six years may readily take from five to twenty grains (0.3 to 1.25) a day, in three or four doses, in plenty of water, after meals. It need not often be interrupted because of the gastric symptoms produced. The nitrites and their preparations play an important part in lowering blood-pressure. They dilate blood-vessels by paralyzing the vasomotor centres (not the central nervous system), mainly the peripheric vessels. Large doses transform hæmoglobin into methæmoglobin and thereby cause cyanosis, dyspnœa, and sometimes methæmoglobinuria. Amyl nitrite may be inhaled in drop doses; nitroglycerin (trinitrite, glonoin) is given in doses of from one-five-hundredth to one-two-hundred-and-fiftieth grain (one-eighth to one-

fourth milligramme) in solution. The spiritus glonoini of the United States Pharmacopœia contains one-one-hundredth grain in one drop. The effect of sodium nitrite, from one to four grains (0.06 to 0.25) a day, in solution or in powder, is milder but more permanent. Sweet spirit of nitre is of an unequal composition; its action on the kidneys is more pronounced than that on the circulation in general.

There are occasional cases in which the secondary compensation required by mitral incompetency is not fully established, and serious disturbances of the circulation arise therefrom. The dangerous symptoms may be cyanosis and pulmonary (or) and cerebral œdema. There are, besides, stupor or convulsions, dyspnœa, dilated veins, cold extremities, and a small and intermitting pulse. It is in these cases that a few of the above-mentioned large doses of digitalis may do good; here it is that wavering and indecision become criminal. Whenever digitalis does not have any effect, a venesection may. Our ancestors were less pusillanimous. Maybe they overdid bleeding, but in an urgent case they did not fail to open a vein. I know that I have several times saved the lives of children (and adults) by opening a vein quickly.

Chronic (and sometimes the final termination of acute) cardiac diseases may lead to heart-failure. In such cases stimulants are indicated. Alcohol must not be given by itself and in large doses in cerebral hyperæmia of any kind. A child of six years may take from three to twenty grains (0.2 to 1.25) of camphor internally; subcutaneously, a solution of one part in five of sweet almond oil should be used, and from five to fifteen drops injected repeatedly. Ether may be given, in doses of from three to ten drops, in alcohol and water, and ammonium carbonate, in frequently repeated doses of from one-half to two grains (0.03 to 0.125), in anise-seed water or in milk. Musk internally, strychnine subcutaneously, may be required. The more urgent the case appears to be the greater is the indication for combining several of these remedies.

Myocarditis.—Though myocarditis, both acute and chronic, is far from being so common in the child as in the adult, it is nevertheless not infrequent; it is, indeed, remarkable how often it is not diagnosticated, or how little its occurrence is appreciated. Its symptoms are, it is true, sometimes very few. It need not be universal; in many instances the lesions are local only, in many others very marked, so as to lead to segmentation and fragmentation of the fibres (Hektoen in *Amer. Jour. Med. Sci.,* November, 1897). The disease is met with either in connection with endocarditis, pericarditis, very often with rheumatism, etc., or is quite frequently uncompli-

cated. Then it is parenchymatous, and the result of the toxic influence of infectious fevers (diphtheria, influenza, typhoid, dysentery, etc.).

In its treatment muscle stimulants must not be given. Digitalis is contraindicated. The recommendation of Heffen, to administer ergot, I cannot approve of, for by its action on the muscular fibres it increases vascular pressure, and thereby secondarily the labor of the inflamed heart muscle. Whatever relieves this temporarily is welcome. Therefore, potassium or sodium iodide combined with a bromide will act favorably. Here is also the place for morphine, either in large doses at long intervals or in small doses more frequently administered, together with ice to the chest. During attacks of collapse, or during weakness or prostration, ether, camphor, and alcohol should be given, either internally or in an urgent case subcutaneously. A dose of calomel will relieve the bowels. Enemata for the same purpose daily, for regular evacuations are the best regulators of intra-abdominal circulation. In chronic cases iron may safely be given with the iodide; not in acute ones, which are injured by it through the increase of vascular irritation. Absolute rest, both physical and mental, is essential. That is why Oertel's and Schott's teaching of systematic exercise should be followed with great care only, even in chronic cases. The extremities should be kept warm (stockings) and ice-bags or wet cloths applied to the heart. Derivation by extensive mustard-plasters and by hot foot-baths taken in a semi-recumbent position should be tried. A very small pulse demands nitrites. The usual cardiac stimulants, such as digitalis, strychnine, etc., are contraindicated, particularly in cases of arrhythmia or gallop rhythm when referable to myocardial weakness.

Acute dilatation of the heart is now and then encountered after the parenchymatous changes of the heart muscle following infectious diseases. Forchheimer (Festschrift) studied it in connection with influenza and its etiology as myocardial and nervous, both the muscle and the nerve degenerating under the influence of a toxin. In children the myocardial insufficiency is the cause of the dilatation, rarely *vice versa,* and the latter should be met with absolute rest extending over weeks or months, warm bathing, iodides and nitrites, and opiates.* Recovery is much impeded by concomitant pericardial adhesion.

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* F. Forchheimer quotes Charles West, who observed, forty years ago, in influenza a combination of symptoms, of which dyspnœa was the principal one, disappearing in two or three days, followed by "extreme depression, cool,

Endocarditis.—That it is "never primary" is a mistake shown by Henry Hun in Festschrift. "Our forefathers knew that rheumatism might begin in the heart." On the other hand, heart diseases are rarely uncomplicated; endo-myo-pericarditis, this complex of varieties, is often found in combination, and the "carditis" of our predecessors was a good diagnosis based on truth. The treatment of this disease is more promising in the child than in the adult, for entire recovery is more frequent in early life than later; but it is important that the diagnosis should be made early. In order not to be taken unawares, we ought to remember that many a systolic murmur that is mistaken for endocardial is myocardial, and that endocarditis may be present without, at least for some time, exhibiting a murmur; there are, indeed, cases which run their full course without a murmur. This is eminently so in ulcerous endocarditis (fever irregular, murmur changing, sometimes quite absent, symptoms (sometimes fulminant) —Henry L. Elsner in Festschrift—of malaria, tendency to emboli not infrequent after gonorrhœa, and then not quite so bad prognostically as is suggested by S. S. Adams in Festschrift). On the other hand, it is also necessary to remember that functional murmurs are not so common in the child, particularly in the infant, as they are in the adult. Thus, every murmur—though there be no hypertrophy developed as yet—should be suspected of being dependent on organic disease. This may also be surmised in most cases of acute chorea, which sometimes precedes and ushers in, instead of following, endocarditis; and in every case of articular rheumatism, the symptoms of which have been described in a former chapter of this book as sometimes so slight as easily to be overlooked (p. 251). Acute endocarditis is also common as a sequela of the chronic form and as part of septico-pyæmia. It is not uncommon as the result of acute and chronic nephritis, and of infectious diseases, such as scarlatina, measles, typhoid fever, variola, tuberculosis, and carcinosis, and is frequently complicated—mostly through the intercession of pericarditis—with pneumonia and pleurisy, also with perihepatitis, perisplenitis, and generalized erythema. Frequent and careful examination, therefore, during the existence of such ailments, while it facilitates an exact and complete diagnosis, suggests the best method of prophylaxis. Most of the cases of endocarditis we

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moist skin, a very feeble pulse, and labored respiration. . . In this condition the children, though quite conscious when roused, lay generally dozing, while, though the somewhat livid hue of the lips and surface seemed to imply the existence of some serious mischief in the lungs, there was nothing to be heard but a large moist râle."

meet with in children being due to acute rheumatism, every case of the latter, though ever so slight, must be watched, put to bed, and treated with sodium salicylate, which may be given a long time after apparent recovery, or resumed with every new attack. Almost every form of "growing pain" ought to be so treated, and in no case of infectious disease must the patient be permitted to leave the bed before much of his previous strength has been restored.

The special treatment of acute endocarditis requires absolute rest in bed, a dose of calomel sufficient to open the bowels, and regular discharges through the course of the disease by means of enemata rather than of purgatives. Frequent but small meals, and articles of food as suggested above. If thirst be great, drinking should be permitted often rather than much at a time. No alcohol in the beginning. Depletion by leeches is rarely indicated, and then only when there is a serious complication with painful pleurisy. In rheumatic endocarditis depletion is not tolerated. For severe pain which depends on pleural complication the subcutaneous injection of a few drops of Magendie's solution of morphine is preferable. Dry or wet cupping will sometimes relieve in such cases; other derivants, such as sinapisms, will often suffice. Vesicatories I do not advise in an acute case, the patient having enough to suffer from nature's infliction. Ice applied in a bag, which must not be too heavy, or ice-water cloths well wrung out, are beneficial in most cases, rheumatic or other. The head and trunk must be raised so as to make the patient as comfortable as possible. Blue ointment has been recommended over the heart and other places, but I cannot say that I have reason to advise it. Strong diuretics, such as act by increasing blood-pressure, must not be given; mild salines will answer best; a small dose of calomel may be given from time to time. According to the indications noted above, potassium iodide, with or without an opiate, will answer best, in doses of from fifteen to twenty-five grains (1.0 to 1.75) daily, for a child of six years. An opiate at night secures rest; potassium bromide may be given through the day. If the case be rheumatic, as it mostly is, sodium salicylate, from fifteen to thirty grains (1.0 to 2.0) daily, will be tolerated and found serviceable. Phenacetin may take its place sometimes, in daily doses, all told, of from five to ten grains (0.3 to 0.6). It acts as a febrifuge, an anti-rheumatic, and a sedative at the same time, better than quinine, a dose of which may, however, answer well now and then, particularly during remission. Antipyrin rarely, acetanilid ("antifebrin" of the trade) never. Aspirin (soluble in alkalies, therefore not affected by the stomach) may be given in endocarditis when it is, as usual,

rheumatic, in three daily doses of from eight to fifteen grains (0.5 to 1.0) each. Serious attacks of dyspnœa are best relieved by morphine, either internally or subcutaneously, or by lead and opium. Drastics will seldom be required and seldom answer the purpose. The nitrites may be tried, though they have not served me so well, or so often, as I formerly thought I had reason to expect; they act best when the pulse is dangerously small. When cachexia and debility are prominent symptoms, tonics and stimulants are indicated early. In bad septic cases chloride of iron may be given at an earlier period. When streptococci are found in the blood, the antistreptococcus serum (Marmorek) may be injected in repeated doses of from five to ten cubic centimetres daily. Credé's ointment should be used at the same time, fifteen grains once or twice a day; subcutaneous injections of yeast and of nuclein have been recommended. Among the stimulants, I think highly of camphor and ammonium. Among the direct cardiac stimulants enumerated above, digitalis ought to be given only after the acute changes in the muscular tissue of the heart have been repaired. (There is hardly a case of endocarditis unaccompanied by myocarditis.)

It is here that the experience and tact of the practitioner must decide an important point. In the further evolution of the case, digitalis with quinine, digitalis with belladonna, digitalis with strychnine, or with a bromide, or with an iodide, together with stimulation of the peripheric circulation by friction, either dry or with alcohol or hot or cold water, find their own indications.

The hygienic treatment of chronic endocarditis has been disposed of in former remarks. The medicinal agents of most importance are digitalis and iron. Constipation and overexertion must be avoided. In connection with the latter, the education and training of the child should be so guided as to prepare him for his future trade, business, or vocation. As endocarditis terminates so often in valvular disorders with consecutive hypertrophy, his future life ought not to be exposed, if avoidable, to great excitements or hard physical labor. A child so affected must not take coffee, tea, or alcohol in any shape as an article of diet. He must not be trained to become a military man, a pugilist, or a medical practitioner.

The management of valvular changes resulting from endocarditis is more successful in childhood than in the adult. Compensation is brought about by consecutive hypertrophy; thus it is facilitated, about puberty, by the rapid growth of the heart at that period of life, and particularly by the increase in size of the aorta and also of the arteries in general, thereby easing the circulation. Besides, purely

vascular disease, which is so common in the adult, is a rare exception in the child. Moderate exercise contributes its share in increasing the growth of muscular tissue of all kinds, and should be recommended, according to Beneke,* as also in undersize of the heart.

Pericarditis.—The pericardium is more accessible to the influence of cold applications than the heart. They generally act well; but we must be prepared to meet with doubtful or no success in many cases, for pericarditis is but rarely a primary or uncomplicated disease; indeed, it is more frequently fatal on account of its complications than of effusion. Myocardial changes (fatty degeneration mostly in the adult), acute œdema or acute inflammation of the myocardium in acute articular rheumatism, chronic interstitial myocarditis, or tubercle, or syphilitic gumma, or complications with purulent mediastinitis or pleuritis, are not uncommon. In pneumonia, pleuritis, and scarlatina pericarditis is not unusual; in rheumatism frequent. The internal treatment of pericarditis is, therefore, in part directed by the complications. Digitalis is indicated mainly in cases which are rather complicated; strophanthus, convallaria, and potassium iodide may take its place or be combined with it, according to the suggestions made above. Morphine is demanded in most cases, if only to give rest for the night. The fever may require phenacetin, aspirin, sodium salicylate, or (during a remission) quinine. After the fever has disappeared, or while it is waning, absorption of the effusion may be promoted by caffeine, sparteine, diuretin, iodides, and a vesicatory over the heart. Effusion into the pericardium is not often so copious as to produce suffocation, but I am afraid that puncture of the pericardium to relieve the fatal pressure is not made so often as it ought to be. Fortunately, errors in the diagnosis are not very easily made; still, they do occur, for I have been called to perform paracentesis of the pericardium where there was some pericarditis, more hypertrophy of the heart, and much pleuritis. The operation

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* From birth to the seventh year the volume of the heart increases from twenty-three to one hundred cubic centimetres, by no means in proportion to the weight of the body. Still, this increase is very much greater than that of the lumen of the arteries when compared with the length of the body. The pulmonary artery is wider than the aorta until puberty; afterwards they are equal or the aorta becomes larger. The subclavian arteries and the common carotids are very wide compared with the length of the body (thereby causing physiological and pathological congestions of the cranium and its contents). Between seven and fifteen years the volume of the heart is from one hundred and thirty to one hundred and forty cubic centimetres; at that time the large arteries increase in absolute width.

is not difficult, the liquid being so copious as to give the heart ample space to recede in a semi-recumbent position. The aspiration should be made in the left mammillary line, in the sixth intercostal space. In the same neighborhood, at the upper margin of the fifth or sixth rib, the incision is made to remove pus, and irrigations may be made afterwards. Drainage has also been established in such cases. If at the same time there be pus in the pleural cavity, it may become necessary to select another spot for the pericardial operation. A. Fraenkel recommended it on the right side of the sternum. The heart has been punctured during the aspiration without evil result; but I am not prepared to say, even with Biedert, that "the puncturing of the heart is not connected with any danger."

Hydropericardium, no matter from what cause, must be treated on the same principles as those which are valid for hydrothorax.

Syphilis of the pericardium and of the heart, if diagnosticated or suspected, require their own specific treatment.

Neuroses of the heart are not so frequent in the child as in the adult. The diaphragm, on account of its higher location, may annoy the heart in tympanites; undue motility (ptosis) of the heart may be congenital; solidification of a lung may render posture on the opposite side difficult and cause tachycardia or arrhythmia; early chlorosis or Graves's disease, alcoholism, the use of coffee or tea, masturbation, and early neurasthenia, often on an hereditary basis, may cause—mostly about the time of puberty—all the symptoms of slow, fast, or irregular heart's action. The treatment should meet the causes: cold water washing and bathing, cold applications to the heart, moderate gymnastics, no sedentary life, little schooling in the usual meaning of the word, codeine one dose for the night, sodium bromide or monobromated camphor in a few doses daily, enema daily, a purgative occasionally, physical and mental hygiene.

Congenital anomalies of the heart claim attention from the moment of birth. The newly-born candidate for *cyanosis* is liable to suffer from asphyxia, the rules for the treatment of which need no repetition here. When the troubles, being the result either of embryonic arrests of development or of fœtal inflammations, prove incurable, almost the only thing to be done for the little sufferers is to protect them as much as possible. If they be so unfortunate as to grow up, exercise should be avoided,—indeed, is avoided. Alcohol is indicated in conditions of collapse only; no blood must ever be taken; laxatives should be sparingly given if at all. The temperature in which the little waifs are to live ought to be equable, moderately warm, their wearing apparel warm and comfortable.

Congestive disorders which would require the use of cold in otherwise healthy children must mostly do without it, as the patients seldom bear it. Mild vegetable acids are coveted by many. Only those who appear to develop hypertrophy of the heart should take digitalis or strophanthus, provided their effect on the arteries need not be feared. Small doses of an opiate will often relieve their discomfort and dyspnœa. The combination of digitalis with iodides, administered for months in succession, gave relief in a number of cases in which the patients lived four years or more.

There are anomalies of the infant heart which are congenital, or nearly so, and still not comparable in dignity to arrests of development. Rheumatism, scarlatina (rarely), or inflammations of some intrathoracic viscus, when contracted in early life, may result in cardiac complications. They are on the left side of the heart (while fœtal endocarditis affects the right half pre-eminently). *Hæmatoma* at the free margin of the mitral valve is formed immediately, or soon after birth, below the endocardium. It is liable to disappear, and with it, by recovery, or by compensation, or by increased frequency of the cardiac movements (by which the blood-wave becomes smaller and the valve excursion shorter), the systolic mitral murmur caused by it (like that which is caused by rheumatic endocarditis); but excrescences, hard noduli (Cruveilhier), cicatrization, and insufficiency of the mitral valve may persist (Luschka, *Virch. Arch.*, vol. xi.). The latter is easily diagnosticated and requires the usual treatment of acquired chronic endocarditis. As *blood-nodules* on the cardiac valves, Berti (last in *Arch. f. Kinderheilk.*, vol. xxxi., 1901) describes what he takes to be, not hemorrhages, but ectasias and cysts and evolution processes of the valvular tissue with disappearance of the vascular net. Treatment as above, if any.

The *ductus arteriosus Botalli* becomes nearly obliterated within two weeks, entirely within three months, by the aspiration of its blood into the newly opened lungs, by its being bent by the traction of the lungs, by the proliferation of the spindle-shaped cells of the tunica media, and finally by thrombosis. Theo. Escherich (Festschrift) describes, in cases of patency of the duct, sudden attacks of shallow or absent respiration, cyanosis, bulging eyes, swelled lips, slow heart action, and tonic contractions of the extremities. His treatment consists in B. Schultze's method of treating asphyxia (p. 83). It is to be repeated many times daily, without much exertion, just enough to keep the lungs acting.

Ptosis of the heart (dislocation downward) has been observed with epigastric pulsation as the result of weakness of the connective

tissue of the great vessels which sustain the heart. Varicosities and sclerosis were noticed as consequences. Possibly a proper epigastric support may have a good effect. Four cases of Feranini (*Centralbl. f. inn. Med.*, January 6, 1899) were complicated with mitral stenosis, small size and asymmetry of the cranium, feeble bones, stunted growth, and deformed chest and extremities; once with mental weakness.

Congenital undersize of the heart does not appear to be so frequent as that of the arteries. Indeed, in many cases of undersized arteries it was found of normal size, or somewhat larger. In the latter case the heart was not always hypertrophic; on the contrary, in most instances there was some fatty degeneration of the flabby muscle. Like every small organ, the small heart may be built up by moderate and persistent gymnastic exercise, a small dose of strychnine given three times a day for weeks or months in succession, cold washing and friction, and an altitude of from one thousand to fifteen hundred feet. A certain amount of muscular growth will probably result from it; it is quite welcome, for the labor of the heart requires either an organ of sufficient size or one of unusual strength.

Neoplasms of the heart (carcinoma, sarcoma, fibroma, myoma, lipoma, myxoma, tubercle, echinococcus, cysticercus, and syphiloma) are rare in early life, the last named more frequent than the rest, and the only one that so far can be reached by (antisyphilitic) treatment.

2. *The Blood-Vessels.*

The structure of the blood-vessels is sometimes very defective, the walls being thin, fragile, and pervious. In such cases hemorrhage, small or copious, is a frequent symptom. The frequency of hemorrhages in the newly-born, leading, when in the cranial cavity, to asphyxia, convulsions, idiocy, or early death, is, among other reasons, caused by the thinness of the vessel-walls, whose tissue has not yet quite evolved from its embryonal condition. This, or a similar condition, may continue for life. This *hypoplastic state,* however, is not, of necessity, general: it may be local. The early nose-bleedings of some, though they have no heart disease, and the congenital tendency to aneurism, mostly in places where the elastic tissue, either from arrest of local development or by microbic destruction, is either scanty or absent (usually at the origin of branches, Eppinger), prove the occasional occurrence of these circumscribed and local defects.* A *uniform*

* A. Jacobi, Extracranial Aneurism in Early Life (Trans. Tenth Internat. Med. Cong., Berlin, 1891).

thinness of many or all of the arteries, however, is most likely to be complicated with narrowness, which has been studied by Virchow, Sée, and others in its relation to incurable chlorosis, palpitation, and cardiac asthma. That thinness which predisposes to fatty degeneration of the intima and media, to sclerosis of the adventitia, to atheromatous endarteritis, and to the formation of aneurism at an early age has not been made the subject of active treatment, so far as I know, except by myself. I feel convinced that the administration of phosphorus,—not phosphates of any kind,—with its stimulant effect on the growth of connective tissue in general, has rendered me good service in habitual tendency to cutaneous, mucous, and internal hemorrhages. *Hæmophilia* of moderate degrees appeared to improve under its use, and the children to be safer and better developed. The dose for a child of three years should be from one-fiftieth to one-thirtieth of a grain (0.001 to 0.002) daily; that means from two to three minims of the oleum phosphoratum, or from one to one and a half teaspoonfuls daily of the elixir phosphori (United States Pharmacopœia of 1890).*

Atheromatous degeneration of arteries, large and small, in babies, children, and adolescents is rare, but cases are from time to time reported. In another part of this book I have spoken of the recommendation of lactic acid in these conditions. *Syphilitic* vascular changes require their specific treatment. *Tuberculosis* of blood-vessels, mainly small arteries, has been known a long time. Bacilli enter through the lymph and the blood circulation, are frequently perivascular first, and find their way into the intima.

Thrombosis of veins in general, and of the sinuses of the dura mater in particular, is the result of retardation of the (general or) local circulation and of coagulation of blood by marasmus from whatever cause: rapid elimination of water (cholera infantum), debility of the heart, pressure on veins, or inflammation in the neighborhood (for instance, caries of the petrous bone). In the same way throm-

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* The unreliability of the percentage of phosphorus when dissolved in oil, and particularly in cod-liver oil, is the cause of the ill success in the hands of observers and of the clouds of European magazine articles that rain down on the profession. If they would only use, now and then, the preparations of the U. S. Pharmacopœia! Binz, who favors phosphorus therapeutics (mainly in rhachitis), recommends a method to determine the percentage of phosphorus in oil solutions (Centralbl. f. inn. Med., November 14, 1902). A phosphorus solution which is invisible in the dark becomes visible when warmed. Such solutions as contain little phosphorus require a relatively high temperature for that end.

bosis of the femoral vein may be caused by peritonitis or by a pelvic tumor (or by fractures not set). In the cranium the right transverse sinus is most frequently affected, but quite often also the inferior petrous, cavernous, and longitudinal sinuses. Such thromboses cause hyperæmia, œdema, or extravasations; it is by their symptoms that the diagnosis is made. The treatment must be preventive in order to be successful. Early attention to the ear and mastoid process, treatment of diarrhœa before inspissation of the blood and heart-failure take place, timely stimulating and roborant treatment, and not *pro re nata*,—that is, when it is just a little too late,—are the best preventives. The subcutaneous injection of large quantities of warm sterilized water, with sodium chloride (1000 to 7), is capable of preventing the inspissation of the blood which results from acute and copious diarrhœa, and often proves life-saving.

Welch refers a number of venous thromboses to cardiac diseases (Festschrift), mainly to advanced mitral affection with failing compensation, tricuspid insufficiency, and pulmonary infarctions. Flexner asserts the frequency of terminal bacteric infections in heart diseases. All this preaches the sermon of preventive treatment (and curative so far as possible) of cardiac and of infectious disorders.

Congenital local dilatations of blood-vessels, capillaries, smallest veins, and smallest arteries, together with an increase of their number, and mostly with incompetent structure, are known by the names *nævus, telangiectasia, angioma*. Their color depends on the nature of the blood-vessels composing the anomaly, also on their distance from the surface, their size on the extension of the morbid process, and their size and consistency on the admixture of connective tissue. They are found in all sorts of tissues and organs, mostly on or below the surface of the body. In the subcutaneous tissue, when mixed with much connective tissue, they are liable, after having remained unchanged for many years, to undergo sarcomatous degeneration. Therefore, and because of their tendency to rapid growth in every direction, with increasing deformity and possible danger from hemorrhage, the early removal of all those which do not exhibit from the beginning a tendency to fade and finally disappear is indicated. The methods followed to obtain that end are very numerous. Vaccination over a nævus will generally destroy it, but may do so but partially, and will leave a bad scar. Plasters of tartar emetic and of Vienna paste cannot be controlled to such an extent as to destroy the growth only. Injections of perchloride or subsulphate

of iron are known to have given rise to extensive thrombosis, gangrene, and death; injections of alcohol have been tried, but have not, I think, reached farther than the ear of the medical public. Corrosive sublimate in collodion (1 to 8) is an excellent caustic where the nævus is not extensive, particularly on the head; it rarely requires more than a single application. Fuming nitric acid is perhaps the best of all local applications; the pain is but temporary, and the effect circumscribed and fairly thorough. But it ought to be used for superficial nævi only, and even then requires repetition in a number of instances. Excision is a good method if the operation can be performed in a short time and all the morbid parts can safely be removed without loss of too much blood. The ligation of angiomatous tumors is indicated where they can be entirely grasped either without or with the aid of needles run through their base; but time is required for them to fall off finally, and the wound demands careful and persistent antiseptic treatment until the danger from local infection has passed and a smooth scar has been perfected. Electrolysis has been praised very highly, particularly in the treatment of the extensive wine-marks. Still, personally, I never saw a satisfactory result in these cases. There remained always speckled, whitish scars of small size alternating with the original discoloration,—a result which I should not claim as an improvement upon the original condition. The actual cautery is the most satisfactory of all our remedies; very few will at present use it in any other shape than that of the galvano- or the thermo-cautery. The heat should not be excessive: white heat destroys blood-vessels too rapidly to permit of simultaneous coagulation of the blood, and produces hemorrhages. Dull-red heat will accomplish a cure. A momentary application suffices for a superficial nævus; its action can always be controlled and strictly localized, and the formation of the scurf secures against surface infection. Nor are large angiomata inaccessible to it. When these are to be destroyed, it is best not to attempt too much at first. It is unnecessary to destroy everything; long after the direct effect has passed away, coagulation in the blood-vessels and slowly progressing cicatrization result in the gradual lessening of the swelling. When the tumor ceases to diminish in size, the operation is repeated, sometimes after many weeks or even months. The cautery is then introduced into the very spot at which the previous application was made. In this way the cicatrix remains localized. As a general rule, a cicatrix following the application of the actual cautery is smooth and becomes more so and less perceptible from year to year.

3. *The Lymph-Vessels.*

Lymphangioma is the dilatation of lymph-vessels, localized or multiple, with or without proliferation, extending from the walls of the lymph-vessels. Careless operation with the knife may lead to lymphorrhœa; I removed several with the actual cautery. When in the skin, multiple, and connected with hypertrophy and œdema of the cutis and subcutaneous tissue, either localized (neck, shoulder, dorsum, extremities) or diffuse, it is called *elephantiasis*. It may be removed when not so extensive as even to preclude, after removal, skin-grafting to replace the defect.

Of *chyluria* (lymphorrhœa into the urinary organs), such as is frequent in tropical regions under the influence of filaria sanguinis, and observed by Bouchut in an hysterical girl of fifteen (no cause known), I have seen one case in a child of eleven years. Kamienski had a case of chylous ascites in a baby of five weeks. Paracentesis appeared to be harmful, recovery was spontaneous (*Jahrb. f. Kind.*, vol. xli.).

Cystic lymphangioma (hygroma, on the neck and in the axilla) is unilocular or multilocular, slightly movable, fluctuating, and not compressible, because there is no longer any open communication with the rest of the lymph-system. On the neck it may be mistaken for the hygroma resulting from a partially patent and endwise obstructed branchial arch. Total extirpation is the preferable operation if it can be done. Puncture and subsequent irritation by injection of alcohol, or Lugol's solution, or diluted carbolic acid (from three to five per cent.) may require repetition in multinuclear cases. That is why incision of the cavities and subsequent iodoform drainage should be preferred. Occasional complication with a malignant tumor impairs the prognosis.

XI

Diseases of the Skin

Burns.—Burns of the first degree rarely require more than cooling applications and rest, both general and local, water, lead wash of different strengths, oil, and cotton. Persistent cold applications are not tolerated. When large blisters have been formed, the epidermis should be removed and the sore surface irrigated with an antiseptic solution or an aseptic sterilized saline solution (6 to 1000) and thoroughly dusted with bismuth subcarbonate or dermatol. An aseptic dressing then applied may remain eight or ten days; after that time the sores will generally be found healed. Individual cases and opportunities may require different methods. The time-honored application of equal parts of lime-water and oleum lini, to which a twentieth of a per cent. of thymol may be added, is still much favored. The burn should then be thickly covered with aseptic gauze. After this application is removed, a fine powder of bismuth subcarbonate should be spread over the wound and the whole covered with gauze again, or an ointment containing bismuth, or bismuth and boracic acid, or bismuth and zinc may be employed. To thoroughly guard against infection, the washing of the wound with a three-per-cent. solution of carbolic acid, or of salicylic acid, or of boracic acid (not so painful as the other two) must precede the application of a gauze thoroughly covered with bismuth subgallate finely powdered, or with a mixture of bismuth and starch, or the same with the addition of from one to two per cent. of salicylic acid. Such an application may remain undisturbed for weeks. Orthoform powder is soothing and fairly antiseptic. Extensive burns do well in the permanent warm bath. Should large defects result, transplantation may be practised afterwards; if contractures, extension must be employed in time and apparatuses used for a sufficient period.

The younger the patients the more liable are they to suffer from burns, though apparently mild. Reflex symptoms of a nervous character are not quite so bad as the transformation of hæmoglobin into methæmoglobin, or the toxic swelling of lymphatic glands, both or either of which conditions are held responsible for the excessive dangerousness of extensive burns. Much reaction may set in after a day, with high fever and convulsions. Therefore the thermometer

ought to be consulted soon after the accident and the symptoms prevented or treated. Diarrhœa is not uncommon, even after moderate burns, and requires opium and the regulation of diet; collapse demands stimulants, either internal or subcutaneous; and sleeplessness appropriate narcotics.

Burns are more frequent than are the effects of cold, though there are patients who suffer from the latter annually. Common *frost-bites* are frequent, it is true, and annoying, but rarely of great importance. The rubbing of red, itching, and swollen parts with snow (or with petroleum) is quite effective in mild cases. The itching is often relieved by a mild tincture of iodine or by the application of a (from three to ten per cent.) solution of silver nitrate or of calcium chloride in water (1 to 2 or 200), also by camphor in lanolin (1 to 10). The popular remedies of tallow and whiskey or, better still, the application of carpenter's glue to frost-bites bring relief. This may also be obtained by surrounding the inflamed swelling by a protecting (corn) plaster. Vesicles on the toes and heels, filled with blood and resulting in ulcerations, require the latter treatment, together with bismuth subgallate, naphtalin, orthoform, or cauterization with silver nitrate until granulations spring up, or an ointment of balsam of Peru with or without zinc oxide, or bismuth, or applications of a three-per-cent. solution of aluminum acetate, or a fuchsin one, lanolin eighty, vaseline twenty ointment. Gangrene of the skin or of whole extremities is, fortunately, rare. When it occurs it demands rational surgical treatment.

Subcutaneous emphysema may be the result of fracture of ribs or sternum, as in the adult. Most of the cases I have seen occurred during inferior tracheotomy when the incision was too long, or during whooping-cough; a few in pulmonary abscess with adhering pleura. Actual treatment was never required, as absorption takes place within one or two weeks.

Erythema is met with at every age of infancy and childhood, and depends on a number of causes. The treatment is, therefore, partly symptomatic, partly causal. In the newly-born, from the establishment of an unprecedented cutaneous circulation and the discontinuation of the intra-uterine amniotic pressure, the skin becomes red, changes to yellow (alterations of hæmatin), is subject to extensive peeling, and, finally, obtains its normal pink color under ordinary circumstances. The erythema, however, is not always uniform; now and then it bears a resemblance to measles, and is attended by fever, but not by catarrh. As a rule, it demands no treatment except preventive. The bath must not be hot, the temperature of the room not

abnormally high, the bedding not hot and oppressive. Vaseline, cold cream, or lanolin is useful where the redness and the tendency to peeling are very marked.

In the following months erythema is a common symptom when the babies are exposed to pressure or friction by clothing, to the heat of the summer, of stoves, bedding, or bathing, to irritation by urine, or to the septicæmic after-effects of infectious fevers, such as measles, angina, diphtheria, typhoid, or influenza, or after drugs like salol. In some of these cases desquamation is observed; it is the more readily a cause of mistaken diagnosis the longer it lasts and the greater its extent. Children of three or four years, when afflicted with diarrhœa and consecutive cachexia, are subject to a papular erythema which is mostly confined to the gluteal regions and the extremities. Finally, thin and feeble children exhibit frequently a general redness, sometimes mottled, which lasts as long as does the sluggish circulation depending on their general condition.

The indications for treatment in all of these varieties are furnished by the causes. Irritation of the surface should be avoided; the patient must not be exposed to abnormal temperatures, either of air or water, or to errors in diet; diarrhœa and emaciation must be arrested, and vaseline and fats used according to necessities. In many cases a full supply of drinking-water, which is too frequently withheld from the very young, corrects the evil by stimulating cutaneous circulation and the tendency to perspiration, which is almost absent during the first month and very scanty in the second and third.

Constipated and dyspeptic children are very apt to suffer from erythema as the result of intestinal autoinfection, sometimes to such an extent that the diagnosis between it and scarlatina may become doubtful. The difficulty grows in those cases in which the intestinal erythema is attended by the corresponding intestinal fever, an occurrence not at all uncommon. Constipation may be congenital or acquired, and may lead to the same result. The diagnosis is not always easy for other reasons,—viz., the apparent normality of the stomach, which may be found dilated, the absence of diarrhœa, and the actual or alleged absence of flatulency. This erythema is not uncommon; it may last hours or many days, or may alternate with acute attacks of urticaria. The latter is, therefore, not always gastric or neurotic, either in its acute or chronic form, but may be toxic, and it thus shares the etiology of many cases of acne and some of senile pruritus. When occurring in the face exclusively, I have seen it mistaken for erysipelas.

This variety of erythema is sometimes seen mostly on the hands and feet, is symmetrical, and now and then, like urticaria, has vesicles or bullæ (similar to herpes iris). When it accompanies *intestinal autoinfection,* it is usually followed by indicanuria, though perhaps not so regularly as in adults with intestinal disorders, and ether-sulphuric acids in the urine, which is liable to be very scanty and of high specific gravity. When in such cases it is universal or nearly so, that condition of the urine may now and then be utilized for the differential diagnosis from scarlatina, measles, or rubella. Skatol and indol are found in the fæces. In most cases a purgative (preferably calomel) will bring speedy relief, but actual and lasting aid will only come from prolonged disinfection of the intestinal tract by naphtalin, salol, resorcin, oil of peppermint, small doses of calomel or hydrargyrum bichloride, from large enemata containing a twentieth of one per cent. of thymol, or from such as consist of aromatic infusions (mint, catnip, chamomile) exclusively, from occasional purgatives, and from the regulation of the diet, which must be such as not to cause fermentation and putrefaction. In the employment of the sulphites (of sodium and magnesium) I have been rather disappointed. The use of menthol is not to be recommended; it can be swallowed in capsules only, and to atone for its local irritation it has no eminent virtues. As to diet, proteids, except milk, should be avoided; farinaceous foods (cereals) are preferable. Orange-juice is pleasant and useful. Hydrochloric acid in water (1 to 1500 or 2000) as a regular beverage for weeks.

Erythema nodosum (p. 258) may be discussed in connection with this subject. It is probably an angioneurosis of infectious origin (rheumatism, etc.), complicated frequently with pleuritis and endocarditis, very much like *erythema exudativum multiplex,* and consists of large nodes, whose redness turns yellow in the course of the normal alterations of hæmatin; it is mostly seen on the legs, but also along a number of tendons from the occiput downward. It requires rest. When it is the result of rheumatism, sodium salicylate is indicated; when it depends on malaria (Moncorvo), quinine. A six-per-cent. solution of silver nitrate has been recommended for external application. I have used with benefit, I believe, inunctions of oleum gaultheriæ, of potassium iodide in glycerin (1 to 2 or 4), and of potassium iodide and lanolin ointments.

Erythema complicated with loss of epidermis, either without apparent cause or through irritation by urine or fæces, or by friction of the adjoining surfaces of the nates, thighs, axillæ, and the folds of the neck, together with secretion, and even crusts, is called

intertrigo. It is mainly noticed in fat, flabby, and rhachitical babies, is painful and annoying, and may prove dangerous by becoming gangrenous or by inviting the invasion of erysipelas or of diphtheria. Therefore, its treatment and cure are imperative. The diapers must be soft, not pinned during sleep, and frequently changed; the babies must be kept scrupulously clean and bathed at least once a day. A seven-per-mille solution of table salt is more pleasant than water alone. Diarrhœa should be relieved by dieting, internal medication, and rectal injections. Astringent solutions (zinc sulphate, aluminum acetate, tannin) would be beneficial but for the difficulty of making regular applications; ointments containing zinc oxide, bismuth, tannin, or lead are preferable. Fine powders of bismuth subcarbonate, of talcum, of amylum, or mixtures of two of them, with or without the addition of one or two per cent. of salicylic acid, will act satisfactorily. The popular lycopodium powder is not to be recommended. By reason of its gluing together it proves irritant, like all foreign bodies.

Among the circumscribed inflammations of the skin met with in children, mostly of advanced age, are *acne, lichen,* and *prurigo*. Acne is dependent on an interrupted action of the sebaceous follicles. They begin their rapid development about the middle of intrauterine life, and are large and numerous at birth, particularly over the nose, ears, eyebrows, and around the mouth. When obstructed, they exhibit in the infant no black-heads like the comedones of the adolescent or adult, but are white. Normally, they secrete much tallow, which gives the foreheads of many babies their shining, glossy appearance. When this tallow accumulates and gets dry, and mixes with the scabs of the epidermis and foreign material, such as dust, etc., it forms *seborrhœa* of any shade of color between whitish and black, which is more difficult to remove because of the conservative superstition of the mother than because of its own obstinacy. Its importance and its dangers are quite local; it interferes with the growth of hair and predisposes to local irritation of the scalp; it ought to be removed by oil, fat, soap, hot water, and brush, and the subjacent hyperæmia relieved by an astringent ointment. No stimulating diet. Ichthyol in solutions or in ointments has been frequently recommended, as in all irritations and inflammations of the skin.

When acne has formed (in older children) the comedones ought to be squeezed out. For this purpose an old-fashioned watch-key with broad edges will prove as serviceable as most of the mechanical devices of instrument-makers, almost as much so as Piffard's handy little instrument. Frequent hot washing with green soap, or spirit

of soap, followed by ice-cold washing, I have found very useful; besides, the skin should be washed four times a day with a solution of corrosive sublimate in water, or in alcohol and water (1 to 20 to 2000 or 1 to 20 to 1000).

Washing with vinegar dissolves the epidermis cells and thus aids in disintegrating and loosening the obnoxious material. Various mixtures of emplastrum and unguentum plumbi may be employed. After a thorough cleansing with soap, equal parts of precipitated sulphur, glycerin, and alcohol (to be preserved in a well-stoppered jar) are applied in the evening and washed off in the morning; or beta-naphtol 10 parts, precipitated sulphur 50 parts, lanolin or vaseline 25 parts, and green soap 25 parts are applied and removed by washing after fifteen or twenty minutes, after which the skin is covered with talcum or starch. Only in the very worst forms of acne (fortunately, rare in children) must scarifications be resorted to.

Lichen is mostly found in its mildest form: *strophulus* of pin-head size, slightly excavated on top, around a hair. It is not particularly resistant, but is liable to return. *Lichen scrofulosorum,* however, the result of living—not virulent—tubercle bacilli that give rise to no other symptoms, is apt to be obstinate. It is mostly met with in older children, is of a yellowish or red color, and forms a circle around a hair. It does not itch very much, but by reason of its duration and appearance is quite annoying. Locally, warm bathing and frequent ablutions with vinegar and water (1 to 3 or 6) will act well. Antipyrin in a nightly dose will relieve itching whenever troublesome, and by its sudorific effect will contribute to the disintegration of epidermic accumulations. The general treatment of scrofula is required on account of its causal indication. *Lichen acuminatus* and *planus* consist of circular nodules congregated round a pigmented spot, the first in rows, the second flat. Both are rare in children.

Prurigo is found, of pin-head size and pink color, on the extensor side of extremities and in the gluteal region and on the abdomen. In its neighborhood the lymph-bodies swell, and chronic pigmentations are frequent. The itching is terrible, intolerable, exhausting, and may prove fatal. Twice I saw it complicated with or depending on early diabetes; in both cases it terminated only with the fatal cause. Inunctions of glycerin or fat and protracted warm bathing in water or alkaline water should be resorted to. The baths ought to be continued for hours, and may be allowed to last half a day. Vinegar will dissolve the epidermis. Pilocarpine will do well in subcutaneous injections large enough to produce perspiration. As much and as long as permissible it may be combined with antipyrin; and

if subcutaneous injections be found impossible, it ought to be administered internally. Tar, sulphur, and green soap have been found very useful, when continued for from four to six weeks in alternation with warm baths. Wilkinson's ointment contains all of them (flor. sulphuris, ol. rusci, āā 10 parts; sapon. virid., vaselin., āā 20 parts). Kaposi recommends naphtol ointment (5 to 100). The addition of five per cent. of menthol to every ointment used will prove helpful. But it should not be forgotten that the prognosis becomes more serious with every month or year of the duration of prurigo, and that general and preventive treatment demand urgent consideration. Most patients are stricken in their second year; thus an hereditary influence is to be suspected in many. Often the parents are tubercular. The urine should be examined for glucose.

Both prurigo and lichen (also acne in the severe form—rosacea of adults—) will often be benefited by ichthyol (thiol has been recommended for the same purpose, locally) in from five- to twenty-per-cent. ointments. It may also be given internally, when there are hard and irritating infiltrations, in daily doses of from five to twelve grains (0.3 to 0.8). Other internal medication is useless, except arsenic, an occasional purgative, and now and then a sedative (monobromated camphor at bedtime in doses of from two to six grains = 0.125 to 0.4); strict avoidance of stimulants and moderate use only of meat are the main dietetic rules.

Furunculosis in the very young does not often exhibit the same character as in adults. Both the sebaceous follicles and the perspiratory glands being rather patent, there are rarely such large and hard indurations. It is often complicated with acne, or follows eczema, and may complicate scabies. It is frequently found in cachectic infants and children and after protracted diarrhœa, generally in the form of multiple and cold abscesses; sometimes in connection with tuberculosis and glucosuria. These abscesses are liable to lead to extensive suppurations of the connective tissue. The skin must be kept disinfected either by blue ointment or by corrosive sublimate in water (1 to 2000 or 5000). Abscesses—no matter how many—must be incised and disinfected with sublimate solution, or iodoform, or treated with the sharp spoon, or filled with antiseptic gauze, according to circumstances and to sizes. Now and then these abscesses are found near the matrix of the nails, not multiple as in syphilis, but localized, and are liable to destroy the matrix unless incised and disinfected in time. Secondary lymphatic swellings round the neck will, when benign, disappear after a while. If not, they are probably tubercular, and if persistent, without a tendency to get smaller, ought to be enucle-

ated. A preventive measure is the covering up of incipient furuncles with some indifferent plaster (soap, belladonna; no turpentine) to avoid the friction of the clothing. Arsenic in small doses, but persistently given, has a favorable effect. G. Langmann speaks highly of the preventive and healing local effect of the galvanic current.

One of the most common forms of dermatitis in the young is *eczema* in its different forms: the dry, not scab-forming, and very itchy; the small vesicular and *papular,* with but slight desquamation or the formation of thin scabs; the purulent variety, *impetigo,* with moderate crusts; finally, the rapidly growing and pointed *ecthyma* and *rupia.* For, indeed, all of them are but varieties of the same process. It may be microbic in isolated cases, but certainly is not a microbic disease generally. It may be complicated, however, with a parasitic ailment such as scabies. A disposition is caused by the tendency to congestive, catarrhal, or inflammatory disorder such as is understood by "scrofula," not by tuberculosis; also by rhachitis, chronic indigestion, and anæmia; also by incidental fevers, —for instance, that of vaccinia; indeed, it is not uncommon to date the first appearance of eczema back to the effect of vaccination. These occasional or constitutional partial causes of eczema must be considered as regards general and constitutional treatment. These are the cases apt to be benefited first by appropriate diet, then by the protracted use of arsenic, the hypophosphites, cod-liver oil, and iron. Still, it is important never to be tempted to begin such a treatment in an acute attack of eczema, which is more apt to be benefited by a few moderate doses of quinine and purgatives.

Acute eczema is liable to run its course with a great deal of swelling and irritation, resembling in these respects erysipelas. It bears absolutely no water, and in the beginning no ointments. Powders of amylum, or of bismuth subcarbonate, or zinc oxide, or aristol, pure or in different proportions, with or without the addition of one or three per cent. of salicylic acid, prove more efficient. After a while the same constituents may be used as ointments. No large surface of a nursling's skin should be covered with ointments at the same time. Still, an occasional death during the treatment of eczema should not be attributed to it or its treatment, but to the "lymphatic condition" and circumstances connected with it, and to other causes.

Most of the cases presented for treatment are chronic, either in the moist, or crusty, or squamous form. Many of them are itching, and are apt to lead to persistent infiltration of the skin, even amounting to elephantiasis. In many of them the original local causes are still persistent and can and must be relieved or removed. All sorts

of local irritation are found. Seborrhœa, uncleanliness, secretions of the nose, ear, and eye which are permitted to remain and irritate the neighborhood, the oral secretion from whatever cause excoriating the cheeks and chin, the septic piercing of the ear, the presence of vermin on the skin, are all frequent causes of eczema, the predisposition to which is established on certain parts of the body where eczema is most common (head and face) by the large size of the carotids and the physiological congestion and rapid development of the head and all its organs. By mistaking this connection, even the physiological protrusion of the teeth has been charged with producing eczema. Indeed, everything causing sluggish circulation and congestion to the surface—the constipation, for instance, of fat babies, hot bathing, the influence of solar and stove heat—may have the same result.

The effect of protracted eczema on the head is liable to be grave by interfering with the growth of the hair; by causing and extending catarrh of the ear and nose, or blepharitis, conjunctivitis, or keratitis; by producing open sores and thus facilitating the invasion of erysipelas and possibly of tubercle germs; by irritating and tumefying the numerous lymph-bodies of the neighborhood with the complication of hyperplasia or tuberculosis. Thus, the indications for treatment should be considered urgent in every case of eczema; the sooner it is suppressed the smaller is the number of complicating dangers which are direct outgrowths of what appears to be, in most cases, a merely local affection.

Local as well as general hygienic and constitutional treatment—mostly preventive—is required. The body of the infant must be kept clean, but the local eczema should not be touched by water more than is absolutely necessary; the reaction after the bath is liable to bring out a new eruption. If this be on the head, the hair should be cropped close. The nails must be kept short so as to prevent scratching as much as possible, the hands sometimes tied up, or the face covered. Remove thin or thick scabs by warm water, soap and water, warm fomentations (not on the head), oil, fat, liquor potassii in oil or in cod-liver oil (1 to 8 or 12). Use the comb when the scabs are beginning to loosen. Below them the surface is hyperæmic or oozing; the secretion must be wiped off and stopped as soon as possible. Solutions of astringents are neither so convenient nor so effective as ointments. The official zinc ointment will suffice in many cases, if fresh. Vaseline by itself is irritating. Bismuth subcarbonate 5 parts, with ungt. zinci and vaselin., āā 20 parts, is a good combination. Such applications may be made from two to five times

a day. Hebra's ointment is thickly spread on linen and the surface covered with it; layers of it may be worn for days or weeks. There is no harm in the extensive use of lead; I never saw or heard of a case of direct cutaneous absorption which stood criticism, but I have seen lead poisoning in a boy who scraped the lead ointment from his cheeks and ate it for many weeks in succession. The formulæ now and then published in the journals are very numerous; every thoughtful practitioner will make or combine his own from bismuth, zinc, lead, or tannin. In addition to these, I mention for inveterate cases and the scaly form tar (tar, alcohol, and green soap in equal quantities, or ol. cadinum 1 part, ol. oliv. 1 part, lanolin. 10 parts), hydrargyrum ammoniatum (either the official ointment (too strong) or a modified formula, such as zinc oxide 1 part, ammonium hydrate 1 part, ol. amygdal. dulc. 1 part, fat 10 parts), and, finally, silver nitrate. It is mainly in the most obstinate chronic cases of eczema—the crustaceous or squamous variety—that a large surface will heal under the influence of a solution of from three to ten or forty per cent. of silver nitrate, thoroughly applied. A good ointment is made of hydrargyrum bichloride 1 to 200 or 300 of lanolin, which may be gently rubbed in once or twice a day.

Tar has one grave inconvenience. On skins which absorb rapidly it may prove dangerous to the kidneys. Nausea, vomiting, diarrhœa, headaches, vertigo, and a smoky or even black urine, occasionally with more than mere albuminuria, may be observed. The same, to a greater degree, must be said of carbolic acid, which may be added to ointments (2 or 3 to 100) to relieve itching. It requires watching. Where it cannot be used, cocaine (2 or 5 to 100) or lead, zinc, or bismuth ointment may take its place. Where the surface healing is slow, the proliferation of tissue can be accelerated by balsam of Peru (1 to 10) ointment. Bulkley recommends, even in acute eczema, alumnol, from one to five per cent. in solution, ten to twenty per cent. in ointments.

Eczema seborrhœicum (Unna) is a parasitic (microbic) affection. Zinc ointment should be mixed with four or six per cent. of resorcin; or a solution of resorcin (from five to ten per cent.) in alcohol and glycerin, to be used twice a day.

Pemphigus is more frequently observed in the newly-born (mostly between the fourth and eighth days; the syphilitic form of the soles and palms even earlier) and very young than in older children, mostly on the face and trunk, with a pale or hyperæmic basis, running its course when benign and sporadic, inclusive of the drying of scabs, in from six to twelve days. It is seldom chronic, and mostly

so mild that no scabs remain, except when it is complicated with diphtheria or general cachexia. In such cases the bullæ may be hemorrhagic, or even gangrenous. The serum (albuminous and mostly neutral or alkaline) contained in the bullæ, which spring up, with no or a very thin aureola, at some distance from one another, becomes turbid after some days. There is rarely any fever. New crops may start up. Strelitz and Almquist gave themselves pemphigus through transferred cocci. Riehl found in a single case a fungus resembling very much the trichophyton tonsurans. It is often found on children in institutions, and will also spread to nurses or to members of the same family; it seems, therefore, to be contagious, and may be disseminated through careless midwives. In such cases staphylococcus pyogenes aureus was found. Isolated cases are the result of hot bathing and bedding. Thus it seems that this disseminated pemphigus may be either the result of microbes (staphylococci, like those of impetigo) or of mere cutaneous irritation, particularly at the time when the surface is most vulnerable,—that is, in the newly-born. *Pemphigus exfoliativus,* or *dermatitis exfoliativa,* is a very serious form which is apt to terminate fatally in one-half of the cases. According to Ritter, it begins at the mouth on the first or the fourth day of life and extends all over the body, with an angry redness, phlegmons, and gangrene. It was observed in hot seasons, after hot bathing, in sepsis. Riehl discovered a fungus with long mycelium. No scabs form, but relapses take place contiguous to the first starting-point. Dermatol, aristol, bismuth subcarbonate, powdered or in a five- or fifteen-per-cent. lanolin ointment, with soft covering, warmth to the feet, stimulants, and no bathing, is the appropriate treatment. The treatment is suggested by the causes thus far enumerated. Beware of heat and of contagion. Cleanliness and disinfection are required as preventive and curative measures. Astringent ointments or bismuth powders are demanded locally, particularly where the epidermis has been torn off; general roborant treatment is required for puny and cachectic children, and antipyretics if (in exceptional cases) the temperature rise to an unbearable degree; for even delirium has been observed in older children. In most cases powders of bismuth, talcum, amylum, zinc oxide, etc., render good service; in ulcerous cases orthoform, or iodoform once or twice a day, or a solution of silver nitrate (1 to 100 or 1000), or fuchsin ointment (p. 472).

Neuropathic affections of the skin are sometimes congenital; while not always connected with cerebral defects resulting in paralysis or epilepsy, like the *papillomata* described by Neumann (fissured

warts following the course of a nerve and covering the whole side of a body), still, they are serious enough, and sometimes not influenced by treatment. The congenital disposition to the formation of vesicles is in later life often combined with other neuropathic symptoms. A *febris bullosa* has been described both in children and adults. It is reported to be contagious, to have constitutional symptoms, and to run a course like acute exanthemata. It should not be forgotten, first, that diagnoses may be mistaken, that the symptoms of disorders of circulation and of innervation may be very variable, and that on principle it should always be considered risky to coin different names for slight varieties. The *pemphigus neuroticus chronicus* of the mouth described by me (*Trans. Ass. Am. Phys.*, 1894) cannot be mistaken. Common *warts* are probably, in many instances, trophic disorders of a neurotic character; their sudden appearance in great numbers and their sometimes unexpected disappearance seem to prove it. While fuming nitric acid is a fair local application, the internal use of arsenic is often of much advantage. This is certainly the case in what has been noticed first by Hebra as "verrucæ planæ juveniles," and carefully described by Thin. These warts are met with in children and adolescents on the face and back of the hands and fingers; they are yellowish or reddish brown, of the size of a pea or less, flat with a central depression, and may have frequently been mistaken for lichen ruber planus.

A neuropathic *œdema* has often been described, and is easily overlooked when moderate. In a case described by Widowitz it occurred after exposure to cold, with extensive tumefaction, livid edges, and without any complication on the part of the heart or kidneys. A neurotic *cyanosis* has been reported by Tordeus, and by him connected with "dentition;" *vitiligo* in a boy of six years by Wladimiroff. The eyelids, lips, tongue, pharynx, larynx, the orbit, (*recurrent exophthalmos*), the joints (*hydrops articulorum intermittens*), the kidneys (polyuria), the mucous membrane of the intestine (nervous diarrhœa) and of the bronchi (nervous asthma) may thus be affected. Exposure and winter weather are among the causes and suggest preventive treatment. This *angio-neurotic œdema* and *urticaria* should be considered as the result of similar causes.

Urticaria should be treated locally and for its causes (irritation of the skin by scratching, vaccination, epizoa or insects, digestive disorders, medicines like quinine, santonin, balsamics, foods like oysters, strawberries, or fish, uræmia, diabetes, etc.). Locally, washing with carbonic acid waters (siphons), with one- or two-per-cent. carbolic acid solutions, dilutions of chloroform and spirit of

camphor, corrosive sublimate in three hundred parts or more of vinegar and water, one-per-cent. solutions of menthol, and cold cream or vaseline should be used. Internally, stomachics, purgatives, and ichthyol will often do good. The latter may be given a long time with or without liquor arsenitis potassii.

Urticaria pigmentosa was described first by Nettleship in 1869. It originates soon after birth, and lasts, with intervals and relapses, until the fifth year of life or longer. Red papulæ, which soon flatten out and become pigmentous, on the erythematous surface, on the chest, back, abdomen, and extremities, rarely the face, still less on the palm of the hand or the sole of the foot. Unna found rarefied connective tissue with columnar cells. The usual external treatment of common urticaria is not successful. The internal treatment with arsenic should not be neglected. With ductless gland administration I have no experience.

Symmetrical cutaneous hemorrhage connected with cerebral disorder has been reported by Epstein; *erythromelalgia* in a child, by Baginsky; *symmetrical cutaneous gangrene* (Raymond) of feet, nose, and ears, with hæmoglobinuria, in a boy of three years, by Abercrombie; in children of seven, eleven, and thirteen years, belonging to the same family, by Braman. Several of my cases were quite superficial, and healed readily; others terminated in loss of limbs or life. The disposition afforded by rhachitis, anæmia, or leucocytosis is not always demonstrable. They follow acute or chronic constitutional or infectious fevers, measles, pneumonia, typhoid, scarlatina, diphtheria; even whooping-cough, dysentery, etc., and anything that will so depress circulation as to result in peripheric thrombosis. The treatment, besides preventive measures, is locally antiseptic and stimulant.

Scleroderma has many of its (fortunately few) victims among children. It has been observed in the first year of life (Barth). I saw it in a girl of three, a girl of six, a boy of ten, and one of thirteen years. It begins with small or larger, generally symmetrical, circumscribed, mostly longitudinal, discolored hyperplasias, which (usually) after a long time lead to atrophy, shrinking, muscular immobility, and contractures. There is little or no perspiration, and sensation is frequently impaired. I never saw a case in a child or an adult that did not give me the impression of a neurotic (local or more frequently central) origin, and of its being guided by the course of a nerve. The diffuse form, with normal or glossy skin and (generally) disturbed sensation, which extends over the face, or a whole limb, or the whole body, has not been found in children as yet, but

in adult females only. Mainly in the beginning, mercurial treatment, bichloride or blue ointment, in long-continued small doses, did some good. Salol (salicylic acid) has lately been recommended by A. Philippson, who reports two recoveries (adults) under doses of from two to three grammes (thirty to forty-five grains) daily. L. Weber improved a case by giving thyroid (*Med. Monatssch.*, October, 1897). De Renzi recommends the injection of a few minims of a ten- or fifteen-per-cent. solution of thiosinamin, Blocq electro-puncture.

Herpes (group eruption of small vesicles on a hyperæmic aureola) is mostly seen in fevers, such as pneumonia, meningitis, influenza, also in dyspepsia. Powdering with boracic acid, dermatol, zinc stearate, or the application of lead wash or a one-per-cent. solution of alum in water. *Herpes zoster* is mostly found on the lips (chin), in the mouth, and over one or more intercostal nerves, also over the nasal, frontal, sciatic; never over motory fibres when alone; seldom in the severe neuralgias met with in the adult. The irritation is peripheric almost exclusively, seldom in the ganglia, very rarely in the cord (bilateral chorea). In the latter case the spinal (myelo-) meningitis requires calomel and ergot, also salines and digitalis; rarely the thermo-cautery. The usual cases require the local treatment of herpes, a daily dose of quinine with antipyrin, and repeated doses of the latter or of aspirin.

Scabies is apt to become chronic in children because it is often mistaken for or complicated with the various forms of eczema and "prickly heat." Errors may readily take place, because it is not pre-eminently the fingers which are affected, but also the face, the gluteal region, the abdomen, and the joints. These localities constitute a difference from prurigo, in which the extensor sides of the extremities are principally affected. The skin must be thoroughly cleansed with soap every morning, after balsam of Peru, or balsam of Peru 15 parts, alcohol 10 parts, or balsam of Peru and vaseline, in equal parts, have been copiously applied the evening before. A few such applications will suffice, but they stain the linen. The unguentum sulphuris of the Pharmacopœia is too irritating to be applied to the skin of children, but may be mitigated by the addition of fat, styrax liquidus, and olive oil, in equal parts; creolin (from 5 to 10 parts in 100 parts of olive oil) or naphtol with fat (5 to 15 or 100) will also render good service. The clothing must be thoroughly washed in hot soap and water or disinfected with sulphur. Both naphtol and styrax may irritate the kidneys, so that they are contraindicated in children with renal affections. In them, Wilkinson's ointment (ol.

rusci, flor. sulph., āā 20 parts; sapon. virid., vaselin., āā 40 parts; cret. alb., 10 parts) is advisable.

Impetigo contagiosa has thinner vesicles than pemphigus, no fever, and no inflammatory basis. It is found on the uncovered parts of the body, face, hands, and feet; the vesicles are small or large and spread rapidly, and relapses take place. Serious results have not been noticed; still, a case of nephritis is reported as a sequela in a girl of twelve years. It is met with in schools and after wholesale vaccinations, through infection by vaccine lymph. Lassar found the staphylococcus aureus. As many as a thousand cases have been observed in a single epidemic. The treatment must be preventive, if opportunity be given; a school in which the disease is found ought to be closed temporarily and disinfected. The local (and general) treatment is that of a mild eczema.

Favus is, through its achorion Schoenleinii, eminently contagious from child to child and from animal (rabbit, cat, dog) to child, is communicated through beds, caps, and finger-nails, and is not confined to the head. A mild treatment may first be tried. Green soap and warm fomentations will succeed in removing the hard masses, and solutions of corrosive sublimate (1 to 100 or 300) and ointments of naphtol (five per cent.) or pyrogallic acid (ten per cent.) may prove beneficial. Or a ten- (or less) per-cent. ointment of chrysarobin may be tried (according to Wolff) daily for six weeks, alternating it with a corrosive sublimate ointment (1 to 100). After that time, if the treatment have been tolerated, the application should be made every other day, and later once a week. The unguentum hydrargyri ammoniati will do the rest. I rarely saw a case improved without epilation, after a thorough removal of the yellow crusts by means of green soap and fomentations. Epilation can be done by pincers or by the old method of the pitch-cap, which is applied after the hair has been cut to one-third or one-half inch in length. Biedert modifies the old plan by melting two hundred and fifty parts of white pitch and four of tallow. The mixture is then spread over a cloth from six to eight square inches in size, which is fastened on the hair stumps with a hot iron and allowed to remain an hour before it is pulled off. This procedure is repeated every six or eight days until the cranium is entirely bald and smooth. The pain can be overcome and the cruelty of the necessary process moderated by the use of an anæsthetic. Very obstinate deposits must be scraped out.

Herpes tonsurans (from trichophyton tonsurans, a parasite very similar to achorion, common among domestic animals: circular vesicles, enlarging) requires a treatment similar to that of favus, in-

cluding epilation. Before resorting to it, ointments of sulphur, ichthyol, salicylic acid, or chrysarobin may be tried. Corrosive sublimate (1 to 100) in solution and naphtol ointment are very efficacious.

Molluscum contagiosum (light nodes from which lobulated whitish masses containing brilliant oval bodies, perhaps protozoa, can be squeezed out, mostly on the uncovered parts of the body) is very contagious and is met with epidemically. Communication from child to child or from baby to nurse must be guarded against, the morbid growths removed with the sharp spoon and the wounds treated antiseptically (best with carbolic acid), and finally, if required, with balsam of Peru or ointments containing it.

Lupus is in some of its forms (exfoliativus, tuberosus, exulcerans, serpiginosus) not accessible to anything but external treatment. Still, the treatment of the patient, who, as a rule, shows more symptoms of scrofula than of tuberculosis, is not excluded. Zinc chloride has been mixed with two or three parts of starch and made into a paste with water. Its application is very painful and its effect slow. So are Lannelongue's repeated injections of a ten-per-cent. solution of zinc chloride in water; still more so Milton's indefinite and persistent use of carbolic acid and of a twelve-per-cent. solution of potassium hypermanganate (joined to the internal administration of arsenic, potassium iodide, and mercury). Another method consists in the repeated application of saturated solutions of lactic acid; still another is the use of the sharp spoon, and then for three or five days in succession that of a ten-per-cent. mixture of pyrogallic acid. Wherever the affected part is not too large, and in a convenient locality, excision ought to be made and the wound closed; should it be too large for that, transplantation may be performed afterwards. At all events, the destruction of the morbid part, wherever aimed at, is most easily accomplished by the actual thermo- or galvano-cautery. Tuberculin has failed here as in other cases of tubercular disease. A paste composed of arsenous acid 1 part, hydrarg. sulph. rubr. 3 parts, vaseline 15 parts (or another menstruum), applied daily for several days in succession, has a deserved reputation for destroying the morbid masses. Both the Finsen light and the X-ray treatment are still in their experimental stage.

Lupus erythematosus has its localized inflammatory cell-infiltrations near the surface, particularly in its most recent disseminations. That is why it may be most amenable to treatment. I. Schütz treated nine cases with two daily applications of a mixture of 4 parts of Fowler's solution in from 20 to 30 of distilled water. When after four

or six days the surface became irritated, a mild powder was substituted for a few days, and the treatment resumed after four or eight days. The cases got well in from ten to eleven weeks, without scars.

Tuberculosis of the skin (both verrucosa and ulcerosa) may be treated with the actual cautery and with mercurial plaster; *scrofuloderma* (nodes in and under the skin of the face, neck, and extremities, with central softening and a cheesy pus), by arsenic internally and the sharp spoon, and subsequently iodoform and balsam of Peru.

Psoriasis, when acute, is a very distressing disease because of its intense itching. It has been known to originate from local irritation in the scars of vaccination (Bethman) or variola (Cazenave). It requires many and protracted baths and plenty of soap to remove the scales; unguentum hydrargyri ammoniati is used for the same purpose. Ichthyol ointment (from five to ten per cent.) has rendered me good service in the only case I have seen in a child for years. Betanaphtol has been highly praised in ointments containing from five to ten per cent. Neisser recommends chrysarobin or anthrarobin ointments (from five to ten or twenty per cent.). They are positively dangerous in such doses, when used on children, because of the extensive erythema and conjunctivitis following them. On the head, therefore, he substitutes pyrogallic acid, but it dyes the hair black and is not so efficient. For chronic cases the principle of treatment is the same. The eruptions must be attended to locally; ichthyol ointments will also do some good. Chrysarobin ointments (from one to two per cent.), or chrysarobin in traumaticin in the same proportion, should be applied once every day or every few days. Green soap, or liquor potassii, a daily bath in soap and water, will dissolve the scales and facilitate the effect of the other applications. Internally, iodides will prove effective in syphilitic cases. Thyroid in small doses (one to two grains = 0.06 to 0.125 daily) has had some successes among many failures. The best internal remedy is arsenic in long-continued moderate doses. No stimulating food (no dark meat, or no meat at all) or beverages.

A number of *congenital diseases* of the skin and subcutaneous tissue are amenable to treatment; to them belong the *neoplasms*. *Lipoma* is found in two varieties: first, the circumscribed and capsulated; second, the diffuse. While the former is as easily removed as in the adult, the latter is sometimes inoperable, inasmuch as it extends over large areas, and resembles in some instances, or in some parts of the anomalous growths, a moderate or formidable surplus of normal fat only. I had to give up an operation for removal before

it was completed. *Hard fibroma* (connective tissue, circumscribed tumors) should be extirpated before it gives rise to *facial leontiasis* or elephantiasis (Trendelenburg). *Soft fibroma* (f. molluscum Virchow, mostly multiple, with a tendency to immense growth, sometimes pendulous, connective tissue with areolar structure) should be removed quickly from the cutis in which it develops. *Keloid* is an hypertrophied cicatrix extending upward from the corium, with rapid growth. Extirpation is useless because of the new development of keloid. Daily painting with liquor potassii arsenitis and ointments of ammonium sulpho-ichthyolate in lanolin and fat, āā 5 to 8 parts, may be tried. Repeated semi-weekly subcutaneous injections of a ten-per-cent. solution of thiosinamin in absolute alcohol (doses for adults grs. ⅔ to 1½ = 0.04 to 0.1) have been recommended, as also for cicatricial contractures following lupus, etc. (Sinclair Tousey). *Cysts* and *dermoid cysts* are met with; many of them, though congenital, attract attention only after months or years. *Atheromata* (when small and superficial, embedded in skin only,—milia) are not infrequent about the head (eyebrows, etc.). They can readily be enucleated, and ought to be removed before they adhere to the skin and undergo suppuration. When they are suppurating, and removal is very difficult or impossible, tartar emetic in water (1 to 30) may be injected or potassium hydrate introduced. Either of these will disintegrate the cyst-wall to such an extent as to render their removal by pincers possible after a day or two. Congenital *sarcoma* has been described a few times, once by Neuhaus (*Arch. f. Kinderh.*, vol. xxii., 1897), who collected a few other cases. The sarcoma commenced in the subcutaneous tissue. The only one beginning in the cutis itself was recorded by me for the *Am. Ped. Soc.*, 1897. It was on the upper part of the scrotum, with small metastases on the dorsum penis and no swelling of lymph-bodies. It was excised, the metastatic deposits destroyed with the thermo-cautery, and the baby treated with arsenic (*Arch. of Ped.*, November, 1897).

Congenital ichthyosis is the result of an hypertrophy of the epidermis and the papillæ of the corium, sometimes with dilatation of their blood-vessels, also with sclerosis of the connective tissue, and usually with an exaggeration of the normally copious secretion of sebum during the second half of intra-uterine life. The elastic fibres are more or less absent. Sebum not removed, but thickened by epidermal cells and foreign material, forms scales, which may be thrown off, but are rapidly reproduced, and cause fissures and warts. This condition, when mild ("xeroderma"), is not necessarily dangerous to life. A boy of fifteen was freed of his scales by a permanent warm

bath of five days. Lanolin inunctions, with or without ichthyol (from five to ten per cent.), will prove beneficial. Arsenic should be given internally. Thyroid—with which, however, I have no experience in this anomaly—was given by Joseph and others with apparent success. I should favor its use also in congenital *idiopathic atrophy of the skin* (head, face, hands, feet, nails, hair, which is totally absent), which otherwise is not reached by treatment. The effect of thyroid in myxœdema and its alopecia should encourage us.

The worst forms of congenital ichthyosis, which sometimes terminate fatally in a few days, are not amenable to treatment. Partial follicular ichthyosis, in which bony spinæ grow out of hair- and tallow-follicles without affecting the general health, demands frequent bathing, green soap, plenty of fat inunctions, and a ten-per-cent. sulphur ointment; also salicylic acid in a saturated alcoholic solution.

Congenital *neoplasms* on the *neck* are: *hygroma* (lymphangioma with albuminous contents and endothelia); serous and *dermoid cysts,* sometimes so dense as to render their diagnosis from lymphatic tumors difficult when situated below and alongside the sterno-cleido-mastoid muscle; carcinoma and epithelial remnants of the branchia; primary endothelioma of the lymph-follicles; and *sanguineous cysts,* mostly diverticula of veins, or in a few cases rudimentary developments of the jugular vein. They require either enucleation or an extensive incision with aseptic tamponing.

Nævus pigmentosus and *verrucosus* * belong here. Their treatment is similar to that applicable to vascular nævi and tumors (p. 468), the latter differing from the former by a greater prominence of the skin, which is produced by elongation of the papillæ and by hyperplasia of connective tissue; also to the *nævus lipomatodes,* which is a spherical or cylindrical fatty excrescence covered with normal skin, sometimes pedunculated, sometimes sessile and with a broad basis. A few of the latter class are liable to grow out of proportion; all the rest in conformity with, or even less than, the rest of the body. In the majority of cases the time for an operative procedure is left to the medical attendant. Besides the methods of removal which

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* Solden (Arch. f. klin. Chir., vol. lix.) claims it as a fibromatosis of the connective tissue of the nerves. The "naevus cell nest" is not epithelioma (Unna) nor lymphangiofibroma (Recklinghausen), but neurofibroma. Out of this are developed the soft warts and the soft fibromata, the nerves of the skin and the whole periphery participating. Pigmentation in the rete Malpighii is a different process (melanosis).

have been detailed above, total extirpation is advisable in most cases. Indeed, it is the preferable method. Local anæsthesia can easily be accomplished by ethyl bromide, or by a mild solution of cocaine (grs. ½ or 2 to 100), or by Schleich's solution, mentioned on page 72, injected into the skin. Excision is readily executed with but little loss of blood, and the sutured wound is covered with collodion. In a very few days, without a change of the collodion, recovery is apt to be complete.

XII

Diseases of the Muscles

ACUTE inflammation of the muscles—*myositis*—is located either in the external or internal perimysium, also in the contractile elements. Cellular infiltration, coagulation, fatty and hyaline degenerations, suppuration, nuclear proliferation, and the formation of new connective tissue are observed as its morphological changes, with either incurable retraction or curable contraction as their results. *Traumatic* myositis (p. 90) requires absolute rest, the application of cold water or ice, after a while tincture of iodine once a day or every other day, potassium iodide and lanolin ointment several times a day, or gentle massage without the ointment. Potassium iodide internally is indicated when thickening remains. If, after a long time, the muscle, though without pain, does not become normal, the electrolytic effect of the galvanic and the stimulating action of the interrupted current, in short sessions, may improve the condition. Both traumatic and *rheumatic* myositis have a tendency to relapses. The latter requires a treatment similar to that which has been detailed above, with this exception, that hot (dry) applications generally render better service, and the internal administration of sodium salicylate is mostly indispensable. Inunctions of oil of wintergreen are often useful, as are also diaphoretics. The *infectious* myositis of eruptive and septic fevers starts with a moderate increase of temperature, some sensitiveness on pressure, and occasional swelling, an effusion which is either serous or purulent, and requires accordingly, besides the active attention demanded by its origin and a careful differentiation from a possible affection of a joint, either expectant or operative (and antiseptic) treatment. In those rare cases in which purpura is observed at the same time, the myositis has probably a *hemorrhagic* origin. Neuritis and myositis may appear together, as *neuromyositis,* acute, subacute, or chronic, without or with relapses. It is rare, but of long duration, probably always of bacteric origin, and shows all forms of parenchymatous, interstitial, embolic, and hemorrhagic changes. *Syphilis* produces either gummata, which are often mistaken for sarcomata, or hyperplasia, and demands, in addition to internal specific treatment, either the inunction of an oleate of mercury or of the blue ointment or subcutaneous injections of the bichloride. *Tubercular* deposits are

caseous and purulent; they must be incised, scraped out and irrigated, and the cavity filled with iodoform gauze. Purulent myositis is hardly ever idiopathic, and its cause or complications must be ascertained (syphilis, tuberculosis, sepsis).

The *chronic* forms of myositis met with in children are, as a rule, outgrowths of the acute inflammation. The rare forms of *traumatic ossifying* and of *petrifying myositis* are hardly ever seen in childhood, with the exception of the occasional appearance of the *multiple progressive ossifying variety*,—a collateral to the cartilaginous exostoses,—which exhibits in (slightly febrile) acute attacks, or chronically, different stages (embryonal, fibrous, ossifying) of inflammation and bone-formation in the cellular tissue of the fasciæ, in the aponeuroses, and in the tendons of the back, the chest, the masseter, and the extremities; seldom of the abdomen, never of the heart, the diaphragm, or the sphincters. Sometimes it is complicated with absence, undersize, or ankylosis of the phalanges of the thumb or fingers. It is a nutritive disorder, always of congenital origin. Of forty-two cases (A. Weill and J. Nissin in *Nouv. Iconog. Salpêt.*, 1898), twelve were noticed under one year, twelve from the second to the fifth, and ten from the fifth to the fifteenth year. No available treatment is known.

Ischæmic muscular paralysis is the result of anæmia (mostly local, as from the influence of cold). The pain, loss of elasticity, and resulting contracture require massage, gymnastic exercise and electricity, and the subcutaneous daily use of strychnine.

Trophoneurotic ill nutrition and *paralysis* comprise two varieties. One is the result of inflammation of a joint: from disuse the neighboring muscles become atrophic and more or less paralyzed. The other originates in a change of the spinal centres, as in poliomyelitis, with fatty degeneration and atrophy as inevitable consequences. In both varieties systematic massage of the paralyzed muscle, executed with anatomical knowledge, will do good; in the first with mostly complete success. Electrical treatment and strychnine may be combined with it. The atrophy is very rapid, with but slight changes of electrical irritability (no reaction of degeneration), and localized. If the knee be affected, it is the quadriceps that is suffering; if the hip-joint, the glutæi; if the shoulder, the deltoid, infraspinatus, and teres minor; if the elbow, the triceps; if the wrist, the extensors of the forearm; if the fingers, the interossei.

The *pseudo-paralysis* of rickety children is simply debility. Parrot spoke of pseudo-paralysis as the result of epiphyseal swelling. When the spinal cord is found altered (hemorrhage, abscess, cocci

in the fine vessels), there is no longer a "pseudo," but an actual paralysis. In congenital syphilis, muscular debility, with normal electrical irritability, may be observed about the first or third month of life. *Muscular atrophy, progressive juvenile muscular dystrophy, pseudo-hypertrophy,* and *congenital myotonia* have been mentioned above (p. 271).

The affection which has been described as *grave pseudo-paralytic myasthenia,* and which consists in a peculiar exhaustion of the muscles on slight exertion, to such an extent as to render voluntary contraction very difficult and to rapidly diminish electrical excitability, appears to depend either on defective innervation or on chemical changes. In the single case I have seen, in which no causal diagnosis could be made or suspected, except a general muscular debility common to most members of the same family, massage and strychnine rendered some service. Veratrine, physostigmine, and digitoxin are recommended. In neurasthenia the muscles are also unduly exhaustible, but it differs from myasthenia in this, that the nerves are excitable. A good many cases so described should be thoroughly studied. The results of polioencephalitis or other brain lesions and the incipiency of brain tumors have often been taken for "myasthenia."

Torticollis (*caput obstipum*) means a contraction of the sterno-cleido-mastoid muscle, mostly its sternal end; the head is turned to the affected, the face to the opposite side, and the diseased side is not infrequently more or less atrophic. The treatment depends to a great extent on the cause of the contraction. Spasmodic torticollis resulting from reflex of the sensitive nerves of the cervical plexus requires the section of the latter. Malposition in the uterus is an occasional direct source, as also the hæmatoma originating during birth, or later, which has been mentioned elsewhere (p. 90). Bilateral caput obstipum, with the result of forcing the head backward, has been observed in very young infants. In a case of Shaffer the head was drawn forward. No blood was found in the muscles, but only firm connective tissue and atrophy of muscular fibres. This interstitial fibrous myositis depended, probably, on a number of minute traumatic lesions during parturition. Tumors, such as sarcomata, have the same influence on the function of the muscle. This is impaired, in advanced childhood, by sudden strains; for instance, by kite-flying, by loads carried on one shoulder, occasionally also by an abnormal position of the head, enforced by paralysis of the ocular muscles, in order to avoid double vision (Landolt). Rheumatism of the muscle, isolated or more general, and of one or more vertebral articulations, and caries of the vertebræ have the same effect. Sodium

salicylate internally, oleum gaultheriæ, and ammoniacal or camphor inunctions will do good. The same may be said in regard to *muscular rheumatism* in general. Torticollis is also one of the symptoms of the acute rheumatism of the neck which, because of its serious symptoms (fever, vomiting, delirium, with no irregularity, however, of the pulse), has been mistaken for meningitis. Sometimes it depends on a neurosis (neuritis?) of the accessory nerve. In that case the scalenus and trapezius muscles are also affected. Reflex torticollis has been mentioned in connection with intestinal worms and with carious teeth, and an intermittent form is known to exist (Forchheimer) and to depend on malaria. In these cases quinine and arsenic are indispensable. Worms must be removed, teeth corrected. A. J. Gillette says that he cured a case by the removal of adenoid growths. In those cases in which heavy loads carried on one side cause contraction of the other a systematic use of the diseased side will restore the equilibrium. Exaggerated and forcible swinging of the arms will secure co-operation and exercise of the muscles of the neck. Massage both of the muscles and of the articular processes of the cervical vertebræ from the third to the fifth is required. The galvanic current in mild doses relieves spasm. Gentle rubbing with lanolin (in inflammatory cases with potassium iodide or mercury) is beneficial. Cold temperatures must be avoided. Otherwise unconquerable cases require tenotomy, to be performed by open incision, which protects the jugular vein better than the old operation from inside outward. When tenotomy is not sufficient, Mikulicz practises the total extirpation of the sterno-cleido-mastoid muscle. Too violent attempts at reduction may prove dangerous. Brackett (Eleventh Meeting Amer. Orth. Assoc., 1897) met with alarming changes in pulse and respiration, which he attributed to adhesion and shortening of the pneumogastric nerve.

XIII

Diseases of the Bones and Joints

1. *Congenital Anomalies.*

Of the congenital *malformations* of the extremities (bones and soft parts), many are not accessible to treatment. To this class belong arrests of development, either before or after their formation, and spontaneous amputations. *Curvatures* of the limbs (congenital, through fracture of the tibia) may require osteotomy or osteoclasy; but their domain is not very extensive, for in the large majority of acquired *rhachitical curvatures* of the legs recovery takes place spontaneously. Observations in the surgical clinic of Tübingen, extending over a number of years, prove that seventy-five per cent. of all such curvatures will straighten in from two to four years. When the patients were first presented, plaster-of-Paris casts of the deformities were made, and another examination took place after an average of four and one-half years. Improvement was noticed in 15.3 per cent. additional. In 9.7 per cent. only no spontaneous recovery or improvement took place. It is in these that operations are demanded. *Supernumerary fingers* and *toes* are either removed from their cutaneous attachments or extirpated from their sockets. *Congenital enlargements* of toes, consisting in hypertrophy of both bone and fat, are removed by amputation. Universal *giant growth* is always congenital, but not hereditary. The connective tissue, muscles, bones, and blood-vessels, all of which evolve out of the mesoderm, are equally affected. The nervous system and the joints are normal, the skin sometimes thickened, the nails correspond with the phalanges. Whether it is related to acromegalia (which in its full development is observed in later years only, but may originate earlier) remains to be seen. For the present it is not amenable to treatment. *Synechia* of (*webbed*) fingers and toes must be separated; the operation being difficult, it is best to delay it for some time, but not long enough to endanger the growth of the organ. Division of web, with suture of the preserved skin on one finger and Thiersch's grafts on the other, or the latter on both fingers, is asserted to be the best treatment.

Multiple infantile *exostoses* are congenital, sometimes hereditary, very rarely syphilitic, and then recognized by, or connected with, other symptoms of syphilis; they develop early, now and then only

after puberty; grow near the periepiphyseal cartilage, between epiphysis and diaphysis, sometimes from the cartilage of the epiphysis; sometimes found on scapula, pelvis, and cranium; in rare instances grow even after the completion of the growth of the body; in some instances surrounded by a synovial membrane (exostosis bursata); remain cartilaginous or become osseous, and then may interfere with the growth of the bones. They do not often disturb the functions of the long bones and joints, but the ulna has been known to become crippled by them, the skin may ulcerate over them, and the synovial capsule may be raised by one growing too near the joint. These complications sometimes require special treatment and attention. Exostoses, so long as they are but few and not cumbersome, are best let alone. However, in the next case of early age seen by me I shall give phosphorus (p. 130) systematically, for the purpose of enforcing speedy ossification, both local and general. Extirpation is indicated when there are but few, and when these are large; under careful asepsis the operation is at present devoid of danger. Potassium iodide has been administered extensively without apparent effect. When syphilis is suspected, mercury and iodides should be given a trial.

2. *Congenital Luxations.*

Congenital luxation of the *hip-joint,* with the exception of rare cases depending on injuries contracted during birth, is the result of scantiness of liquor amnii, by which, in the cramped position of the fœtus, the growing femur is pushed out of the socket, or, in other (rarer) cases, of an arrest of development of the acetabulum, which is sometimes hereditary and now and then complicated with other malformations. The head of the femur finds no accommodation, and the trochanter is found above its normal place. This is particularly so on the steep os ilium of the female. When the luxation is unilateral the gait is limping; when bilateral, waddling. Extension lengthens the extremity and conceals the deformity. Treatment is either mechanical or operative. Until a few years ago the mechanical treatment was the only one generally recommended. Volkmann relied on permanent extension, particularly in unilateral cases. Hesing has good results with his apparatuses. Schede uses splints, with pelvic support, to extend and to abduct the extremity, for from two to four years in succession. He finds the indication for this treatment in bilateral cases up to the fourth year, in unilateral cases up to the eighth or ninth, for the rudiment of the acetabulum whose size can be improved upon frequently persists up to that period of life. Paci

lost a girl of seven years by dysentery four months after reduction and extension of her bilateral dislocation; he found at the autopsy two new joints which appeared to promise stability of the femoral head in the new position, if the child had lived. Ten years ago the results of operations appeared to be very favorable. At the Congress of German Surgeons of 1894, Lorenz—in that of 1895, Hoffa—presented very satisfactory statistics and patients. Neither of them cuts the muscles, but both reduce the dislocated limb by powerful extension. Hoffa's incision is longitudinal, like that made for resection (Langenbeck); the capsule and soft parts are loosened from the trochanter by subperiosteal operation, the acetabulum is enlarged and the head fitted into it. The superfluous capsular tissues are then extirpated, the wound is filled with iodoform gauze, and an extension apparatus applied. The extremity begins to grow, shortening becomes less, and both head and acetabulum gradually increase in size. Hoffa's operations were performed between the second and eighth years. He presented the statistics of one hundred and twelve operations performed on eighty-two patients without cutting muscles. The last forty-seven terminated without a death. Lorenz's incision runs anteriorly; he does not touch the insertion of the muscles.

Later, A. Lorenz* published his objections to the protracted employment of extension, which keeps the patient in a recumbent position, possibly for years, and interferes with the nutrition and function of the limb or limbs. Instead, he extended forcibly, under anæsthesia, and reduced the head of the femur, the reposition being maintained by strong abduction. The head of the femur is then retained in the small acetabulum by apparatuses and the abduction is gradually diminished. After a while standing and walking are permitted. At first, while abduction is continued, these movements are clumsy and difficult, but when the weight of the body and the constant friction have deepened the acetabulum, they become easier by degrees. The oldest child in whose case this procedure was successful, the luxation being bilateral, was six years and three months. In one case of unilateral luxation standing and walking were interrupted three days only, in others several weeks. Even when the luxation was bilateral they were not long delayed. Two patients were able to stand in six weeks. To ascertain the actual result of a successful reduction, the X-rays have been employed before and after the treatment. As a result of more mature experience, public opinion among surgeons is swinging back to mechanical treatment

* Centralblatt f. Chir., 1895, No. 33; Samml. klin. Vortr., 1896, Nos. 150, 151.

almost exclusively. Schede, Hoffa, Lorenz, Wolf, and Kümmell (*Assoc. of Germ. Phys. and Nat.,* 1896) unanimously discredit any bloody operation in the treatment of even severe cases. It should be resorted to as a last resource, and promises no success, but is risky. Schede reported ninety-nine cases of infants and children up to fifteen years of age, ninety-eight of which recovered with manipulation only. Lorenz reported eighty-three cases treated by manipulation, and extension in abduction, successfully (A. H. Tubby, London *Lancet,* May 1, 1897). The advantages of mechanical treatment are its simplicity and the avoidance of the danger connected with every great operation, of scars, and of probable contractions in later life. One of the latest contributions to the subject is by A. Codivilla (*Zeitsch. f. orthop. Chir.,* vol. ix., 1901). According to him, the bloodless treatment is easiest in early childhood. Only four or five of sixty-six cases reduced were perfect physiological results, but the functional result was good in practically all of them. Bloodless methods were successful even in cases as old as sixteen years; the immobilization of the reduced dislocation in a position of more or less marked abduction must continue from six to nine months.

Congenital luxation of the *knee-joint* is not so frequently observed as that of the hip-joint. Still, G. Muskat collected (*Arch. klin. Chir.,* vol. liv.) seven genuine luxations, four contractures in flexion, and seventy-one incomplete luxations. Massage, cautious attempts at restoring motility, and—under the most urgent circumstances only—opening of the joint are recommended.

Congenital dislocation of the *scapula* is rare. A mild degree is caused by an incompetency (congenital) of the trapezius muscle.

Congenital dislocation of the *shoulder* was observed in rare instances as the result of trauma during parturition. F. S. Eve (London *Lancet,* May 1, 1897) describes two cases. In one the head was below the spine of the scapula; in the other the joint was found "normal, the head elongated obliquely backward." Redundant cartilage was shaved off and reduction performed.

Twenty cases of *congenital dislocation* of the *radius,* mostly backward, were collected by A. Ernstberger, who, like his father, had it, together with symmetrical anomalies of the finger-nails. In his own case there was also a subluxation of a patella.

3. *The Bones.*

Fractures heal the more readily the younger the patient. Callus is speedily formed, and, the muscles being feeble, dislocation of the ends of the bones does not take place to any considerable extent.

Elixir of phosphorus in increasing doses will hasten consolidation in the feeble and anæmic. The fracture of the humerus occasioned during birth requires a light splint with but little wadding. A piece of pasteboard and a few strips of adhesive plaster or a bandage, and the support of the limb by fastening it to the body, are sufficient. Clavicles heal readily when tied up in a triangular cloth, the arm being fastened to the body. Fracture of the clavicle during labor is often followed by permanent paralysis of the corresponding upper extremity. Where moistening by urine, etc., is feared, the bandages should be painted with a solution of resin in ether (1 to 10).

Perichondritis and *osteochondritis* occur, of course, in earliest infancy only, mostly under the influence either of rhachitis, or of syphilis, or of acute infectious diseases, most frequently in the forearm and the leg, also on the ribs or clavicles, or sternum or larynx, and terminate either in cutaneous infiltration or disruption of epiphyses. Pain is rare, and the "pseudo-paralysis" of Parrot means but the functional disturbance due to infiltration of the tissues. *Periostitis, osteitis,* and *osteomyelitis* are due, in the first instance, to the disposition created by the activity of metabolism and by the physiological succulence of the bones, whose growth starts from the periosteum, from the marrow, and from the periepiphyseal cartilage. The vulnerability of general scrofula and hereditary influences add to their liability to become diseased. Proximate causes of inflammation are trauma, colds, infectious diseases such as whooping-cough and measles, and the invasion of cocci and bacilli through the skin, umbilicus, mouth, tonsils, or any other sore surface, also the respiratory and digestive organs, with the resulting septicopyæmia. Infection may be intra-uterine. The termination of periostitis is either in absorption, or thickening, or suppuration. In *albuminous periostitis* pus is substituted by serum and fat. In scrofulous and tuberculous children osteitis is mostly found in the short bones and in the epiphyses. The bones swell, become softened (porotic), and in their interior suppuration loosens the tissue and dilates the medullary spaces so as to inflate and expand the thin external layer (*spina ventosa*). *Tubercular osteitis* softens the bones into a yellowish caseous or fungous mass, and thereby forms cavities, which may heal by means of absorption of the liquid contents and calcification of the remnant, but mostly end in caries or necrosis, in sinuses, in persistent suppuration, and not rarely in amyloid degeneration. The degrees of the different forms vary considerably. For instance, necrosis may be superficial, with a favorable prognosis; or central, with the formation of a

sequestrum the removal of which incites granulations and new formation of bone; or total, and thus removes whole bones, such as the calcaneum, the cuboid, entire phalanges, or the diaphysis of the long bones.

The prognosis is best when the process is superficial. Absolute rest, elevation of the limb, cold applications, tincture of iodine, and deep incision in case of very severe pain which betrays the presence of pus comprise the proper treatment of acute periostitis. Chronic thickening will usually be reduced, perhaps even removed, by moderate pressure, potassium iodide internally, and (or) an ointment of the same with lanolin. Syphilitic periostitis requires potassium iodide in increasing doses, occasionally combined with mercury. Osteitis and osteomyelitis (deep, agonizing pain, with but little swelling at first) require a treatment similar to that of periostitis. The bone should be kept at rest, well elevated and supported by splints, and ice applied. In mild and slow cases tincture of iodine or the ignipuncture of Kocher yields favorable results. Syphilis demands its specific treatment no matter where met with. It should be remembered that syphilitic dactylitis, in the shaps of spina ventosa, cannot always be diagnosticated, clinically, from the tuberculous form, also that syphilis and tuberculosis may be found in the same baby. In such cases a protracted antisyphilitic treatment is indispensable. Incision may strike an abscess, which is then drained. A sequestrum is removed, and will be replaced by bone so long as there is no dangerous general affection. Antiseptic irrigations are indicated in most of these cases, and antiseptic applications should be made constantly unless sterile gauzes be used to fill a cavity or sinus. When caseous degeneration has taken place to a great extent, the question of mere scraping or of resection presents itself. Osteomyelitis requires an early operation, sometimes within a few days after the appearance of the first symptoms. Esmarch's bandage, the chisel, and the sharp spoon are the main reliances of the surgeon; the seat of the disease must be reached and entirely uncovered; counter-openings and ample tamponing may be demanded. Spina ventosa should be treated in a similar manner; part of the remaining external osseous layer should be removed and the cavity filled with iodoform or other antiseptic gauze. Obstinate sinuses must repeatedly be scraped. They often heal under a carefully conducted Bier's treatment (p. 507), with parenchymatous injections of an iodoform emulsion into the surrounding tissue, not into the sinus itself.

In every case of this kind—in fact, in every case of subacute or chronic inflammation of the osseous tissue—phosphorus ought to be

given. It may be continued in such doses as are recommended elsewhere (p. 131) for two or three months in succession.

Tuberculosis of the body of a vertebra (more frequent than that of the arch or of a process) underlies *spondylitis* in almost every case. The intervertebral cartilages are but secondarily affected. In many cases a trauma is charged with being the proximate cause, in others the process develops spontaneously, with but few symptoms. Stiffness on moving, pain on moving and pressure, very little, if any, increase of temperature, and inability to bend and rise without support on a knee or some near solid object are quite often the persistent, but only, symptoms. When spondylitis is cervical, it is liable to produce headache, dyspnœa, and retropharyngeal abscess; when lumbar, pain in the thigh or symptoms resembling those of coxitis. Usually there is at an early period pus either in the bone or at some distance from it. It finds its way along the fascia, rarely into the vertebral canal, and is met with in the lumbar and gluteal regions, in the small pelvis, along the psoas and internal iliac muscles, and along the rectum. The latter occurrence is unfavorable because of the slowness—if at all—of recovery. Lumbar and gluteal abscesses are more readily discovered than those of the psoas, and therefore more amenable to treatment. Incision, wiping out with aseptic gauze (better than irrigations), and injection of a five-per-cent. iodoform-glycerin emulsion will lead to recovery, provided the suppurating and tubercular vertebra heal out. Even psoas abscesses close up in that way, after the destruction of the pyogenic membrane. So far as the spondylitis is concerned, there is, unfortunately, rarely a recovery without some deformity; but if treated in time and properly (corset with or without jury-mast), recovery may take place without it. Permanent gibbus should be avoided. Cases with much suppuration exhibit lasting and marked kyphosis (Pott's disease), or scoliosis, or kyphoscoliosis. As soon as the diagnosis can be made, the patient must remain on his mattress, with a moderate amount of extension. Ice will relieve local pain. When it is moderate, tincture of iodine will answer. Hueter recommended the subcutaneous injection of a two-per-cent. solution of carbolic acid. When there is no fever, the time for a plaster-of-Paris jacket, according to Sayre, has arrived. What the latter requires, however, is that the child should not be too young. To be useful, a certain length of the spine is necessary. Thus, it is principally in the dorsal spondylitis of children of a certain age that it exhibits its best results. The jury-mast is added to support the head and thereby to reduce local pressure in cervical cases. Abscesses gravitating downward are better not touched before they reach

the surface. Then, before their spontaneous perforation, antiseptic irrigations and the use of iodoform emulsions are indicated.

Most cases of spondylitis are tubercular, and either primary or secondarily infected by a mediastinal lymph-node; some (either tubercular or non-tubercular) are traumatic; very few the result of a neoplasm. Abscesses are frequent and difficult to diagnosticate. They and caseous abscesses may cause a peripachymeningitis and narrowing of the spinal canal, with paralysis. This may terminate in recovery, sometimes after a long rest and potassium iodide, etc., treatment, sometimes after operations. The resection of parts of a vertebra is mainly indicated in old cases of (almost) complete paralysis, recovery from which may take half a year or a year. The disease is dangerous because of its origin and its effect. Preventive treatment is always indicated, and mechanical treatment should be gentle. Calot's earliest method of rapid reduction, with or without removal of spinous processes (thirty times in thirty-seven cases), has naturally resulted in several deaths. The author's intrepidity and his disregard both of human life and of public opinion were wonderful to behold. Later he changed his method, proceeded slowly—that is, "several seconds"—in accomplishing the reduction of the prominence, and then used plaster extension with a weight of from forty-five to one hundred and thirty pounds. Those who have followed his procedures are not edified by their results.

A number of cases described as *chronic articular rheumatism* are undoubtedly those of *arthritis deformans*. The differential diagnosis is perhaps best made by remembering that the term "rheumatism" is still too vague to allow its use for diagnostic purposes. The only condition which deserves it is acute (or subacute) articular rheumatism, rheumatic polyarthritis. It affects the synovial membranes. Gout (the affection has also been called "rheumatoid gout" or "rheumatoid arthritis") implies uratic deposits. Arthritis deformans is an affection of the cartilage (influenced by anomalies in the bones?): first, proliferation between the intercellular fibrillæ, then absorption, with, finally, hyperplastic eburnation around the absorbed cartilage and distortion of the limb (the hand in the ulnar direction mostly, with intact thumb and thoroughly enlarged phalangeal ends). A similar process takes place about the shoulder, elbow, knee, toes, and vertebræ. The heart has been found affected in a few cases, but as a complication with rather than a part of the disease. Marked cases of arthritis deformans such as I have seen myself have been published by A. G. Nichols (*Montreal Med. Journ.*, 1896), H. Koplik (*Arch. Ped.*, 1896), who collected eighteen, and Vargas (*Bull. offic. de Barcelona*, April, 1897). (He counts "Jacobi among those who

do not mention the disease," erroneously.) Very suggestive also are the early changes which take place in the skin and the rest of the epidermoid tissues and in the muscles. The accompanying changes in the muscles,—a slowly progressive atrophy with corresponding paralysis and contracture of the antagonists, and nodes on tendons, the atrophy being very marked in the interossei, without reaction of degeneration, and with only so much alteration of electrical and galvanic excitability as is explained by the atrophy of the muscular tissue,—trophic changes of the nails of fingers and toes (thickening, fragility, and exfoliation), and those of the skin (vitiligo and chloasma and slight indications of scleroderma, even ichthyosis in a few instances *), appear to prove their great difference from rheumatism and their very intimate connection with the nervous system, which is known to influence greatly both bones and joints (S. Weir Mitchell, *Clin. Less. on Nerv. Dis.*, 1897). Consequently the antirheumatic treatment, by salicylates, etc., is absolutely useless. The galvanic current, slowly increasing doses of arsenic administered a long time, protracted warm bathing at home or in Wildbad, Oeynhausen, Nauheim, Töplitz, protracted exposure to hot air of from 120° to 150° F. (Tallerman), and judicious massage have served me best. Arthritis deformans is not incurable. There must be no absolute rest.

Not always are many joints affected. The *chronic ankylosing inflammation* of the vertebral column, which may run a protracted course without an affection of the small joints, and the cases of monarticular stiffness of the jaws appear to belong here.

4. *The Joints.*

Inflammations of the joints are frequent,—more so in infancy than in childhood. Acute cases are rare, however, in children eight or ten years old, who have more control over their muscles and take better care of themselves. Younger children are more exposed to traumatic injuries; besides, not to speak of the phlebitis of the newly-born, there are in the earlier years distinct predisposing causes of joint disease in such infectious diseases as scarlatina and diphtheria. Syphilitic joint diseases appear in infancy and childhood in different forms,—as epiphysitis with effusion into the joint without synovitis and without suppuration; as osteitis with effusion and with gummatous infiltration of synovial membranes and effusion; as primary gummatous synovitis (rarely); as symmetrical synovitis (mostly in

* Curschmann in Schmidt's Jahrb., 1895, No. 8, p. 220.

the knees) in children of from eight to fifteen years, at the same period of life in which the interstitial keratitis of syphilis is commonly found. In all of these affections a thorough and protracted antisyphilitic treatment is required. In all joint diseases the synovial membrane, the fibrous capsule, and the cartilage are affected either separately or collectively, and the contents of the diseased cavity are either serous, or purulent, or fungous. Most of the latter are tubercular, and were known to be so long before the tubercle bacillus was discovered; indeed, as early as 1873, Köster recognized the tubercular nature of "tumor albus."

The prognosis is fair when the secretion is serous. Fluctuation is easily recognized when the joint is superficial. It remains as "hydrarthros" in chronic cases. The treatment requires absolute rest, and in the acute stage the flexed position of the limb—which is either voluntarily chosen because it relieves tension or is the result of a reflex contraction—must be respected. Other aids are: cold applications and mustard-plasters; in less urgent cases, tincture of iodine, pure or diluted with alcohol, once or twice daily; in chronic cases, a vesicatory either to its full effect or applied for half an hour only, and repeated daily or several times a day; later, ointments of potassium iodide and lanolin, or mercurial plaster, which may be made to cover the whole joint and may be changed once every few days; two daily applications of iodoform in collodion (1 to 8 or 20) over the whole joint; compression with a rubber bandage over a proper pasteboard, felt, or wood splint, the latter to protect the neighboring large blood-vessels. Potassium iodide internally will render good service while the affection is of a purely inflammatory character. Persistent contracture must be overcome by massage, cautious passive movements so long as there is no pain, and forcible extension, either without or with anæsthesia. Massage improves the prognosis in subacute serous inflammation of the joints, also in contusions and distortions; after the massage the joint should be immobilized, slightly compressed, and raised. It acts well in chronic (rheumatic) inflammation, with thickening and proliferation of the capsule. Villous proliferations should be broken up by manipulation and changed into a detritus.

Tubercular cases have a decided tendency towards either suppuration or fungous degeneration. About the knee the abscess is sometimes outside the capsule and permits of an incision which does not reach the interior. Still, a small communication with the latter is almost always present. The opening of intracapsular abscesses, once so dangerous as to be considered semi-criminal, is no longer feared.

Repeated aspirations of the pus under aseptic precautions with subsequent injection of sterilized iodoform in oil or glycerin (1 to 5 or 10), or in liquefied vaseline, and intra-articular occasional operations, such as scooping, resection, etc., with tamponing and draining, have reduced the dangers and are daily swelling the records of recoveries. General treatment to overcome the anæmic and cachectic condition, and particularly antitubercular hygiene and medication, are demanded in most cases.

Lately (*Deutsche Zeitsch. f. Chirurgie,* vol. xli., July 30, 1895, p. 378), E. Wieland published a contribution to the treatment of surgical tuberculosis in childhood with iodoform injections which, to my mind, contains everything now known on the subject and all that is sound and advisable. Iodoform treatment, however, is certainly not a panacea. Cases of tubercular coxitis, for instance, complicated with large abscesses and with perforation of the acetabulum, which offer great difficulties in the way of irrigation, of thorough cleaning out, of injections, and of compression, are liable as well to resist iodoform treatment as to yield unfavorable results after a radical operative interference. But in a large percentage of cases injections of iodoform emulsions, aided by orthopædic measures (bandages, stays, plaster of Paris) or by mild operative procedures, and last, but by no means least, by constant attention to the general health (air, food, clothing, and bathing), and by medicinal support with arsenic, creosote, or, preferably, guaiacol, yield good results. It is true that this treatment takes patience and time, is even apt to be expensive, and certainly exhibits no tangible proof of a great surgical achievement to the impressionable lay mind; but it is efficient, and has the advantage of not interfering with the growth and development of the limbs, which are mostly injured, and permanently so, by subjecting the epiphyseal cartilages to a radical operation. In a few cases the absorption of iodoform, when employed in solutions, has proved dangerous through a consequent toxic nephritis. For this reason, solutions in ether or oil are not to be recommended; for, after all, it is the local effect of iodoform which is aimed at, and not a general one. Emulsions are preferable. Krause employs a suspension of ten per cent. of iodoform in water, with the addition of but little glycerin and gum-arabic.

The places to be selected for injections, according to him, are: for the wrist-joint, below the styloid process of the ulna; for the elbow, above the capitulum radii; for the shoulder, exteriorly to the coracoid process; for the hip, above the trochanter major; for the knee, below the patella; for the ankle-joint, below the malleolus,

in an upward direction. The injection into the hip-joint is made, according to Küster, who has followed that method these fifteen years, at the interior margin of the sartorius muscle on a line drawn between the crossing of the femoral artery and the prominence of the trochanter major. That is where, in lean persons, the spherical head of the femur is liable to be felt, and where in coxitis visible or palpable swellings are not uncommon. For at this point the capsule is thinnest, and here, also, is the location of the subiliac bursa, which in ten per cent. of the cases communicates with the joint. As a trocar may hurt the cartilage, a hypodermic syringe is employed the canula of which has a length of from five to seven centimetres and a thickness of one millimetre. Küster does not irrigate the joint, because in a large proportion of the cases there is either no fluid at all (parenchymatous synovial tuberculosis), or when present it is either sero-fibrinous (hydrops tuberculosis) or purulent (cold abscess). Neither Bruns nor Küster believe that an irrigation with a three-per-cent. solution of boracic acid or another antiseptic has any better effect than the uncombined injection of iodoform. In the parenchymatous variety from five to ten cubic centimetres (one to two and a half fluidrachms) of a mixture of twenty per cent. of iodoform and eighty of glycerin are employed; this operation is performed weekly (Bruns). In the serous or purulent variety, after the fluid is either aspirated or spontaneously discharged, from ten to thirty cubic centimetres, enough to moderately fill the cavity (two and a half fluidrachms to one fluidounce), are injected. This procedure is repeated every two or four weeks (O. v. Büngner, *Centralb. f. Chir.*, No. 51, 1892, pp. 1057-1064). Periarticular abscesses should be incised and scraped thoroughly before an injection is made. The same holds good for fungous degeneration of the capsule of a joint. Bones in a very diseased condition—the talus, for instance—should be removed entire. If pus cannot entirely be removed, counter-openings are required. At first, for the purpose of thorough cleansing and disinfection, irrigations may be made with a mild solution of mercuric bichloride (1 to 5000), to be followed for a few moments by a stronger one (1 to 1000 or 2000). The principle of conservatism must never be lost sight of. All are unanimous at present that conservative treatment is the more urgently demanded the younger the patient. Radical operations are indicated only when the case is one of extensive and protracted irremediable suppuration with progressive destruction of tissue. Resection, however, must not go beyond the cartilage between epiphysis and diaphysis. If tuberculosis be markedly developed, either locally or generally, it is better to amputate than to resect. Fistulæ

which do not contract or shorten should be treated with strips of gauze dipped in equal parts of balsam of Peru and alcohol, and when they are very dry and indolent with (Villate's) injections, composed of copper sulphate 10 parts, zinc sulphate 10 parts, and distilled water 120 parts; or a fuchsin ointment (1 to 80 lanolin and 20 fat). It is particularly the knee- and elbow-joints that require conservative treatment, both cautiously and patiently.

Another method of conservative treatment of tubercular joints has been introduced by A. Bier (*Arch. f. klin. Chir.*, 1894, p. 306). Encouraged by the fact that lungs in a condition of passive hyperæmia resulting from cardiac disease or from kyphosis have a rather pronounced immunity from tuberculosis, he advises to produce a passive venous congestion of the tubercular joints by bandaging the limb tightly below the affected joint and compressing it above with an India-rubber band (Esmarch). To secure a moderate amount of hyperæmia and cyanosis, and to avoid undue pressure and œdema, the bandaging should be gentle, be interrupted once or twice a day, and not continued through the night and when there is a suspicion of phlegmon. Such a degree of passive hyperæmia is known to give rise to the new formation of connective tissue and to induration. That hyperæmia, it is suggested, affords a certain degree of protection against the proliferation and action of bacilli; it is "bactericide." This is also the effect aimed at by Landerer when he recommends cinnamylic acid, and by Lannelongue, who injects zinc chloride for that purpose. That such was Koch's original theory when he introduced tuberculin is well known.

It is only very docile children that submit to the treatment readily. That is why days should be spent on playwise application of the method and on gaining the good will and the confidence of the patient. Bier continues his treatment at least three months. Massage, formerly used simultaneously, he has discarded. He found his method particularly practical when employed for tuberculosis about the ankle-, knee-, and elbow-joints, also for the testis, less so for the shoulder, not at all, as yet, for the hip-joint. He found, however, that if there was much suppuration, the limbs thus obstructed tended now and then to acute inflammation, lymphangitis, or erysipelas. Ulcerations increased in size, but finally healed; sometimes large granulations sprang up, but recovery eventually took place. Tubercular sequestra were often absorbed, and sometimes firmly attached to and embedded in the surrounding osseous tissue. Even tubercular skin was benefited by frequent dry cupping, but not to such an extent as joints and bones by the above treatment. Glands were not acces-

sible to the same method, except the cubital. Carcinoma, sarcoma, lupus, and syphilitic swellings were rather the worse for it; so was extensive suppuration with streptococci and staphylococci. In acute rheumatism the effects varied; in gonorrhœal joints, chronic articular rheumatism with no acute exacerbations, and arthritis deformans they were fair. If carried out with care and perseverance, Bier's method sometimes yields astonishing results. (See Willy Meyer's report before Orthop. Section of the N. Y. Acad. Med., *Amer. Med. Surg. Bull.*, 1895.)

The treatment, however, is not always to be confined to this method alone. Abscesses are aspirated, if possible, in their upper part to avoid persistent discharge, and filled with a ten-per-cent. iodoform emulsion. Slight compression may follow, and the injection is repeated in about a week. If there be considerable purulent discharge, the iodoform treatment is continued or Villate's solution (p. 507) employed. Under its use bone fistulæ heal rapidly. If loose splinters be accessible, they are removed. Forcible extension by apparatuses under anæsthesia, tenotomy, and plaster of Paris should be employed in the treatment when indicated; so should passive movement, massage, and warm baths, particularly where there is functional ankylosis. True ankylosis requires resection when the false position of the extremity becomes intolerable, for a considerable curvature of the lower extremity or the extension or hyperextension of the upper cannot be borne. That generous diet and proper hygiene and antiscrofulous and antitubercular medication must not be omitted in an ailment which is either the result or may be the beginning of a generalized infection is self-evident. The best results of the treatment of tubercular bones may be expected in the calcaneum; its anterior portion is mostly affected because its spongy part has a scanty circulation only and its medullary part is large and soft. For the same reason sequestra may be found, which are rare in the other bones of the tarsus. As it is least connected with other bones, its tuberculosis remains mostly local, but may affect the adjacent tendons (Finotti).

So far as the antitubercular treatment with guaiacol is concerned, I can but repeat what I said on the subject formerly. No one treatment of all forms of tuberculosis ever satisfied me to the same degree as has that with guaiacol. In the different varieties of pulmonary tuberculosis, when the destructive process was not too acute, it has almost invariably improved both appetite and general condition, rendered expectoration less purulent, and increased the weight of the body as well as improved the complexion. The more chronic the cases the more perceptible is the effect of guaiacol. Thus, in tuberculosis

of the osseous system its action is very satisfactory. The dose for a small child is from a drop to two or more drops, to be repeated three or four times a day, or guaiacol carbonate in three or four daily doses of from one to three or four grains each. Both of these preparations, particularly the latter, may be combined with other drugs, according to indications,—preferably with arsenic in generalized tuberculosis of the soft tissues, or with phosphorus in extensive inflammations of the bones of a chronic or subacute nature.

Coxitis begins mostly in the head of the femur, and is rarely attended by very acute symptoms. As it is curable when recognized early, every case of dragging, of untimely fatigue, of favoring either limb, of vague pain, and of slight increase of body temperature in the afternoon requires careful and repeated examination. Pain in the knee depending on irritation of the obturator and internal saphenous nerves is not increased by pressure. Limping and apparent lengthening of the limb with abduction and shortening with adduction are found not to be actual, but the result of voluntary change of position. These conditions are overcome by rest, the local applications mentioned above, and conscientious extension in bed. At a later period, when all the symptoms of acute irritation have disappeared, extension by apparatuses and counter-extension may be employed for the purpose of permitting active exercise (Taylor's and Phelps's extension splints). When, however, the swelling increases, an abscess is formed, and perforation takes place, a spontaneous luxation will often be the result, with either elongation or shortening (luxation upward and backward with adduction and inward rotation of the extremity). The os ilium may perforate, or what is left of the head of the femur may start for the sciatic foramen, or upward, and all of the head may be lost by suppuration. Even in these bad cases partial recovery sometimes takes place. A new joint may be formed or actual ankylosis result from the healing surfaces joining one another. The size of the incisions will depend on that of the abscesses, and the operations on the bones on their condition. Complete resections ought to be made in as few instances as possible; the periepiphyseal cartilages controlling the growth of the limb require careful protection.

Tubercular coxitis is eminently a disease of early age. Nearly fifty per cent. of the cases occur during the first decade of life, nearly forty during the second. One-third of all the cases remain free of suppuration; of these, seventy-seven per cent. get well; of the purulent form only forty-two. Altogether, about forty per cent. terminate fatally, death ensuing from tuberculosis of the lungs or of the

meninges, or from general miliary tuberculosis, amyloid degeneration, or exhaustion by suppuration or by sepsis. About fifty-five per cent. get well under conservative treatment; still, the motility of the hip-joint is impaired by contraction, so that either adduction (in two-thirds of the cases) or abduction, with actual or apparent shortening or lengthening of the extremity, results therefrom. Actual shortening depends either on retarded growth or (in the process of bone destruction) on displacement of the acetabulum, which is more frequent than spontaneous luxation; apparent shortening results from the voluntary elevation of the hip, or by fixing the extremity in adduction parallel to its fellow.

The general rules of constitutional and local treatment hold good for *gonitis* (inflammation of the knee-joint), which is liable to be tubercular in perhaps a larger percentage than any other joint. Deformity becomes very marked at an early date, the leg is very apt to be luxated backward, rotated outward and in genu valgum position, and both pseudo-ankylosis (adhesion of the ends of the bones by connective tissue) and true ankylosis (solid connection of the cartilages or of the bones) are frequent.

Inflammations of the *ankle-* and *tarsal-joints* are mostly tubercular. They take a slow course in most instances, and result but rarely in recovery unattended by deformity, unless there be timely, either conservative, or operative, or combined treatment, which may save many a foot and life. Unfortunately, constitutional tuberculosis is a frequent complication, and death, therefore, is not uncommon before even a local restitution can take place. The *elbow-joint* exhibits the same tendency to deformity and ankylosis, but is rarely the source of a hectic condition and of death. Early fixation in a sling and the application of either water-glass or plaster-of-Paris bandages are indispensable, while the forearm and the humerus should be placed nearly rectangularly. The same position must be secured for the foot. In coxitis and gonitis the limb ought to be kept entirely or nearly straight.

Genu valgum (*knock-knee*) is the exaggeration of a normal disposition produced by a slight depression of the external parts of the articular surface, mainly of the thigh. This disposition is increased by the rhachitical softening of the bone (in later life to an eminent degree by the pressure brought about by the occupation of bakers, waiters, saleswomen, etc.). The speedy cure of rhachitis is an essential preventive. A plaster-of-Paris support (which ought to be renewed every few weeks), made to dry while the extremity is gently flexed, procures a normal position while the bone is hardening under

the influence of phosphorus, etc. The elastic length-garters, which have to a great extent taken the place of the circular ones, applied below or above the knee, must not be tense, for in that case they increase the external concavity. They ought to be worn on the inside of the thighs, or both inside and outside. In bad and chronic cases osteotomy is performed above the condyle of the femur (Macewen), also on the diaphysis of the tibia, and the bones are then allowed to heal in extension. *Genu varum* is almost always the result of a rhachitical outward curvature of (and below) the epiphysis of the tibia. It is but rarely that the femur participates in the deformity. If it be noticed in time, straightening can be effected before the parts harden. After this has taken place, osteotomy or osteoclasy must be resorted to.

Pes varus (*club-foot*) is often congenital. Defective supination is normal in the fœtus, and becomes exaggerated by the pressure of the uterus when amniotic liquor is scanty. In many cases there is at birth a deformity of the talus of such a character that its neck is long externally and the head turned inward; also of the calcaneum, whose anterior process is raised and articulations somewhat dislodged. According to H. von Meyer, the posterior tibial muscle is always primarily affected. The paralytic variety of club-foot results from immobility of the extremity, caused by complete paralysis or by some other sickness necessitating protracted rest in bed, or from paralysis of the extensor muscles of the lower extremities consequent on poliomyelitis. The deformity is an equino-varus rather than a mere varus. With proper timely precaution its development may be avoided.

As the articulations begin to suffer at a very early period, and growth is very rapid, treatment should begin at once. Indeed, the foot which at birth is seventy-five millimetres in length, is one hundred and seven millimetres after a year, 122.3 millimetres after two years, and 136.4 millimetres after three years. There is an increase of forty-three per cent. in the course of the first year; this increase is the more rapid the younger the infant. After three months the foot has added one-seventh part to its original length, and another ninth in the second quarter. Therefore, recovery from a moderate degree of club-foot, when treatment begins at birth, will take three months; when after a year, twelve months.

Manual correction with massage must be resorted to many times during the day. At night the tender foot of the newly-born bears quite well a pasteboard splint, well lined, and strapped with a snug bandage. Later, or in procrastinated cases, a plaster-of-Paris band-

age, or one of water-glass, or of poroplastic felt modelled around the foot and lower two-thirds of the leg on its inner side will be required to preserve the normal position. As there is occasional anæsthesia of the surface, great care must be taken lest undue pressure be exercised. After the above treatment has had a satisfactory effect, Scarpa's, Stromeyer's, Sayre's, or any other shoe which permits of walking should be used. Tenotomy is required in a great many cases, —either of the tendo Achillis, or the anterior tibial, or the plantar aponeurosis, or several of them at the same time. The open operation of A. M. Phelps (preceded by Alfred C. Post) has gained many friends. He cuts all the layers of the soft parts at the sole of the foot successively, avoiding the ramifications of the plantar nerve, and occasionally incising the articulations of the talus and of the navicular and internal cuneiform bones. Healing takes place under the moist blood-clot. The paralytic muscles require persistent use of both the interrupted and the continuous currents. The function of the muscles can be improved, provided the patience both of the physician and of the patient is equal to the necessities of the case. Elastic straps may be so arranged as to sustain or replace the normal muscular function.

Pes equinus is the result of paralysis, either local, or spinal, or cerebral, and is complicated with atrophy of the muscles of the calf and of the sole of the foot, the sole becoming concave and the toes pointing downward. Here also tenotomy of the tendo Achillis and of the plantar aponeurosis, together with the employment of electricity and galvanism, are indicated. An apparatus is required to lift the anterior part of the foot, and while the patient is lying down or sitting up, soon after the operation, he may practise upon a band properly attached to temporarily restore the normal position. Children will easily learn to look upon the exercise as play.

Pes calcaneus in a mild form is often congenital and sometimes complicated with pes valgus. The desirable position is restored by a shoe supplied with a high heel and so constructed as to press the foot down.

After Albert had accomplished, in 1877, an artificial stiffening of the joint, which should be considered a last resort only, by his arthrodesis, Nicoladoni introduced the shortening or transplantation of (not necessarily the same) tendons.

To heal a talipes calcaneus with paralysis of the muscles of the calves, he severed the peroneal muscles behind the malleolus and the tendo Achillis above the heel, and joined the central ends of the peroneal tendons to the stump of the tendo Achillis. Pocas, in a case of paralytic pes valgus, connected the tendons of the extensor hallucis

longus and of the paralyzed anterior tibial. Ghillini, to supplant the action of the paralyzed anterior tibial muscle, cut the tendon of the peroneus longus near the cuboid bone, also that of the anterior tibial six centimetres above its insertion, and joined both by suture, with satisfactory result. Tendon grafting and muscle transplantation for deformities following infantile paralysis have been practised successfully. S. E. Milliken (*N. Y. Med. Rec.*, November 28, 1896) reported on fourteen operations performed on nine patients. They were transplantation of the sartorius into the sheath of the quadriceps, the joining of the extensor hallucis longus to the paralyzed tibialis anticus, of the gastrocnemius to the peroneus longus and brevis, of the extensor digitorum communis to the tibialis anticus and *vice versa*, of the extensor hallucis longus to the extensor digitorum communis, of the flexor hallucis longus to the tibialis anticus, and of a part of the deltoid to the tendon of the paralyzed triceps. Many successes have been scored since.

Pes valgus (*flat-foot*) is not infrequently congenital, the talus being found downward and forward. In other cases the deformity is rhachitical. Both to prevent and to cure it, antirhachitical treatment and temporary rest are demanded. There are also (rare) paralytic cases occasioned by paralysis of the supinator muscles of the foot. In these electrical treatment and the subcutaneous use of strychnine, together with massage of the calf and of the sole of the foot and stimulating embrocations and friction with cold or hot water, will render service. In all severe cases walking should not be permitted until a reasonable time has elapsed; the lower extremity should be raised, symptoms of vascular irritation relieved by applications of cold water, and a normal position should be enforced by plaster-of-Paris bandaging, which must be continued through weeks or months. When walking appears to be again permissible, the inner margin of the foot must be raised by thickening a part of the sole of the shoe, or by elevating it by springs which are elastic enough not to injure by pressure. I. Wolf insists upon not resting the patient at all, but makes him walk immediately after the application of plaster of Paris.

From a practical point of view, the subdivision of *scoliosis* into three varieties is as follows: the first degree comprises those cases in which suspension of the body removes the deformity altogether; the second, those in which this effect is but partially attained; the third, such as are not influenced by it. The prognosis in the first is favorable; in the second it is fair when the growth of the skeleton is not completed; in the third it is not good, but should not be considered absolutely bad. It greatly depends on whether the scoliosis

results from a relative or an absolute insufficiency of muscles, or whether it is caused by a deformity of the vertebral bodies. The former may be either simply local in the muscles or depend on central paralysis, in poliomyelitis, in Friedreich's disease, and in some cases of progressive muscular atrophy. The latter may be congenital, but is frequently the result of rhachitical softening later. In such instances a thorough antirhachitical treatment, with proper food and hygiene and phosphorus, must not be postponed a single day. The habitual scoliosis of the first eight or ten years is of merely muscular origin, and mostly total and universal; the convexity generally to the left, and not often lumbar. This condition is found in babies who are persistently carried on the left arm; in school-children who rest the left arm on the table while the body is accommodating itself to the book and leans to the right; in girls who approach the bench sideways and pick up their skirts under the right gluteal region. The danger of becoming scoliotic is particularly great in those school-children whose sight is defective. Those who stand a great deal and carry the right shoulder forward develop a right dorsal with a compensatory left lumbar scoliosis. The prevention of all varieties consists in the avoidance of their causes. A baby must not be persistently carried on one arm: a mother is more apt to obey this rule than a nurse. The muscles must be exercised at an early age,—simple domestic gymnastics, but not overexertion; and the habitual use of cool or cold washing once or twice a day, with good food and air and plenty of sleep on a hair mattress, are indispensable. The school lessons ought not to last more than twenty or at most forty successive minutes; there must not be too many of them; there should be ample light from the left side while the child is studying or writing; defective sight must be corrected by glasses; the chairs or benches should be supplied with a support up to the lower dorsal region of the spine. During school sessions a light corset may also be worn, and at night an apparatus to restore the equality of the two sides. Massage of the defective side and of the muscles in general will add to the good effect, and the concave side of the chest may be exercised by the enforcement of the habit of deep inspiration while the hand is firmly planted and pressed on the convexity. Systematic exercise and strengthening of all the muscles of the body by appropriate gymnastics, particularly in well-directed institutions, are greatly to be recommended.

In more obstinate cases the foot corresponding with the lowered hip may be raised by thickening the sole of the shoe. Volkmann recommended the raising of the chair or bench under the dropping

hip. Sayre's corset is either worn constantly or is made detachable. Rauchfuss's apparatus is so constructed as to leave the defective side but little or not at all supported while the patient is lying down.

The *kyphosis* of feeble rhachitical children requires general anti-rhachitical treatment. The baby must not sit up until the muscles have become stronger; the bed should have a hair mattress; and the patient must take the air while being carried either on a hair mattress, or in a wire cuirass, or in a tin or pasteboard or sole-leather mould sufficiently lined to be comfortable. As the baby grows, walking must not be encouraged. He will rise when his bones are hard enough and his muscles sufficiently strong.

XIV

Diseases of the Ear

Malformations of the ear, both external and internal, are mostly the results of arrests of development, and are but rarely amenable to improvement by treatment. A faulty position of the auricle may be corrected after birth; when it protrudes unduly, bandages or adhesive plaster, worn for a number of weeks, will keep the organ in a more normal position. Obstruction of the auditory canal by either an epithelial or an organized membrane can be relieved; the former demands a metal probe to perforate it; the latter, a cruciform incision and removal of the flaps.

Foreign bodies are common in all accessible cavities, which prove frequent receptacles for shoe-buttons, beads, peas, beans, etc.; sometimes their removal is very difficult; vegetables swell and thereby totally obstruct the meatus. The use of probes during examination is sometimes decisive in regard to diagnosis, sometimes very deceptive; the reflector is indispensable. The secretion of secondary catarrh must first be removed by syringing and wiping; pincers will remove a body which is not tightly incarcerated; a Daviel spoon, or the blunt end of a hair-pin bent upon itself, or a sharp spoon is often required for peas and beans. While the attempts at removal are going on, the ear ought to be frequently injected with warm water to expel shreds and blood and to facilitate inspection. Before the operation is begun, a cocaine solution may be instilled into the ear. A spray of ether may be demanded, and in urgent cases anæsthesia by chloroform; for, the extraction of a foreign body being paramount, even pieces of bone have to be removed sometimes to render its expulsion possible.

Living bodies, such as insects, will die in water, oil, alcohol, or a two-per-cent. solution of carbolic acid. Dried secretion, or cerumen, is softened by filling the ear with oil or glycerin and syringing forcibly with soap and water. The after-treatment may demand all the requisites of the therapy of inflammation,—rest, cool and disinfectant applications, erect posture, and narcotics.

Otitis externa (inflammation of the external auditory canal) is the result of irritation by foreign bodies or by clean or dirty fingernails, brushes, and sponges, also of the frequent use of ear-spoons, or of exposure to a high wind or draught; or it may depend on

eczema which extends inward from the neighboring surface. Gonococci and tubercle bacilli have been met with in the external ear, diphtheria not infrequently; dirty bathing water is probably a more common cause of ear disease than is generally supposed. Now and then external otitis complicates internal, particularly in infectious diseases such as measles and scarlet and typhoid fevers. The general disposition to scrofula—that means to subacute or chronic inflammation of the tissues with rapid disintegration of the surface epithelium and insufficient tendency to reparation—is a frequent factor in the production of external ear disorder, and requires constitutional treatment. Preventive measures are indicated by the causes enumerated above. Foreign bodies must be looked for and, if present, extracted.

The three forms of external otitis are the erythematous, the catarrhal, and the phlegmonous (including the furuncular). The first exhibits a general redness, and produces scales rather than secretion. An occasional application of lead wash, or lead ointment, or zinc ointment, or bismuth carbonate, finely powdered, will be all that is required in the average cases. Where the redness is marked and angry, with a good deal of itching, the ointment should contain five per cent. of cocaine; or a watery solution of cocaine hydrochlorate (from two to six per cent.) or a fresh suspension of adrenal substance in water (1 to 10) may from time to time be brushed over the sore surface.

The catarrhal form of external otitis is by no means a uniform or always a mild affection. There may be pain, also secretion of a simply catarrhal or of a malodorous (fat acids) or cheesy nature. Erosions, ulcerations, and swelling of the neighboring lymph-bodies are quite common. The integument is sometimes greatly swollen and now and then granulating; below and behind polypoid excrescences the bone may be affected; through the defective ossification (sometimes persistent) anteriorly and inferiorly, fistulæ may form in the parotid region and even in the maxillary joint, and pus may find its way along the incisura Santorini through the cartilaginous floor of the meatus. The drum membrane is frequently affected. Every form of *myringitis* is met with, from a slight hyperæmia to thickening and turbidity of the membrane, even to perforation. Thus, there is every reason for early and persistent treatment. In the interest of examination, the speculum must not be used at first, except in older and very docile children; it annoys, pains, and frightens, and is seldom as useful as in advanced age because of the horizontal position of the young drum membrane, only part of which, at best,

can be seen. The secretion must be removed by syringing both frequently and forcibly (but the current must not be directed to the drum membrane) while the head is inclined so as to allow the instantaneous egress of the fluid. The injection fluid may be warm water, soap and water, salt and water (6 or 7 to 1000), or mild astringent solutions of lead acetate, zinc sulphate, tannin, or alum (1 or 2 to 200); or the secretion may be removed by tufts of absorbent, or borated, or salicylated cotton, which are held tightly in a pair of pincers and not rubbed hard against the wall of the canal. A saturated solution of boracic acid (four per cent.) is both mild and slightly disinfectant. Boracic acid finely powdered may be thrown in so as to fill the canal after it has been thoroughly dried. When the renewed secretion has liquefied the powder, after a few or many hours, they are both removed by cotton or by injections, the ear thoroughly dried, and boracic acid introduced again as before. Mercuric bichloride (1 to 5000) injections may be given several times a day, mainly when there are much hyperæmia and infiltration, in any of the varieties of external otitis; warm fomentations of the same solution should be made persistently. Two daily applications of carbolic acid in glycerin (1 to 10 or 20) have also been recommended; I believe they frequently irritate and fret the surface. *Polypoid granulations* have been removed by ligature. Chromic acid is liable to deliquesce so much, even when used carefully and in small quantities, as to endanger the drum membrane. The solid stick of silver nitrate is safer, and requires for neutralization, after application, only a salt-water solution. A daily touching with liq. ferri perchlorid. or liq. ferri subsulphat. is very effective and quite safe. Biedert recommends hydrargyrum sozoiodolate. In external otitis leeches are seldom required, and then only when there is an excess of swelling. To relieve local pain and tension, cocaine solutions act better than do those of morphine. The oleate of morphine irritates the sore surface. Internally, a dose of morphine or some other opiate, or chloral, may become necessary. The patient must be kept in a semi-recumbent or almost erect position, on a cool pillow, in every catarrhal or inflammatory condition of the ear. Cases of external otitis with copious secretion, complicated with or dependent on eczema, are greatly benefited by one or two daily applications of a small quantity (well rubbed in) of mercuric bichloride in lanolin (1 to 300 or 500). In obstinate cases of eczema a solution of silver nitrate (1 to 10 or 50) may be brushed over the parts once every few days, or Lassar's paste may be used (zinc oxide and amylum āā 25, salicylic acid 1, white vaseline 50), which need not be removed when a new application

is made; or an ointment containing pure tannic acid and glycerin, āā 4 parts, which are mixed thoroughly, and to which are added fat 30 and carbolic acid 0.3 parts.

The phlegmonous form of external otitis is mostly recognized with facility; the pain is intense, the swelling marked, more or less local, circumscribed, and red. Before an incision—which ought to be made in time—appears advisable, applications of solutions of hydrargyrum bichloride (1 to 5000 water) are better than warm fomentations. As stated, incision must be made soon and will relieve quickly. The furuncular form demands at once either an incision or carbolic acid treatment. Both should be preceded by local cocaine or ethyl bromide anæsthesia, for the pain may be intense. The incision must be as thorough as in a furuncle of any other region. It may often be substituted by a thorough application of concentrated carbolic acid. If applied early, a single (or repeated) application will prove effective. As its action is quite local, when used carefully there is no danger. If the furuncle be pointed and the surface excessively painful, the acid ought to be introduced into the centre of the swelling by means of a slightly curved probe.

Accompanying *myringitis* is apt to improve after its cause—the otitis externa—has been removed. A vesicatory or tincture of iodine on and about the mastoid process is helpful. Direct injury of the drum membrane by cold water or salt water during bathing can be averted by a wool tampon.

Otitis media, both the catarrhal and the purulent varieties, is a very frequent disease in infancy and childhood. It is asserted by some that it is found in seventy per cent. of all nurslings, which is an exaggeration. The great vascularity of the mucous membrane of the middle ear furnishes a ready disposition. Even in the middle ear of the newly-born accumulations are met with which either constitute or dispose to otitis. According to some, the masses frequently encountered consist of detritus developed from the fœtal epithelial covering; others accuse aspiration during and immediately after birth; some attribute pathological changes to œdema produced *ex vacuo,* the vacuum being due to the sudden separation of the mucous membranes formerly closely adjacent to each other. Infants have a large, short, more horizontal Eustachian tube, with a funnel-shaped pharyngeal aperture; thus infectious material of the common eruptive fevers, streptococci and staphylococci, the bacilli of a diphtheritic rhinitis, and even gonococci find easy access. Most frequent are the diplococcus Fraenkel and the staphylococcus pyogenes albus; streptococcus impairs the prognosis. On the other hand, pus has an easier

egress from the cavity, even during the sucking movements; that is why otitis media may run its full course without apparent local symptoms, and why obscure fever, sepsis, or atrophy should rouse the suspicion of occult ear trouble. Perforation of the drum membrane does not occur in such cases. In lobular pneumonia otitis media is quite frequent, still more so in croupous pneumonia; in scarlatina, also in measles and typhoid fever, it may be very severe. All the varieties of nasal, pharyngeal, and naso-pharyngeal catarrh, also adenoid vegetations and hypertrophied tonsils, are known to be frequent causes of middle-ear disease. Vehement spells of whooping-cough, forcible medicinal or other injections into the nares, and violent sneezing, coughing during pneumonia, vomiting, or finger contact during gastro-enteritis are apt to carry foreign material into the Eustachian tube and middle ear, particularly when the uvula is congenitally split (bifida), and still more so when the hard palate is fissured or when there are adenoids which impede pharyngo-nasal ventilation; for in such a case the levatores palati have no support and the muscles of the tube are insufficient and atrophied.

Preventive treatment has a wide scope. The number of cases of otitis media—according to Schwartze, twenty-two per cent. of all diseases of the organ of hearing are purulent forms of middle-ear disease—is as significant as its causes are manifold. Nasal, post-nasal, and pharyngeal catarrhs must be attended to in their incipiency. Regular attention to the nose of infants would prevent much disease and many calamities. Indeed, defective hearing is more common than we suspect. Bezold found (1886) that of nineteen hundred and eighteen school-children, twenty-five per cent. had but one-third and eleven per cent. but one-fifth of normal hearing distance, and his statements have been amply confirmed by many more recent observers. Most cases of perforation of the drum membrane, chronic suppuration, abscesses in the mastoid process, permanent paralyses of the facial nerve, and cerebral abscesses can be prevented by treating and curing the origin and fountain-head of the future distress. The hypertrophied mucous membrane of the nose must be reduced, adenoids removed, and enlarged tonsils resected in time. The interior of the nose, at least of every infant or child with a tendency to nasal or pharyngeal catarrh, ought to be washed—irrigated—at least once a day, according to known principles (p. 410), but very, very gently. Gentle insufflation of the nares will clear the cavities of mucus. It may be done by a Politzer apparatus (no simultaneous deglutition is required) or by blowing into a soft-rubber tube introduced into one nostril, while the other is kept open. There is better

reason, from the point of view of danger to health or life, for washing the inside than the outside.

A child with an acute attack of middle-ear disease ought to be in bed, the head raised. The symptoms are not always urgent or easily recognized. In the very young the large size and shortness (p. 519) of the tube facilitate the exit of the internal secretion into the throat, so that the drum membrane is not annoyed and pain from internal pressure and irritation is insignificant in many instances. Careful examination, however, will leave a doubt as to the actual seat in few cases only. A mild antipyretic, a small dose of a narcotic, or a purgative will ameliorate the symptoms. In the very beginning the Eustachian tube ought to be treated by inflation (Politzer) very carefully, if at all; older children, who can be taught the use of Valsalva's method, must be warned against its excessive and vehement employment. When the acute stage has passed, both are mostly indicated. The severe pain may be relieved by a cocaine solution (2 to 10 or 100) instilled into the ear, also by one or more leeches to the mastoid process of the affected side, in most cases but one side being diseased. In mild ones tincture of iodine alone will suffice. When the drum membrane is red, a cloth moistened with a solution of hydrargyrum bichloride in water (1 to 5000), applied to the ear and frequently repeated, will, after getting warm, do equally as well as the most favored warm poultices. When secretion of mucus or pus is increasing inside, the posterior half of the drum membrane is pushed out first, afterwards the anterior; between the two, particularly in older children, the hammer can be distinguished. A spontaneous perforation is apt to form in the anterior portion, but the presence of a white discoloration does not always indicate pus. When the protrusion of the membrane is very marked, an incision should be made, mostly posteriorly and inferiorly. The general opinion of experts, however, is no longer in favor of indiscriminately early operation; still, when it is performed, the incision ought to be sufficiently large. Pus is then expelled by inflating through the nares (Politzer), and wiped out or carefully syringed out with a warm solution of table salt or of boracic acid (3 or 4 to 100). The patient should rest on the diseased side. Boracic acid is then used as described in the rules laid down for its application in external otitis, or the canal is gently syringed with a mild solution of hydrargyrum bichloride (1 to 5000), or of an astringent,—zinc sulphate (1 to 500). To what extent, during all this time, narcotics are to be used, or whether anæsthesia, local or general, ought to be employed, depends on the individual case and the judgment of the practitioner; also whether

an antiscrofulous or antisyphilitic treatment (the latter but rarely in children) be demanded. Chronic discharges require politzerization frequently, though cautiously, and the use of boracic acid and astringents; secondary polypi, treatment similar to that detailed above.

The secondary affections of the *mastoid process* demand leeches, ice, and tincture of iodine; where there is œdema, warm poultices and a deep incision. Abscesses of the mastoid process and of the brain require timely operation by an expert hand. The general rules laid down by Tröltsch are still valid. Cerebral affections due to ear disease are, when originating in the external meatus and the temporal bone, in the transverse sinus and the cerebellum; when in the middle ear, in the cerebrum; when in the vestibule and cochlea, in the medulla oblongata.

According to many, the antrum should be opened and cleaned out for the purpose of discharging pus both from the antrum and the middle ear. In that way secondary operations are avoided. Contrary to this general practice, A. Politzer expresses the belief (Text-Book, 4th ed., 1901) that it is sufficient to open the abscess and to remove its osseous wall, as far as it is softened and covered with granulations, without opening the antrum. The latter operation he recommends only when the wall between the empyema and the antrum is thoroughly softened, or when there are symptoms of an epidural or a cerebral abscess.

Operations require especial knowledge, dexterity, and caution when made on infants and young children. There are no mastoid cells yet (H. Knapp, *Jour. Amer. Asso.*, February 23, 1901), but a pneumatic cancellous tissue in the base of the squama; that is why abscesses are found above rather than behind the ear. Besides, between the bones there is sutural substance; the roof of the middle ear near the third temporal lobe is in part membranous.

In my opinion, one of the most important additions to modern surgery is our knowledge of the operative accessibility of all the spaces and nooks of the middle ear, as taught by Schwartze, and of the epitympanic part, by Zaufal, in all cases of chronic suppuration of the middle ear accompanied by sensitiveness or suppuration on the surface of the mastoid process, or by fistulæ, with osseous stenosis of the meatus and facial paralysis; of middle-ear disease exhibiting cerebral symptoms, with or without persistent fever, though there be no external inflammation; also in cases of cholesteatoma of large size, with alarming cerebral symptoms during the operation, particularly while injections are being made, or in those in which sequestra or foreign bodies must be removed, mainly when they give rise to

brain symptoms; and, lastly, in cases of profuse ichorous secretion, or of actinomycosis, or of tuberculosis of the middle ear.

Deaf-mutism is rarely a primary affection of the organ of hearing, though arrests of development and the results of fœtal inflammations are not uncommon. It is also found in many instances of cretinism. It would be better in a large percentage of cases to assign it a place in connection with diseases of the nervous system, for most of both the congenital and the acquired cases result from cerebral affections. It is not often hereditary. If more extensive statistics prove its (very doubtful) dependence on consanguineous marriages, a wiser social hygiene can be made to act as a preventive. Alcoholism of the parents is a cause, and society and the state, with its organization of ignorance and disorder, are responsible for so much of deaf-mutism as is not unavoidably pathological. About half of all the cases are acquired, some even after children commence to talk, the majority of them through cerebral and cerebro-spinal inflammation. According to Biedert, fifty-five per cent. are of that class, twenty-eight per cent. depend on acute infectious diseases (typhoid, scarlatina, and diphtheria, also variola and measles), 3.3 per cent. on traumatic injuries, and 2.5 per cent. on ear affections. Thus many of the congenital cases and most of the acquired are preventable. The treatment must be directed to so much of pathological change in the brain, the acoustic nerve, or the ear as is still accessible to the influence of either remedial or operative interference. Chronic (mostly interstitial) inflammations of the brain should not be given up as incurable so long as mercury and the iodides have not had sufficient opportunity to show their absorbent powers during a protracted administration. External and internal otitis, naso-pharyngeal catarrh, hypertrophy of the tonsils, and adenoid vegetations should be attended to in time, though these affections appear ever so slight.

XV

Diseases of the Eye

Malformations of the eye are of different variety and gravity. Some cannot be corrected, such as *cyclopia, microphthalmia,* and *albinismus;* some need no correction, like the common (vertical) form of *coloboma* of the iris, or the congenital *atresia* of the pupil. The latter consists in the persistency of a part of the pupillary membrane originating from the posterior aspect of the lens, and, if still extant after birth, disappears slowly. Others require, and are corrected by, operations. *Epicanthus*—an abnormal accumulation of cutis near the root of the nose—may be removed by an operative procedure, in the event of its not gradually disappearing spontaneously.

Neoplasms of the eye and eyelids are not frequent in infancy and childhood. Congenital *nævi* of every variety, however, are not uncommon. Very superficial ones on the eyelids should be kept under observation. When uniform and rather pale, they are liable to heal spontaneously. When a net-work of enlarged blood-vessels is found on the lids or conjunctiva, there is often a central point the compression of which by means of a silver probe empties all the neighboring branches. This centre ought to be destroyed by a single application of the thermo- or galvano-cautery, or by a trace of fuming nitric acid, or by running a sterile silk ligature underneath and tying it. When they form small or large tumors (sometimes only dilated blood-vessels, at other times angiomata cavernosa), in most cases the actual cautery is easier and safer than the knife. The cautery must be used carefully and sparingly,—too little rather than too much, according to rules detailed above,—and always with a view of avoiding a consecutive ectropion.

Dermoid cysts are found on the lids, inside; also on the eyeball; even in the orbit, from which their removal is rather difficult. They must be enucleated when the diagnosis is undoubted. They have been mistakenly diagnosticated in cases of encephalocele of the interior angle of the eye.

Lipoma is very rare, still more so than *cysticercus cellulosæ.* A few instances have been reported in which this cystic degeneration of the ovum of the tænia solium was found in children in the posterior chamber and under the skin of the lid.

Chalazion (not always tubercular, as has been asserted) is a

mucous cyst in the tarsal cartilage, with a tendency to induration. The eyelid is turned over, the small tumor incised, its contents scraped out, and iodoform applied once. As the wound is covered by the lid, it heals rapidly.

Glioma of the retina (Beer's amaurotic cat-eye) develops rapidly. Its vascular, sometimes red and bleeding, surface distinguishes it from suppuration of the vitreous body. It must be enucleated at once, as it is liable to grow rapidly in every direction.

Syphilitic *gummata* have been observed in some cases of retarded syphilis. They exhibit the symptoms of iritis, and require an anti-syphilitic treatment.

Tubercles of the iris are, fortunately, rare. They give rise to an incurable chronic iritis and necessitate enucleation of the eyeball. Tubercles of the choroid are sometimes observed in the incipient, sometimes in the advanced stage of tubercular meningitis. They are not considered amenable to successful treatment. But a case of tubercular meningitis with tubercle of the choroid was described lately. It recovered.

Foreign bodies hidden under the eyelids must be removed speedily, for conjunctivitis will immediately follow their presence. They are often washed out by the copious secretion of tears. The lower eyelid may easily be turned out and the corresponding portion of the conjunctiva inspected. The upper requires turning up, which is more difficult because of the resistance of the child, but easier than in an adult, on account of the greater motility of the skin of the young eyelid. To facilitate inspection, the eye may be gently pressed backward into the orbit. The body, when seen, is removed by pincers, a fine sponge, a piece of gauze, or wiped off in the direction of the nose. In case of necessity, anæsthesia may be procured by a drop of a two-per-cent. solution of cocaine. This is indispensable when the foreign body is in the cornea and demands instrumental removal. If it be iron, a strong magnet will remove it; when it is located externally, without, when in the deeper tissue, with, a previous operation. The danger connected with foreign bodies entering the eyeball, and the indication for immediate, or delayed, or no operation depend on the condition of the foreign body, which may be aseptic and not injurious, may irritate mechanically or chemically, or be infectious. As a general rule, the foreign body is readily recognized in the anterior chamber, the iris, or the lens, and should be removed immediately according to the rules laid down in ophthalmological works.

Injuries of the eye by puncturing, cutting, blows, etc., require absolute rest, the removal of foreign bodies, the application of ice,

of atropine solution (eserine when the wound is peripheric), and gentle pressure. Bad cases of laceration and destruction are either irremediable or require special, perhaps operative, treatment.

Lachrymal stenosis is apt to correct itself with the development of the nose. Probing under ether has been recommended, and an astringent wash for the conjunctiva, with massage of the sac.

Burns should be treated on general principles. The effect of acids is best counteracted by copious irrigation with water and cooling applications afterwards; of lime, by oil (not by water), the careful removal of the foreign body, and ice applications.

The eyelids suffer from *blepharitis* mostly in scrofulous children, in whom dust, smoke, and infections of all kinds are apt thoroughly to influence the superficial tissues. It often accompanies eczematous eruptions of the head and face, and is frequently carried by the fingers. Therefore, soap and water, a nail-brush, and cutting the nails short are good preventives; so is the successful treatment of the head and face. The blepharitis and conjunctivitis of measles require no special local treatment; the common forms do well with zinc ointment, or one of the yellow oxide of mercury with vaseline (1 to 50 or 100). The secretion must not be permitted to get dry. Hard crusts are dissolved by a warm solution of sodium carbonate (1 to 100 or 200) or by frequent washing with soap and water. Grave cases demand epilation of the eyelashes, every one of which—so far as required—must be caught singly and drawn out slowly enough to secure removal of the entire hair. Ointments and solutions of lead it is best to avoid, for complications with corneal erosions, grave or slight, are very frequent in affections of the eyelids and conjunctiva, and even the slightest ones may be indelibly stained by lead salts.

Both the integuments and the connective tissue of the eyelids being of loose structure and expansible, œdema is quite frequent. Insect bites are mostly diagnosticated by their circumscribed and pointed appearance; cardiac and renal diseases require their own diagnoses and have their own indications; so has hydræmia from whatever cause, besides the indications for the administration of iron, quinine, or arsenic.

The *conjunctiva* is very liable to be affected by medicinal and poisonous agents. According to Silberman, anilin, potassic chlorate, and corrosive sublimate produce thrombosis; pungent gases, conjunctival hyperæmia and conjunctivitis; antipyrin, urticaria of the eyelids; copper arsenite, redness and corrosion; hydrogen arsenide, a brownish-red or icteric discoloration; potassium bromide, simple

or phlyctenular conjunctivitis, without, however, influencing the blood-vessels of the interior; chrysarobin, a local inflammation; coniine, a burning sensation; ergotin, hemorrhages; potassium iodide, inflammation; iodoform, when applied locally, an erysipelatous tumefaction; and sodium salicylate, œdema and a bluish exanthema; in larger doses, tumefaction and vesicular eruption. Still, cases of conjunctival disease depending on these agents are comparatively rare.

Microbes are common in catarrhal conjunctivitis. In the newly-born cocci and diplococci are frequent (p. 107), in the adult diplobacteria.

In a number of cases of *conjunctivitis* the conjunctiva of the bulbus does not participate extensively. Common forms of fevers, also whooping-cough and principally measles, are among the causes of acute conjunctivitis. Sometimes there is but little redness; the lids are thickened and stiff with œdema. In other cases there is plenty of mucus, sometimes purulent, now and then with a tendency to coagulation, but not to such a degree as to render difficult the differential diagnosis from diphtheria of the eyelids. The mucous secretion must be wiped off with absorbent cotton or a moist cloth, a three-per-cent. boracic acid solution should be applied or instilled, and cold water employed at intervals of from one to ten minutes; chlorine-water, if obtainable fresh (a teaspoonful in a glass of water), should be used for applications; if the surface secretes much, corrosive sublimate (1 to 4000 or 5000). If the secretion be purulent, silver nitrate, 1 part in 100 or 500 parts of distilled water (black bottle), must be applied once a day, best with a brush, and washed off with pure water. A high degree of congestion, with phlyctenular eruptions,—sometimes unilateral only, not infrequently combined with blepharitis,—demands persistent application of cold, best by keeping a number of small pieces of cloth on a lump of ice and applying them at short intervals until they begin to get warm. Atropine sulphate (1 to 200 or 500) should be instilled once or twice a day, and the lids kept at rest. To hold them immovable, if the patient be very young, a layer of absorbent cotton should be covered with, or slightly soaked in, collodion and applied after the eye has been wiped dry. Later an ointment of the yellow precipitate of mercury (1 to 50 or 100), or calomel finely powdered, may be employed once a day.

Chronic conjunctivitis presents in many cases few symptoms only. The superficial hyperæmia does not always correspond with the burning sensation often complained of, and the mucous secretion is but trifling and collects mostly in the inner angle of the eye. Overexertion

of school-children, particularly of those who are hypermetropic or astigmatic, diseases of the nose of a catarrhal or ulcerous nature, indigestion and constipation, anæmia, scrofulosis, or trichiasis, are just so many causes and require the appropriate causal treatment, both medicinal and hygienic, change of air (country), and cool and cold bathing. These measures often suffice to relieve even secondary disorders of the lymph circulation, which is easily disturbed. Like the orbits, which discharge their lymph-ducts into the deep facial lymph-bodies, the lids and conjunctivæ are connected with the glands of the aural and submaxillary regions. The medicinal treatment is disinfectant and astringent; the remedies must be changed from time to time. Zinc sulphate (1 to 250 or 500) with or without cocaine muriate (1 or 2 to 100), in more protracted cases ointments of zinc or copper sulphate (1 to 100 or 150), solutions of boracic acid (3 to 100) or of sodium carbonate (1 to 100 or 200), in suppurating cases a daily brushing with silver nitrate (1 to 250 or 1000), combined with scrupulous cleanliness and avoidance of vascular stimulants, will meet all indications.

The *chemosis* of scleral conjunctivitis does not require any additional applications; mild astringents and rest will suffice. Rubbing, constipation, and coughing result in hemorrhagic discoloration (general blueness or extravasations) which requires rest and cool (or warm) fomentations.

Diphtheritic conjunctivitis cannot readily be mistaken. The infiltration is hard and the pseudo-membrane not removable. There is no secretion; indeed, the eye is dry to such an extent that the pressure of the exudation alone ulcerates the cornea. Absolute caution in every case of—particularly nasal—diphtheria, and covering the healthy eye, when (as usual at first) but one eye is affected, with a cotton and collodion application, aided by more cotton and a bandage, are indispensable. Thorough and speedy mercurialization and antitoxin are indicated. Papayotin (1 to 5 or 10 of water and glycerin), not to be substituted by "papoid," may be applied every hour. Silver nitrate deserves no recommendation. Chlorine-water, carefully applied while the eyelid is kept away from the eyeball, whenever that is possible, may render good service. Ice must be applied carefully and persistently.

Most cases of *gonorrhœal conjunctivitis* are contracted during birth from the gonococcal discharge of the maternal vagina; others through handkerchiefs, towels, fingers, or bathing water. Its treatment has been discussed (p. 107).

Trachoma, possibly of a microbic, surely of a specific character,

consists of granular deposits and proliferation of cells which crowd upon the normal tissue and render it atrophic. Its duration is long; its treatment must be persistent. The acute attack, or stage, requires daily brushing with silver nitrate (1 to 100), and washing off with water when the first effect of the caustic becomes visible. The subacute cases demand a daily (or less frequent) application of the copper sulphate stick. The granulations may also be scarified, scraped out, or squeezed out,—an old operation successfully re-established by modern surgery. Many cases do well with a daily application of one part of mercuric bichloride in one thousand parts of distilled water. The conjunctival duplicature, which is the pet seat of trachoma, has been excised to get rid of a large part of the diseased masses at once. For domestic treatment, an ointment of copper sulphate and vaseline (1 to 100), with or without cocaine muriate, will prove beneficial. A similar treatment, somewhat modified and diluted, is applicable to what is described as *granular conjunctivitis,* which probably is in no case anything but a mild form of trachoma. *Follicular conjunctivitis* is probably of the same nature in many cases; usually it is described as an inflammation of the (microscopically small) glands of the conjunctiva. The follicles are in rows near the margin of the eyelids. It is complicated with, or depends on, the presence of foreign bodies, of nasal disease, or of other varieties of conjunctivitis, and is not infrequently found in large numbers in families and in schools. The treatment is milder than that of the previous forms,—rest, washing, boracic acid solutions, astringents.

Keratitis, beginning with a small vesicle, which is mostly not observed, and rapidly terminating in a superficial ulceration, is frequently met with in "scrofulous" children, who, besides, suffer from affections of the mucous membranes of the nose, lips, and ear, from eczema, glandular tumefactions, etc. Some patients are rickety. To overcome the spasm of the conjunctiva, cocaine is often required to facilitate examination; for that purpose the dipping of the head into cold water, a popular remedy for photophobia, is probably not convenient. The constitutional disorder must be combated by cleanliness, fresh (country) air, bathing, plain and nutritious diet, quinine in small, iodide of iron in proper doses. Potassium iodide in small doses (from one to two grains), three times a day, given for a long time, is very successful in many cases. The room must be kept moderately dark and the eye protected by a shield. Good local applications are chlorine-water diluted in from twenty to one hundred parts of water, corrosive sublimate (1 to 5000), boracic acid (3 to 100), atropine

sulphate solution of one-half per cent., or cocaine muriate solution of two per cent. (the last two occasionally in combination). When the ulceration is near the corneal margin, eserine is recommended in place of atropine; but it is advisable to remember that it produces a congestion of the iris and may predispose the latter to be drawn into the morbid process. Old cases will do well with occasional (one every day or two days) gentle applications of silver nitrate (1 to 200 or 500) or (particularly when the conjunctiva is pale) of finely powdered calomel; this latter has always been highly recommended, and is useful, if persistently employed through weeks and months, when turbidity of the cornea remains behind. Old cases with defective power of reparation will do well when the lids and eyeball are gently kneaded with an ointment of the yellow precipitate of mercury (1 to 50). In many instances some of these remedies will act better than others; alternation is often required. A simple ulceration, no matter what application is employed, will heal better, or best, by avoiding friction of the eyelids; they ought to be immobilized by cautious bandaging, which may be removed to make the demanded local applications. Under the bandage a cloth wet with a solution of corrosive sublimate (1 to 5000) or boracic acid (3 to 100) will prove quite acceptable and beneficial. Suppurating ulcerations lead to hypopyon and perforation. They require, besides atropine, or eserine when near the margin, occasional applications of corrosive sublimate (1 to 2000) or silver nitrate (1 to 100). Biedert recommends cocaine and scraping or burning of the abscess. According to him, the main obstacles in the way of speedy recovery are: complications with conjunctivitis, blepharitis, nasal affections, stenosis of the lachrymal duct and blennorrhœa of the lachrymal sac (but rarely its congenital obstruction), and blepharophimosis with photophobia and rhagades.

Parenchymatous or *diffuse keratitis* is a peculiar variety. The turbidity and thickening of the two corneæ (the process being bilateral) are extensive, not always uniform, often disseminated, and complicated with considerable vascular injection on and around the corneæ and with synechia of the iris. Very many cases of this variety—according to some, the vast majority; ninety-six per cent., according to Parinaud; thirty per cent., according to Siklossy—are the results of syphilis, either hereditary, or acquired, or retarded hereditary. They require persistent antisyphilitic treatment with potassium iodide (and mercury). Scrofula, rhachitis, malaria, and arthritis are also charged with producing this form. It is certainly true that iodine and mercurial treatment are not always successful. Some cases are benefited by sodium salicylate. Atropine is useful in all.

In *neuroparalytic keratitis* both the conjunctiva and the cornea are deprived of sensibility, the lids do not move, the eye is kept open, the cornea is dry (*xerosis*) and may undergo softening (*keratomalacia*), with the result of either perforation or incurable turbidity and local thickening. It is observed in severe infectious fevers, particularly during the unconscious state of typhoid, and in the coma of encephalitis. These results are not often met with for a long time in succession, for most of the patients die of the original disease. They have also been noticed during and after frontal and conjunctival herpes zoster. In all these cases the eyeball must be moistened with salt and water (6 or 7 to 1000) and the lids closed by a bandage or by cotton with collodion. In most cases the latter will prove as effective as suturing of the two eyelids. Xerosis of the conjunctiva is also noticed, in very young infants, as the result of ill nutrition and consecutive marasmus. Most of the patients are from two to six months old. Proper and sufficient food will sometimes restore both the eye and the general health, but the mortality of these cases is very high. The same condition is found in children of from three to nine years (Thalberg, Förster). Several such cases were complicated with hemeralopia.

Keratoconus—the conical raising of the centre of the cornea—requires a cautious thermo- or galvano-cauterization; *pannus,* the centre of which is generally absolutely deprived of blood-vessels, demands stimulation. Daily insufflation of finely powdered calomel, continued for weeks or months, has met with some successes. Infection with erysipelas and gonorrhœa has been observed to restore circulation and absorption, and the latter has been utilized, consequently, to accomplish these ends. An infusion of the seeds of jequirity (from three to five per cent.) has been used for the same purpose. Kobert prefers a one-per-cent. solution of its constituents, either abrin or ricin.

Acute iritis is rare in infancy and childhood; its complication with *glaucoma* still more so. Of its two great causes, syphilis is almost exclusively of the hereditary variety, and rheumatism exhausts its main danger in starting endocarditis.

Chronic iritis is not so often seen in early life, except in connection with diffuse keratitis. The treatment of iritis is essentially identical with that of the same affection in adults: hydrargyrum, iodides, and salicylates, according to the causal indication; instillations of atropine sulphate in distilled water (1 to 100 or 500) from two to ten times a day, or oftener if the danger of adhesion be imminent, with a two-per-cent. solution of cocaine muriate if the pain be great;

absolute rest in the acute variety; dry heat; a dark room; iridotomy, or rather iridectomy, in most cases to loosen synechiæ and restore a pupil. Subconjunctival injections of corrosive sublimate (1 to 1000, a few drops at a time) were used by Darier in 1892, and in Deutschmann's clinic. They are made near the margin of the cornea and downward, and are recommended principally for syphilitic affections of any part of the eye, except, perhaps, the optic nerve. Parenchymatous keratitis and iritis are also said to be amenable to the same treatment, though they be not syphilitic. Later reports are not quite so favorable.

Suppurative *cyclitis* and a true *abscess of the vitreous body* are generally found together. Blindness is imminent, and enucleation to save the other eye becomes a necessity in almost every case, except in small children. In them the process has often exhausted itself, and may terminate in blindness and contraction without secondary irritation. When the abscess is small, part of it may be absorbed, and a white cloud in the lower part of the vitreous body, with feeble vision, may be the only evident results.

Uncomplicated inflammation of the *choroid* is rare in children. Idiopathic choroido-retinitis is observed in later years in both eyes after it has lasted a long time. It certainly commences at an early age, but takes decades before it ends in contraction of the field of vision, degeneration of the retina and optic nerve, and turbidity of the vitreous body and the posterior capsule of the lens. In all cases, whether syphilitic or not, treatment with mercury and iodides is the only one either reliable or advisable.

Congenital cataract demands an operation if vision be insufficient. If it be partial, atropine and iridectomy will suffice. Total cataract is rare in early years, but it may affect a number of persons in the same family; it may also, in exceptional cases, run a rapid course. More frequent is *zonular* cataract, which exhibits round its nucleus one or more turbid layers, followed by normal clear ones. As at the same time in a number of cases transverse phosphatic deposits are found in the teeth, zonular cataract has been attributed by many to rhachitis; others connect it with convulsive diseases. Some constitutional disorder has been charged with being the cause, but no treatment has been advised, nor is there any apparent indication, except to correct the accompanying myopia.

Diseases of the *retina*, the *optic nerve*, and the *orbit* show no particular symptoms in the young, nor do they require special treatment different from that employed in advanced age. In many cases of acute or chronic leptomeningitis with ample effusion, blindness

depending on copious secretion in and around the tissue of the optic nerve is an early symptom. Early diagnosis of this condition, and treatment with mercury, iodides, and derivants (diuretics, purgatives, diaphoretics), may succeed in reducing the œdema and preventing compression and atrophy of the nerve. A number of such cases will get well. Lumbar puncture, performed once or repeatedly, ought to relieve pressure. *Retinitis albuminurica* occurs rarely on one eye only. Once it was found on the left side, when there was only one (the left) kidney.

The tissues of the young eye being soft and elastic and expansible from internal pressure, *glaucoma* is rarely seen at an early age. Its place is taken by *hydrophthalmos* (*buphthalmos*), which requires the operative procedures employed for the glaucoma of advanced age, —either iridectomy or sclerotomy.

Strabismus is common in infants during the first few months of life. In them it is the result of an insufficient development of muscular power in general and of accommodation, and requires no treatment. That which makes its appearance during convalescence or in general hydræmia terminates in recovery. Diphtheritic paralysis of the muscles of accommodation recovers spontaneously, or through generous feeding and the administration of iron and strychnine. Muscular paralyses resulting from cerebral diseases depend on these for their treatment, if any be possible. The ordinary form of ophthalmoplegia, for instance, results from nuclear degeneration. Still, there are a number of hereditary cases reported by Gourzein and considered by him solely muscular. In them the ptosis was very marked; there were also nystagmus and some amblyopia. Persistent strabismus in children of five or six years requires the same methods of operative treatment as that of adults.

Nystagmus is a symptom only. It is either of central (sometimes rhachitical) origin, connected with an intracranial pseudoplasm (and choked disk), or hereditary atavy; or dependent on locally diminished vision (affection of the cornea, lens, retina, or choroid); or on rotary spasm. It may be combined with strabismus, and may be horizontal, vertical, or diagonal; on one or both eyes. Bandaging one eye will sometimes stop it; but the therapy is that of the underlying lesion.

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