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THE
PROPHYLAXIS AND TREATMENT
OF
INTERNAL DISEASES

THE PROPHYLAXIS AND TREATMENT OF INTERNAL DISEASES

DESIGNED FOR THE USE OF PRACTITIONERS AND OF ADVANCED STUDENTS OF MEDICINE

BY

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PREFACE

THIS book has been written for physicians and for advanced students. It embodies the results of thirty years' experience in hospital and private practice, and is only a compilation in so far as it deals with the prophylaxis and treatment of tropical diseases, which are now of great importance, and where my experience has been lacking. In these cases I have consulted and abstracted the literature which I have thought most reliable.

Those methods of treatment which have been most serviceable to me are invariably mentioned first, and are followed by other useful methods, and by such as are recommended by accepted authorities.

The methods recommended for prophylaxis and therapy are such as can be carried out in private practice, and when for any reason hospital or sanatorium treatment is needed, or when I have had no experience with the therapy recommended by others, the statement is explicitly made.

It has been my aim to consider all the modern methods of treatment as they are of the utmost importance. It will be seen, therefore, that much space is devoted to hydrotherapy, gymnastics, exercises, diet, and always with a view to their adaptation to private practice. When this is not possible, such places are named as have seemed to me to be of most value. The diet recommended can be obtained in any American household, and the food values are taken from a table of American foods prepared by Atwater, which is found in the Appendix.

It is taken for granted that only the best drugs will be chosen, and those drugs which are prepared in this country can usually be obtained from many reliable sources; I have, therefore, refrained from mentioning the names of manufacturers. Most of those made abroad can be obtained only from one source, so that there is no choice. The dosage is always that which has served me best, and both the metric and English systems of measures and weights are given as the metric system is official and the English the one in most common use. Whenever it is necessary, either because a remedy should be given in a certain way or because a combination of remedies has stood the test of long experience, a prescription is added.

Surgical methods have been referred to principally from the point of view of the physician; unless there is some special object no reference is

made to the technique of operations, but their indications are stated as specifically as is possible in the present state of our knowledge.

Subjects have been considered which encroach upon the fields of specialists. These have always been described as they would be by one who has had to treat them himself, and I hope these chapters will be found of service to the general practitioner. In some instances of rarer diseases it was deemed unnecessary to give the details of the methods of treatment, as they could easily be found in other works especially devoted to these diseases.

The Appendix to the Intoxications was kindly prepared for me by Dr. Allen Ramsey, who is eminently fitted for the work by his studies on the subject. Dr. Kenneth W. Millican has assisted me by suggestions and in the press work.

In preparing this work I am indebted to my friend, Mr. E. F. Bliss, for invaluable assistance in the correction and revision of the original manuscript and for many helpful suggestions.

F. Forchheimer.

Cincinnati.

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INTRODUCTION

THE history of medicine shows that the treatment of disease was first taken into consideration, and that many centuries passed before its prophylaxis was regarded. The history of the development of the medical profession is the history of prophylaxis and therapy. At first prayers, offerings, conjurations, and various methods supposed to be supernatural were used; gradually empirical systems were established, and last of all scientific. For the various rites used in the treatment of disease it was not necessary to have a medical specialist. Whoever was master of the rites, and this was usually the priest, treated the disease. So little was known in regard to the specific treatment of disease that the priest could easily add this little to his other acquirements. With increasing knowledge of medicine the time necessarily came when it was impossible for the same man to be both doctor and priest. Again, for a long time the physician could be master of all departments of medicine; indeed, some of them were not satisfied with this alone. Haller (1708–77) taught physiology, anatomy, botany, surgery, medicine, and law, and besides wrote romances, poems, and other literary works. In our own day we have seen Helmholtz teaching anatomy, physiology, and mathematics. The mass of knowledge is become so great that it is impossible for one man to grasp it all, and in medicine, if he could so do, it would be impossible for him to keep up with the additions made from year to year. As a result of this there have developed men who devote their whole time and attention to one special branch of medicine, and within the last few decades hygiene must be considered such a branch. It was in the nature of things that the prevention of disease, prophylaxis, could not be put upon a scientific basis until the causes of disease were accurately known. Morgagni, the father of modern pathology, wrote his celebrated book, "De Sedibus et Causis Morborum per Anatomen Indagatis," in 1761; and while he was the forerunner of the pathological era in medicine, the origin of disease was still a matter of hypothesis until progress in collateral science made it possible for Pasteur and Koch to find the cause of infectious diseases. R. Koch did as much as a man could do, but if biology had not been well enough understood, the microscope not sufficiently developed, and chemistry not enough advanced, the bacterial theory of disease would have remained a hypothesis only as Koch found it. While the causes of all infectious diseases have not been established, and while there are infectious diseases not caused by bacteria, the prophylactic methods to be pursued are thoroughly understood, though some of the measures best to be taken are still under discussion.

It was natural that the discovery of the bacterial origin of some diseases should be followed by a period in which this was considered the origin of all

diseases. Even now, twenty years after the first publication of R. Koch's appeared, bacteria are alleged to be the causes of disease, where the nature of scientific evidence proves the contrary. But the bacterial theory for a long time led to the utter neglect of the human being as a part of that combination which makes disease, and the structural changes due to disease were brushed aside as being of no material importance.

All, however, who were not carried away by the enthusiasm of the bacterial school, who were fully aware of the fact that an organic lesion represented only a manifestation of disease, could not be made to believe that the work begun by Morgagni, John Hunter, carried on by Louis, Laënnec, Andral, Rokitansky, Virchow, was to be pushed aside as without value. Repeated and continued observation has shown that the bacterium is only one of the causes of organic change—this and nothing more. To the bacterial cause we must add chemical, physical, and biological causes, the study of which has been somewhat in abeyance while the bacterial theory has occupied the stage. That chemical causes produce disease has long been accepted and proved, but that all those diseases which are now ascribed to chemical causes are really due to them is yet to be established, and this will be impossible until chemistry has solved the all-important question, What is the structure of albumin? Physical causes also have been recognized for a long time: with the advance of the new science of physical chemistry and the progress made in physics more diseases will be found due to physical causes than are now accepted. Those who held exclusively to the bacterial theory made very little of the biological causes of disease; even heredity was no longer accepted as a factor in disease. At present saner views prevail. While there is no doubt that infectious diseases are due to lower forms of life, even in them heredity is a predisposing cause. In many cases hereditary transmission of structural peculiarities is enough to account for disease.

We now come to the characteristics of the individual human being as a cause of disease. Here we must take under consideration predisposition and immunity, permanent or temporary, local or general, artificial or natural, active or passive. With the advent of Ehrlich's lateral chain theory much has already been done to explain immunity, much is doing, and much may confidently be expected in the limitation of disease. If, moreover, there be added to the causes already mentioned the surroundings of the individual, the food he eats, the water he drinks, the air he breathes, and his occupation, it will be seen that no department of medicine is more comprehensive than those of etiology and prophylaxis, and the two go hand in hand. In all civilized countries investigators are at work on the causation and prevention of disease. But the practical application of prophylactic measures in the individual is the duty of the practitioner, who, as in all departments of medicine, is called upon to apply and to test the conclusions reached by others. In so comprehensive a subject, however, it is impossible usually for the practitioner to find time to make the necessary investigations, even if he have the requisite knowledge and laboratory facilities. It is necessary, then, that specialists be developed in this department, but in this country, at least, the question arises of the *modus vivendi* of these specialists. They cannot subsist upon the work offered them by their patients, and the general profession should not be asked to add to its many unremunerated public duties. The

State is bound to watch over the health and wealth of its citizens, and these specialists should be supported by the State. It is true we already have our health officers, appointed by cities and States, but few of them can be looked upon as authorities in etiology and prophylaxis. But in addition, on account of the supremacy of the States in matters not under the jurisdiction of the national Government, there is no uniformity in matters medical. In an epidemic it may happen that one State carries out prophylaxis on one basis, a neighboring State on another; in yellow fever one relies upon the extermination of mosquitoes, another upon shotguns. In this matter departments of the national Government are doing excellent work, but they lack authority in case they come in conflict with State officials. It would seem, then, that there should be national recognition of these facts by establishing a department of public health, whose head should be a cabinet officer, a man of medical and sanitary knowledge and reputation. In this way uniformity would be established throughout the land to the great advantage of us all. The benefits accruing to the State by the establishment of central authorities are best seen in Germany; the benefits that follow scientific, rational prophylaxis in England, where, notwithstanding the fact that ships almost daily arrive having infectious diseases aboard, no epidemic of these infections ever develops.

The treatment of internal diseases is an art, and like all arts it is influenced by science, but, under all circumstances, it is an art practiced by one human being upon another. This admitted, it follows that therapy can never become an exact science, for, aside from its being an art, the two human factors, the patient and the physician, will never be reduced to mathematical quantities. However this may ultimately be, in our present state of knowledge, this statement must be looked upon as correct.

The success of treatment depends upon both patient and physician. As the advance in medicine is justly measured by the number of human beings it benefits, so the advance in therapy must be measured in the same way. Likewise, that physician must be considered best who helps or cures the greatest number of patients. The scientific and specialistic tendencies of the present time make us overlook this fact, so that we have many doctors of medicine who are not physicians at all, though they practice medicine; they are pathologists, bacteriologists, what you will, in the disguise of physicians, to whom the remark of Mephisto to the "student" applies:

> "Ihr durchstudiert die gross' und kleine Welt,
> Um es am Ende gehn zu lassen,
> Wie's Gott gefällt." —*Goethe.*

Bayard Taylor renders this:

> "Learn of the great and little world your fill,
> To let it go at last, so please ye,
> Just as God will!"

In days gone by it was a comfort to throw the responsibility upon the Lord; at present, however, though the physician may consider himself the instrument of the Lord, he assumes responsibility for omissions and commissions in therapy. It is difficult to measure the duty of a physician. In

a broad, general way it may be said to consist in doing what is best for the patient. In a special case, it is the best an individual physician can do for the individual patient; here again appears the human factor, most changeable, untrustworthy, irreducible to pure science. Analysis of the physician's qualities, for the best treatment, shows that more is demanded in the medical profession than in any other. I do not here refer to mental and physical qualities, to character, to breeding, to all those qualifications that make the gentleman. I do not fear contradiction when I assert that these qualities are as common in the medical profession as in any other. Apart from all this, how can a physician do the best for the patient? The *conditio sine quâ non* is, first of all, that he make a correct diagnosis, for *qui bene diagnoscit, bene curat.* In this book we are not treating of diagnosis, and we merely remark that the therapeutic management of a patient under all circumstances must be the logical conclusion from the diagnosis. Of course there may be treatment without a diagnosis, for sometimes diagnosis is not to be made, and yet treatment, even rational treatment, is required. This form of treatment is unsatisfactory and usually only symptomatic, but it is as old as the art of medicine, and has produced empirical rules that may not well be neglected. It seems to me that when a remedy has stood the test of several centuries, it should not be discarded because some plausible theoretical objections may be opposed to it. Many examples might be cited; astringents, principally those containing tannic acid, have been used with benefit in diarrheal diseases, but when the cholera bacillus was discovered, the use of astringents was disparaged on the ground that they did not destroy the bacillus. Cantani, however, used them to great advantage in an epidemic of Asiatic cholera, and it was afterwards found that they do have an effect upon the bacillus and their reputation is restored. The revival of the use of calomel, the use of opium in diarrhea, are among many that might be mentioned. These empirical methods need not be symptomatic only; as the result of experience alone two of the three most efficient methods of causal treatment have been established in malaria and in syphilis.

The symptomatic treatment of disease must not be neglected, but it must not be put upon the same plane with causal treatment. Notable exceptions to this statement can be found; for instance, when a symptom endangers life its treatment is paramount, as we find in febrile cases in which the life-saving indication is reduction of temperature; in stimulation of vital centers affected by various intoxications; in the supply of fluid to the heart after large hemorrhage; in rest given to important nerve centers by means of narcotics. The skillful physician does not hesitate to combine causal and symptomatic treatment, but he is not wise who tries by polypharmacy to meet every indication which may arise in any case. The symptoms are not the disease; it follows, therefore, that logical treatment consists in removal of the cause and not simply of its manifestations. For the present the treatment of the prime causes of disease is restricted, but the treatment of remote causes has much advanced; there are very few functional affections in which it is not necessary to treat something more than the organ or organs immediately affected. To mention but one example, in disorders of the stomach we must regard general metabolism, affections of the bowels, the liver, the lungs, the heart, the kidneys, the nervous system, the blood. Whoever treats the stomach as if it were an

organ not associated with the rest of the body will fail of success. The same is true for all functional and for some organic affections of all organs and systems of the body. When possible, symptomatic and causal treatment should go hand in hand. There are therapeutists who in their eagerness to cure the disease lose sight of the patient. How often we find this the case! Notably in dieting disease, and not patients, for gastro-intestinal disorders, for gout, diabetes, or obesity. This occurs also in connection with many other diseases, as the result of too much medication—too much, too much of any means likely to harm the patient.

The patient must be treated as an individual. While we have average data for almost everything connected with the human being, they are valuable only as averages. Thus we have knowledge of the average effects of drugs, but in an individual case these effects may not follow their administration, and more harm than good may be done. It must be remembered that the physiological effects of drugs have been worked out on the lower animals, often not mammals even; statements about these experiments are of little value unless they have been verified in the human being. The effects reported arising from beasts or men in good health, how is it possible to apply these drugs to disease in general or to disease in the individual? Time and experience must settle this question. The physician who uses drugs without knowing upon trustworthy evidence their average and individual effects is certainly guilty of temerity. How can the physician know the effect of drugs in an individual patient? There is but one way—observation. In regard to many drugs, experience has taught that in individual, general or local, physical peculiarities they should not be given, but there are so many exceptions to the rules that we may be misled. A knowledge of the individual patient is essential, and for this the family physician is indispensable. The statement made by patients that a certain physician knows "their constitution" is sneered at by many. If by "constitution" is meant the individual peculiarities of the patient, the physician who knows these has an enormous advantage over the one who does not, even if both have equal general professional knowledge. I venture the statement that these peculiarities are more important for treatment than for any other department of medicine. In treating human beings we must take under consideration much more than is explained by the present state of medical science; it is not only what drug is given, but frequently how it is given, that produces the desired effect—a fact that cannot be denied. All this, and more, is included in the term psychotherapy. With the exception of hypnotism, all psychotherapeutic measures should be understood and practiced by the physician. As a passing phase, possibly, of popular medical credulity, much is now doing with psychic measures by people without medical education. As a result much harm has been done, as many can testify; but much good has also been done, and it has been rather a shock to many an ultra-scientific physician to find that an ignorant, irregular practitioner can accomplish more with some of his patients than he can. Unconsciously and consciously the medical profession has used suggestion from the time it began to exist. At the present day we understand better the methods of suggestion, largely because there is a greater demand for their use, and it is best for all reasons that they be used consciously by the physician. Naturally physicians will differ as to the good they can do with these various methods,

just as they differ about other matters; but he who cannot use them successfully is not entitled to belittle their value, or to deny their frequent good effects. Far better would it be for him to admit that some limitation prevents his getting as good results as his neighbor. In the use of these psychic methods we are always afraid of encroaching upon irregular methods, but there need be no such fear provided what is done for the patient is done solely for his good and that no harm follows.

As no true physician would keep secret his methods of treatment, so no true physician should prescribe preparations the composition of which is unknown to him. A knowledge of the properties of drugs and their effects upon individuals is prerequisite to success in therapy. At the present day there are so many new drugs that it is an utter impossibility to test them all. Again, it is a serious question whether it is well for the physician to do this. I am not now speaking of him who prides himself upon trying every new drug as soon as it is put upon the market, who is looked upon as a progressive therapeutist and scientific withal; if he is therapeutically successful, it is largely due to the suggestive effects of his medication, but the constant change of drugs and their multiplication soon enough limit his usefulness because the suggestive efforts are overdone. Such a man has absolute faith in drugs, especially in new drugs, and, as so many of the older therapeutists were in the habit of saying about their young days, he has a great number of drugs for one disease and has not developed to the point of having one drug for several diseases. It will be found that most physicians rely upon a comparatively small number of drugs, but these they know perfectly in their good and their bad effects, just as the best workman uses few tools. Such a physician is constantly adding to his pharmacopœia, but he adds judiciously, not hastily, and usually after a drug has been thoroughly tested by others, with the result that of the many new drugs constantly introduced he retains at best two or three each year.

The treatment of each patient should be conducted on the same principles as are used in war, save that in medicine everything is not fair. The physician should lay out his plan of battle, prepared for defense against any movement of the enemy and for an attack where any chance is shown.

For many reasons it is difficult to estimate the results of treatment. Upon superficial observation it would seem as if the statistical method ought to be thoroughly satisfactory. I believe that when a great enough number of cases is taken into consideration, cases that have been treated by trustworthy men, conclusions arrived at by this method could be fairly relied upon. How great should be the number of cases? Hebra was in the habit of saying that ten thousand cases were required before a therapeutic opinion could be justly formed. It is superfluous to say that few persons have the chance to observe ten thousand cases of any one disease; moreover, so many are not required, for the absolute number of cases is of much less consequence than that the results should be verified by the observation of competent investigators. In other words, it is not the number of cases but the men who have reported them that establish trustworthy statistical results. This is due to many complexities inherent in reporting therapeutic results. First there is the difference in diagnosis, which may legitimately exist; there is the varying grade of intensity in the same disease at different times; there is the variety

in quality of patients and in their surroundings; there is a possibility that good, indifferent, or bad medicinal preparations are used; finally, there is the human element of the observer. He may be overenthusiastic and fail to see things objectively; he may be just the opposite, prejudiced against the method used, and in this way fail to see things objectively; he may omit one of the important features in carrying out the recommendations of others, and his results will thus be without value. For these reasons statistical results do not carry the weight that otherwise might be attached to them. It is also not astonishing that the profession will follow the recommendations of an observer whom it believes competent, though the number of his cases has been comparatively small. Having done this, the observing physician trusts to his own experience, which, under all circumstances, is decisive as to the effects of any drug or of any method of treatment. The fact is often lost sight of, that not the worker in the laboratory but the clinician is the supreme judge in therapeutic matters. The application of a drug is in the hands of the physician, the *modus operandi* in those of the theorist; in other words, therapy is an art. As in all applied art, however, the best results are obtained by coöperation of the theorist and the practitioner. In order, then, to get the best therapeutic results the physician should be both scientist and practitioner.

SECTION I

SPECIFIC INFECTIOUS DISEASES

I. TYPHOID FEVER

PROPHYLAXIS

THERE is no disease in which prophylaxis is of more importance than in typhoid fever. We know the cause of the disease, the mode of its propagation, and the means of preventing its spread; the last, moreover, seems so easy of accomplishment that, except under exceptional conditions, it appears almost criminal to permit the disease to spread. The exceptional conditions are to be found in wars and among semicivilized or barbarous nations. The morbidity and mortality during the Cuban and the Boer wars could have been materially lessened if proper precautionary methods had been followed, and, above all, if the medical men had been consulted. How much can be done in this way, has been taught us by the Japanese; in future, war must not be looked upon as an exception to the general rule. Among semicivilized nations much good work is being done, in spite of the enormous influence among them of custom and superstition. In a civilized community, however, where an outbreak of typhoid fever occurs, we find either ignorance or carelessness. The alliterative statement that food, fingers, and flies are accountable for typhoid fever covers almost all the methods of its mode of propagation for human beings.

SOURCES OF INFECTION.—*Water* is the principal article of food which spreads typhoid fever. The question of water supply in cities is at the present time a serious one, but as far as typhoid fever is concerned it is not difficult of solution. How weak the force of conscience is among civic legislators in some parts of the world is shown by the fact that in many cities the drinking-water is constantly polluted by sewers, and this with their full knowledge. Where the intake of the water supply cannot be controlled, the output must be guarded. This can be done with reasonable security by large, properly built filtering beds, placed under the constant surveillance of a skilled bacteriologist, but in most cases it is advisable for the family to take the extra precaution of boiling the drinking-water. The objection to drinking boiled water—that it loses its "life"—can be easily overcome by shaking it, so that it again takes up the air which has been driven off by boiling. Public filters, however, of the proper sort are perfectly safe, provided there is a bacteriologist in charge of them; otherwise they possess only spiritual value.

In the country, pollution of the water supply comes principally from two sources: the emptying of sewage or surface drainage into small streams or wells, or the connection of leaky cisterns with the privy vaults, directly or indirectly. The author knows of one community in which surface wells and cisterns were formerly used, and which was yearly visited, during the autumn months, by an epidemic of fever; all this disappeared after the village had grown to the dignity of having a common water supply from artesian wells. In the open country it is the duty of the physician, when in the presence of a case of typhoid fever, to give all directions necessary for preventing the spread of the disease.

Milk also requires strict supervision, principally on account of the water from unknown sources that it contains, added either for purely commercial purposes or with laudable, but misdirected, attempts at cleanliness by the dairyman. The modern and humane dairyman sees that his cows get pure water, and that all his utensils are thoroughly sterilized; but if the family milk supply does not come from such a milkman, one who employs for delivery only such persons as know the relation between milk and disease, it is necessary to boil the milk. As the family rarely knows anything about its dairy, and as those who deliver the milk have been known to exchange milk or even to add water of known but very suspicious origin, it is well in cities always to boil the milk. In the country, with the precautions before described as to water supply, raw milk may still be looked upon as a permissible luxury.

Other articles of food that have been accused of transmitting typhoid fever are butter, ice, oysters, and celery. As to ice, Sedgwick and Winslow show that the risk of contracting typhoid from natural ice is infinitesimally small. The risk is greater with artificial ice, depending upon the water used in its manufacture. Both oysters and celery have been known to transmit typhoid; but here again the risk is small, and precautionary measures need only be taken under extraordinary circumstances. For oysters this is done by avoiding those that come from places where they have been fattened in impure water. For celery and other vegetables and fruits no precautions can be taken except careful cleanliness.

The patient himself is a source of great danger, but reasonable precautions, properly carried out, will remove all possibility of this. It is possible to transmit typhoid by direct contact. Leube reports one case in which a thermometer, introduced into the healthy rectum after having been used in a typhoid patient, was the carrier of infection. Cole states that, at the Johns Hopkins Hospital, 1.81 per cent of all cases are of hospital origin, and suggests that isolation may become necessary. It is therefore necessary to disinfect everything that has been in contact with the mucous membranes of a typhoid patient. The typhoid bacilli leave the patient's body by means of the stool and urine, at times also by expectoration, and possibly with other secretions. In order that a community may not suffer by the presence of a typhoid patient, it is necessary that all secretions and excretions be disinfected.

Disinfection.—For disinfection of stools a five-per-cent solution of carbolic acid—twice the volume of the stool (Cole), or one per cent of chloride of lime to the mixture of stool and urine (Klemperer)—may be used. For

the urine alone, Gwyn has shown that from three tenths to four tenths of its volume are necessary for a five-per-cent carbolic-acid solution and one fortieth of a 1 to 1,000 solution of corrosive sublimate, which must be allowed to stand for from one half to one hour in order that the bacteria may be destroyed. The sputum may be disinfected in the same way. In giving baths, the water frequently becomes polluted; it therefore becomes necessary to disinfect it, which is done, according to Babucke, by the addition of 250 gm. of chloride of lime to 200 liters of water, the mixture to stand for one half hour. In water closets or privies, chloride of lime or carbolic acid should be used. All soiled linen should be treated with three to five per cent carbolic acid, then thoroughly boiled, and washed after it has been boiled.

In the presence of a fever epidemic it is well to disinfect the privy vaults with slaked lime or iron sulphate. When the precautions as to stool and urine are taken as soon as these are passed, flies can play only a very subordinate rôle in the transmission of the disease. In tenements the food should always be kept covered. People should be instructed how to prevent infection; cleanliness of all kinds, especially of the hands, should be insisted upon.

Individual Prophylaxis.—In typhoid, as in all infectious diseases, it is necessary that as good a condition of general health be maintained as is possible: a regular life, normal diet, absence of worry, and temperance in all things. If the resistance to infection can be increased, the lower form of life which produces disease may be destroyed; much of the hysterical anxiety, which amounts to bacteriophobia, will be overcome when this principle is understood. If with this is combined the care necessary to prevent ingestion of bacteria, the individual prophylaxis becomes perfect.

Wright and Semple and Pfeiffer and Kolle have each introduced a vaccine for typhoid fever; to Wright is due the credit of having perfected the method, and of having made extensive practical application of it. Small quantities of culture of the typhoid bacillus, in which the bacillus has been killed, are used; experimentally they produce, when injected, a serum which contains both bacteriolysins and agglutinins. The vaccine has been used especially in hospitals and in the British army, Wright and Leishman vaccinating British soldiers in India (1898–99), with the results shown in Table I.

Table I

Not Inoculated.			Inoculated.		
Number of men.	Number of cases of typhoid.	Deaths.	Number of men.	Number of cases of typhoid.	Deaths.
8,400	213 (2.53 per cent)	23 (0.27 per cent)	2,835	27 (0.95 per cent)	5 (0.2 per cent)
25,851	657 (2.54 per cent)	147 (0.56 per cent)	4,502	44 (0.98 per cent)	9 (0.2 per cent)

Table II, indicating the results obtained at Ladysmith, shows even greater contrast:

TABLE II

NOT INOCULATED.			INOCULATION.		
Number of men.	Number of cases of typhoid.	Deaths.	Number of men.	Number of cases of typhoid.	Deaths.
10,529	1,496 (14.18 per cent)	336 (3.2 per cent)	1,705	33 (1.93 per cent)	6 (0.37 per cent)

In both tables there seems to be an enormous reduction in morbidity, as well as in mortality, the latter being especially well marked in the second table showing results obtained at Ladysmith. These results are verified by the observation of 10,225 vaccinated subjects, and certainly deserve most careful consideration. All theoretical objections can be waived in the face of so large a number of cases. Even conservative authors admit that the method should be tried in armies, and for the protection of nurses against contact infection.

TREATMENT

SPECIFIC TREATMENT.—A number of sera have been used; Walger and Silvestrini using those from convalescents, Chantemesse and Tavel those from immunized horses. Of these sera that of Chantemesse is the only one that requires further notice. The statement is made by him that, in twenty months in the Paris hospitals, the mortality from typhoid fever was 19.3 per cent, but that when his serum was used only five per cent died (1902); three years before this statement, he reported 100 cases of typhoid in which this serum was used before the tenth day without a death. If the use of this serum does no better than to be followed by a mortality of five per cent, it is useless; a series of 100 cases without a death may mean anything or nothing. None of the other methods of specific treatment have been confirmed, Jecz administering the supposed immunizing bodies *per os*, E. Fränkel injecting dead bacilli during the attack and Rumpf injecting cultures of Bacillus pyocyaneus. The only encouraging results obtained by bacteriological methods are those recorded by Wright, referred to before. Here it is a question how long the beneficial results of inoculation may endure; in the case of the Fifteenth Hussars, part of which had been inoculated at home, after one year's service in India the results were as shown in Table III.

TABLE III

NOT INOCULATED.			INOCULATED.		
Number.	Number of cases of typhoid.	Deaths.	Number.	Number of cases of typhoid.	Death.
179	11 (6.14 per cent)	2 (1.12 per cent)	360	2 (0.55 per cent)	1 (0.28 per cent)

While this is a small number to draw deductions from, yet after a year the same results hold good as for fresh inoculation.

ABORTIVE TREATMENT.—The remedies that are used for this purpose are calomel (Liebermeister), iodine, and many intestinal antiseptics. I think I have prevented the development of typhoid fever by calomel in one case, though never by iodine. No one can prove, for obvious reasons, that he has suppressed typhoid fever, and now that we know that the typhoid bacillus is found with constancy in the blood, the reasons for denying the possibility of preventing the development of a case of typhoid by drugs are increased in number, especially as the bacillus has been found in the blood as early as the fourth day of the disease (Busquet).

ANTISEPTIC TREATMENT.—Heretofore the idea has been current that as the lesion was in the intestine and was produced by bacteria, therefore a destruction of these bacteria was of the utmost importance. For this purpose a number of drugs has been used: salol and salicylic acid combinations, carbolic acid, chlorine, thymol, corrosive sublimate, chloroform water, the benzoates, turpentine, iodine, menthol, singly or combined the one with the other. The effect of intestinal antiseptics upon gastrointestinal infection will be discussed in the chapter on Gastrointestinal Intoxication; the number of drugs recommended shows that the effects in typhoid are problematical. That a certain effect does follow is shown by the effects of calomel used in the first week of the disease; by the use of this drug the stepladder rise in temperature may frequently be interrupted. But granted that all the bacteria could be killed in the intestine of a typhoid patient (which, unfortunately, is impossible), the disease might be mitigated as to its intestinal symptoms, but it would run its course uninterruptedly because of the blood infection. The intestinal antiseptic method of treatment, then, is based upon an erroneous scientific conception of the disease; if it were possible to destroy the typhoid bacillus in the blood, then we might be able to accomplish something. In time we hope that this will be accomplished. The good results reported by a number of authors are to be ascribed to a possible local effect of their remedies, but as much, also, to the small number of cases taken into consideration. When a certain much-lauded antiseptic method of treatment was used in a large number of cases, as occurred in the Cuban war, it was soon found wanting in efficacy and was dropped in favor of other methods. We have seen that specific methods, up to the present, offer us little that is promising; still the future treatment of all infectious diseases must lie in this direction. We are, therefore, forced to rely upon symptomatic treatment.

SYMPTOMATIC TREATMENT.—*Hydrotherapy.*—This method has been called the antithermic method, because by it heat is antagonized by cold. At the present time few, if any, are willing to admit that the treatment of temperature alone is essential; it is only in the rare, exceptional cases in which great hyperpyrexia exists that temperature must be taken into consideration, and then only because in the end it may of itself destroy life. If this hyperpyrexia can be controlled until its cause is removed, then the patient's life may be saved by treating the temperature alone, as far as this cause is concerned. Fever must be looked upon as a normal reaction of the human system to some reagent, but this reaction must, if possible, be kept within bounds; for within certain limits the general metabolism can be changed so that the effects of fever upon the system may be diminished. But the object of hydrotherapy is not alone to reduce temperature, although the degree of temperature indi-

cates its use. Hydrotherapy, when properly used, does much more than this; it acts upon the nerve centers, it increases respiratory interchange, it stimulates the peripheral circulation, it increases elimination by its effects upon blood pressure, and therefore acts as a general roborant; in few diseases has it been used with so much success as in typhoid fever. To Currie (1787) is due the credit of first having used cold water in typhoid, as well as in other acute infectious diseases; but to Brand, of Stettin (1861), we are indebted for the formulation of a method and its introduction to the general profession.

Brand's method is as follows: The temperature of the patient is to be taken, preferably in the rectum, every three hours; when it exceeds 102° F. or 101.5° F. in the axilla, the bath is to be given. The temperature of the water is to be between 65° and 70° F. Before going into the bath the patient is to receive an alcoholic stimulant, his head and chest are sponged with cold water; he now either steps into the tub, which is brought to the bedside, or is lifted into it and then immersed, so that the water covers the chest. A cold compress, kept constantly moist, is put on his head. While in the bath he must be constantly rubbed on the extremities and the chest, but not on the abdomen. After from ten to fifteen minutes—sometimes sooner, sometimes later—he begins to feel cold, shivers or becomes cyanotic, and must then be lifted from the bath, dried off except the abdomen, and put to bed. He may now take some food. The bath must be repeated every three hours if the temperature exceeds those noted above, or if the nervous symptoms are not controlled. These directions are sufficiently simple to be carried out with mathematical precision, yet there are very many who do not do this, preferring to make modifications of their own which, when sufficiently extensive, do not give the same results as have been obtained by Brand and a large number of English, French, German, American, Italian and Russian authors. Naturally, the method is then blamed, when the blame should attach to the inventive genius of the modifiers.

What is accomplished by Brand's method? The course of the disease is shortened, the nervous symptoms are controlled, the circulation is improved, the condition of the mucous membranes is changed for the better, and lastly the mortality is diminished. The Brand method must not be used in acute cardiac conditions, in peritonitis, in intestinal hemorrhages, in very old or in very young people.

What are the objections to its use? In hospital practice the equipment may not be adequate. Many a hospital exists in which are performed the most brilliant operative *tours de force*, but in which the Brand method cannot be carried out. In the presence of an epidemic, the nursing corps must be large and under all circumstances efficient. In addition, a certain number of patients object very seriously to the application of this method; recorded experiences of observers differ in this regard; v. Ziemssen, when he himself had typhoid, looked forward to his baths with the greatest pleasure. Osler hopes that a method may be found which "may be less disagreeable, to put it mildly." My own experience lies between the two. There are always a certain number of patients who object to anything done to them, and I have seen many a patient who absolutely refused to take the baths; in a large majority of cases the patient becomes accustomed to the routine and does not

object, and finally he becomes fond of the bath, as, indeed, some do from the outset.

In private practice the question is more difficult. When the surroundings of the patient are favorable, the method can be carried out as easily as in hospital practice; but this can be the case only in exceptional instances. In most cases the additional expense will make it difficult to use this method. But under all circumstances an attempt should be made, even if some concession or other is required, to treat the patient by tubbing. Popular prejudice may make it injudicious to use this method, and then the practitioner must be the judge of whether he is willing to compromise with his medical conscience or to use some other method of treatment. Again, in many parts of the country it is absolutely impossible to carry out the Brand treatment; there are no professional nurses, the distances are so great that the physician cannot properly supervise the method, or there are no facilities. When for any reason Brand's treatment cannot be used, some other hydropathic measure should be tried. The various measures are arranged in the order of their efficiency:

The cold pack.—The patient is wrapped in sheets wrung out of ice water, covered with a blanket, and rubbed as in the Brand method. The sheet must be changed every ten minutes and applied three times. According to Liebermeister, this is equal to a Brand bath; my experience does not verify this conclusion, although in exceptional cases I have seen temperature reduced when the bath had very little effect in this direction.

The fan bath.—Possibly equal in importance to the cold pack is the fan bath. The patient is covered with a sheet, which is sprinkled with ice-cold water from an ordinary garden sprinkler, while all the time the patient is fanned and rubbed, the latter as in the Brand method. The use of warm water is not attended by the same general results as when ice water is used.

The warm bath with gradual reduction.—The patient is put into a warm bath, the temperature of which is gradually reduced to 65°–70° F. by pouring cold water into the tub or putting in pieces of ice.

The warm pack.—The wet pack with water of the room temperature.

The warm bath.

Sponging.—Sponging the body with ice water or with tepid water. Sponging the body with alcohol and water (equal parts).

I have had no experience with Leiter's tubes.

Antipyretic Treatment.—The remedies used are the coal-tar products: antipyrin, phenacetin, acetanilid (antifebrin), malakin, kryofene, lactophenin, and a large number of others. According to the principles stated before, it seems irrational to use any of these drugs unless it becomes absolutely necessary to reduce the temperature and relieve certain nervous symptoms. Not only does it seem irrational, but the use of these drugs is followed by depression and sometimes serious collapse, so that in prolonged fever, although we may reduce the temperature, we are risking the life of our patient. If to these ill effects is added the tendency to produce changes in the hemoglobin, we have sufficient reasons for not using this method of treatment in a routine way. Quinine is no longer used for the purpose of reducing temperature in typhoid.

Treatment of Nervous Symptoms.—Insomnia is best controlled by small doses of opium or morphine. It is remarkable how a small dose of one of these drugs will act in typhoid without leaving any bad effects. The new hypnotics—sulphonal, trional, chloralamid, paraldehyde, veronal—will do very well on occasions, but their action is uncertain. Hyoscine hydrobromate is of great value in muscular restlessness; it succeeds where no other drug will. With the strict carrying out of the hydropathic method, the necessity for giving drugs will not often arise. Beginning with the second week of a well-developed case, the weakness of the patient deserves serious attention. Here, unless there are contraindications, especially on the part of the kidneys, alcohol should be used as a stimulant; beef tea must be given, and, if necessary, strychnine, camphor, or ether; the two latter especially for cardiac weakness.

Routine Treatment.—In all acute infectious diseases the best room in the house should be selected for the patient. Light and air are absolutely necessary for his welfare. In typhoid, a room close to the bath is very desirable. The question of nursing is of the utmost importance; there are few diseases in which the trained nurse is more indispensable than in typhoid. It is necessary to have two nurses, one for day and the other for night duty, for in no disease are the duties of the nurse more continuous and more arduous. A rule that must be laid down absolutely is that a typhoid patient must not be left alone for a minute; many a patient has jumped out of the window, or killed himself in other ways, because of neglect of this rule. Again, a typhoid patient must be kept in bed for at least four weeks; his bladder and bowels must be evacuated into a bedpan, and he must be kept as quiet as possible. The temperature, pulse, and respiration should be recorded every three hours during the day and during the night; when the patient is asleep he should not be disturbed unless there are special reasons for doing so. If the patient comes under observation before the middle of the first week, a large dose of calomel should be given (0.30–0.60 = gr. v–x), followed by a saline cathartic; if toward the end of the first week, one half of this may be used, especially if there is constipation. At this time the method of using hydrotherapy may be determined upon, and the patient is put on the regimen that is to be used during the course of the disease. The mouth must be kept clean; the teeth should be brushed three times daily and the mouth washed with some mild antiseptic—listerine or boric acid; this is done to prevent secondary infections and to promote comfort; sordes and fissured tongues are an opprobrium, and reflect upon the character of the nursing. To add to the comfort of the patient, he may be allowed to suck small pieces of ice; when he is delirious these may be enclosed in small bags made of cheese cloth. With hydrotherapy bedsores are rare, but in order to be more certain the back, the buttocks, and the coccygeal region should be washed off three to four times daily with equal parts of alcohol and water. The patient, if delirious, should have his position changed every hour or two, in order to prevent decubitus and possibly hypostases. The patient should be given large quantities of pure, cool water; it serves to keep the mouth in good condition, to reduce temperature, and to increase the quantity of fluid in the tissues, to increase the renal function, thus minimizing the effects of the bacteria, which leave the circulation by the kidneys, and increasing the quantity of toxines eliminated.

DIET.—The question of food for typhoid patients is of paramount importance; the following requisites can be mentioned: 1. The food must be digestible. 2. It must have sufficient caloric value, so that compensation may be made for the loss in weight incident upon fever metabolism. 3. It must not affect the bowels. 4. It must be nonirritating.

Milk is the food that has been selected as the basis of feeding in typhoid fever; considered as the principal article of diet, this is correct in a large number of cases, but as the sole article of food it does not fulfill the requisites mentioned above. One liter of milk, to look at it from one point of view only, represents 590 calories; it is the rule to give two quarts of milk in the twenty-four hours, representing about 1,300 calories. The nutritive needs of a person weighing 120 pounds are about 1,925 calories in twenty-four hours when at rest; even this is not covered by two quarts of milk, there being a deficiency of 600 calories; how much greater the deficiency, then, with increased temperature!

In addition, there is a certain number of patients who cannot take milk, and in nearly every case of typhoid the milk feeding has to be cut down or interrupted because of deficient digestion. Buttermilk may be used, but it may produce diarrhea; predigested milk is of value, or a dilution of milk with lime water or some carbonated water. In these cases it sometimes becomes exceedingly difficult to feed the patient; fat-free cocoa may be used, cooked in milk; the milk may be given as a milk shake; wine whey, equal parts of sherry and hot milk, strained and allowed to cool; or substitutes for milk have been used. For this reason, if for no other, it becomes necessary to add some other article of food. My favorite food is oatmeal, properly boiled and strained, of which large quantities can be taken as jelly. To this may be added eggs, either raw or the white in the form of albumen water, and the yolk thirty-five minutes boiled (each egg having about 52 calories and providing usually all the necessary requisites of good typhoid food). If to these there be added small quantities of alcohol, one ounce of whisky having 100 calories, it will be seen that the waste can be easily lessened from that which would follow milk feeding alone.

Under no conditions, then, should milk be used exclusively as a typhoid diet. For special purposes, beef tea, beef juice, or ordinary black tea may be added to the list. Custards may also be used. This diet should be given until the end of the fifth week of the disease—i. e., when the temperature has been normal for a week. Then solid food may begin: first chicken, toast, beef, mutton, lamb; finally a gradual return to the normal diet.

F. C. Shattuck recommends the following more liberal diet:

(*a*) Milk: hot or cold, with or without salt, diluted with lime water, soda water, Apollinaris, or Vichy; peptonized milk; cream and water (i. e., less albumen); milk with white of egg, buttermilk, kumiss, matzoon, milk whey, milk with tea, coffee, cocoa.

(*b*) Soups: beef, veal, chicken, tomato, potato, oyster, mutton, pea, bean, squash; carefully strained and thickened with rice (powdered), arrow root, flour, milk or cream, egg, barley.

(*c*) Horlick's food, Mellin's food, malted milk.

(*d*) Beef juice.

(*e*) Gruels: strained cornmeal, crackers, flour, barley water, toast water, albumen water with lemon juice.

(*f*) Ice cream.

(*g*) Egg, soft boiled or raw; egg nog.

(*h*) Finally, minced lean meat, scraped beef, the soft part of raw oysters, soft crackers with milk or water, soft puddings without raisins, soft toast without the crust, blancmange, wine jelly, apple sauce, and macaroni.

The accompanying table represents the results of the Brand treatment in conjunction with Dr. Frederick C. Shattuck's diet, at the Massachusetts General Hospital, in cases of typhoid fever:

Year.	Cases.	Relapse.	Per cent.	Hem.	Per cent.	Perf.	Per cent.	Death.	Mortality.
1892	27	2	7.4	2	7.4	0	0.0	4	14.8
1893	20	1	5.0	1	5.0	1	5.0	2	10.0
1894	24	2	8.3	1	4.1	1	4.1	3	12.5
1895	20	2	10.0	2	10.0	0	0.0	2	10.0
1896	43	12	27.8	1	2.3	1	2.3	6	13.9
1897	9	1	11.1	1	11.1	0	0.0	0	0.0
1898	12	3	25.0	3	25.0	0	0.0	2	16.6
1899–1901	79	12	15.1	6	7.5	3	3.7	6	7.5
1902	27	4	14.8	3	11.1	1	3.7	1	3.7
1903	18	3	16.6	3	16.6	1	5.5	1	5.5
1904	9	1	11.1	1	11.1	1	11.1	4	44.4
Total	288	43	14.9	24	8.3	9	3.1	31	10.7

I am permitted to present this table through the kindness of Dr. Frederick C. Shattuck. The three years (1899–1901) have been previously analyzed by Dr. Smith; for the tabulation of the remaining years I am indebted to Dr. J. B. Hawes. It will be seen that the results are as follows: Relapses, 43, or fourteen per cent; intestinal hemorrhage, 24, or 8.3 per cent; perforation, 9, or 3.1 per cent; mortality, 31, or 10.7 per cent. The method requires further trial before a definitive conclusion can be reached as to its absolute value; it seems rational, and certainly is agreeable for the patient, whose nutrition can be better maintained than by the ordinary routine diet.

ABNORMAL FORMS AND COMPLICATIONS OF TYPHOID FEVER

The rudimentary forms should be treated with the same care as to diet and rest as the fully developed case. The excessively developed case should be looked upon, as in all acute infectious diseases, as a toxæmia or septicopyæmia, and be treated as such (see Septicopyæmia). The complicated form requires treatment directed principally to the complication itself. The complications that require special mention here are those of:

The Oronasal Cavity.—*Epistaxis.*—It is of paramount importance to find out where the bleeding comes from; a careful examination of the nose, therefore, should be made. If the epistaxis comes from ulcers in the anterior part of the nose, they should be touched with silver nitrate or trichloracetic acid, or an aseptic plug may be introduced into the nose. If the bleeding parts cannot be found, and the epistaxis requires special attention, the nasal

douche, with plenty of hot water (temperature, 110° F.), adrenalin solution (1:1,000), a few drops into the nose; compression of the facial arteries may be tried; the introduction of bougies made of gelatine (beware of tetanus); and only when absolutely necessary, which occurs frequently enough, the plugging of both anterior and posterior nares. In the mouth, stomatitis hyphomycetica, or thrush (q. v.), parotiditis, etc., are to be treated as recommended in their respective chapters. For diphtheritic inflammation of the mouth see Diphtheria. With the care before advised, diseases of the mouth are rare in typhoid fever, as are diseases of the tonsils and the soft palate and pharynx.

Laryngeal Ulcers.—Application of ice bags externally as soon as the first symptoms are noticed. Inhalation of mild antiseptics may be used; topical applications may be also made. Of prime importance is the prevention, if possible, of perichondritis. When there is evidence of this, ice bags should be used externally. When pus has formed, it should be evacuated as early as possible.

The Gastrointestinal Tract.—For vomiting, ice pills, milk and lime water (equal parts in teaspoonful doses every ten to fifteen minutes), carbolic acid (℞ Acid. carbol., 1 gm. [gr. xv]; mist. gummosæ, 100 gm. [℥iij], one teaspoonful every hour or two); *champagne frappé.* The toxic vomiting, of ill omen, is most difficult of control; for this, cocaine hydrochloride (a teaspoonful of 0.1-per-cent solution every two or three hours) may be given; if possible, lavage of the stomach may be tried, or hypodermic injection of morphine. External applications to the epigastric region, sinapisms, or more intense counterirritation, are usually of little avail.

Constipation.—In the beginning of the first week calomel may be used; after that it is safer to use glycerine suppositories or enemata. Saline cathartics have been recommended, but too much peristalsis in the small intestine is risky. In the latter part of the disease it is essential that the bowels be kept thoroughly open; some of the prolonged fevers after the fourth week of the disease are, in my estimation, due to processes of absorption that go on in a relaxed and overfilled bowel. For this purpose the safest and most efficacious cathartic is castor oil. Here the salines given after meals, occasionally preceded by calomel and blue mass, may also be used.

Diarrhea must be checked only when it produces untoward symptoms, weakness, or exhaustion. A rule that can be safely followed is not to interfere when there are not more than two or three liquid stools in the twenty-four hours. When interference is necessary, the diet will have to be changed: less milk or predigested milk; cocoa, cognac, or claret instead of whisky. Medically, the bismuth preparations, especially the subgallate combined with salol (bismuth. subgallat., salol., āā 5 gm. [gr. lxxv] in pulv. No. xv div. One powder every two to four hours); quinine tannate or small doses of opium or morphine may be administered.

Meteorism should be closely watched by the physician; a paretic bowel, overdistended and ulcerated, may lead to serious complications. The most efficacious remedy is the introduction, high up into the bowel, of a large soft elastic catheter (No. XV), to which is attached a long rubber tube, so arranged that its distal end may be put higher than the level of the abdomen. The catheter may be introduced every three or four hours, as necessity arises, and be allowed to remain from five to ten minutes. I have used this method

for many years with signal success and without doing harm in any instance. The ordinary rectal tube should never be used, being too thick, too hard, and too resistant. Neither is it safe to use any form of manipulation of the abdomen, as has been recommended. Turpentine, both internally and in the form of stupes, is highly recommended. I have seen little effect from its use.

Intestinal hemorrhage occurs in from five to ten per cent of all the cases, but the appearance of streaks of blood in the stool does not always mean a large intestinal hemorrhage. When there are general or local evidences of a hemorrhage, then the following method of treatment may be employed: The food must be cold; small pieces of ice may be given; an ice bag should be placed upon the abdomen—if the temperature of the patient is not too low, two ice bags may be used; a hypodermic injection of adrenalin chloride (1.0 to 1.5 c.c. of a 1 to 1,000 solution) should be given, and internally gallic acid or one of its compounds. Morphine may also be administered, either *per os* or subcutaneously. If the hemorrhage is great, as shown by symptoms of collapse, the foot of the patient's bed should be elevated, and as soon as possible large quantities of a 0.90-per-cent solution of common salt (Hamburger) in distilled water should be introduced into the circulation, in order to supply fluid which will keep up the heart's contraction. If there is sufficient evidence that danger is not imminent, this can be done by high rectal injections; if danger is more imminent, then by hypodermoclysis; if there is direct danger to life, then transfusion into a vein should be immediately made. It is always a wise precaution to keep a 0.90-per-cent solution of NaCl, as well as the necessary sterilized instruments, ready for use in the house of the patient.

Intestinal Perforation.—Medical treatment is of no avail. This complication is looked upon as absolutely fatal, although very few who have had large experience with typhoid have not seen spontaneous recovery now and then. But the mortality is so great that surgical intervention is called for. The difficulty lies in an early diagnosis, for it has been shown that the earlier the patient is operated upon the better the results. All possible precautions should then be taken to insure the earliest possible diagnosis; assistants and nurses should be instructed to recognize the suspicious symptoms of perforation, and the patient should be watched carefully. When the diagnosis is made, laparotomy should be done and reparative surgery resorted to. In general practice the results, as yet, have not been so good as those reported by Keen (16 recoveries in 83 cases), but these will improve as the fact is accepted, that every case of typhoid perforation, even if the patient is moribund, should be given the chance of an operation.

Peritonitis, in the majority of cases, is produced by conditions of the bowel which approximate a perforative condition. As such it should be treated like a perforation. Whenever there is evidence of pus, operative interference should be resorted to. Without this the condition should be treated as referred to hereafter.

The Respiratory System.—Bronchitis rarely requires attention. The pneumonias, gangrene of the lung, tuberculosis, and pleurisy should be treated according to the methods to be described hereafter.

The Circulatory System.—The heart always bears watching in typhoid fever. Stimulants are required in a large number of cases; alcohol in cases

in which long-continued effects are desired. For acute myocardial insufficiency produced by dilatation, digitalis may be used (see Treatment of Heart Diseases); in heart collapse, ether, camphor, or musk should be used hypodermically. Dilatation of the heart should be recognized early, and be properly treated.

The Genitourinary Apparatus.—*Toxic albuminuria* requires general attention only. For the treatment of *nephritis* and *pyelitis*, see the proper chapters. *Cystitis* gives much trouble to the patient; it is best treated by the internal use of urotropin, care being taken not to get the unpleasant by-effect; therefore, not too large a dose—0.3 gm. (gr. v), three or four times daily—should be given, and not for a longer period than four or five days in succession. The local treatment of the *bladder* is of great importance; lavage of the bladder with a saturated solution of boric acid once or twice daily; sublimate (1 to 10,000), lysol, creolin, or any of the other mild antiseptics may be used. *Orchitis* is treated externally; by elevation of the scrotum, application of ice bags, strapping, and, when necessary, by incision for the removal of pus. In the female, the conditions arising in the generative organs (abortion, menorrhagia, gangrene of the genitals) must be treated by the proper methods.

The Nervous System.—The inflammatory conditions, meningitis, myelitis, neuritis, will be discussed in their proper places. Those conditions due to toxic affections of the nervous system, like aphasia, as a rule require no treatment; according to their anatomical results they are either self-limited or they produce fatal results. Even if this were not the case, they are very little influenced by therapy. Hemorrhage into the central nervous structures must be treated in the manner to be hereafter described.

The Locomotor Apparatus and the Skin.—Bedsores are best treated by placing the patient on a water bed and by the external application of aristol, iodol, or iodoform. Erysipelas, not uncommon in badly managed hospitals, and diseased conditions of the muscles will be discussed fully under their proper headings. The typhoid spine requires proper orthopedic treatment.

Septicopyæmic Complications.—There is a large number of complications that belong to this class, due to the typhoid bacillus, or more commonly to a mixed infection of streptococci and staphylococci. These complications are found in nearly every organ and tissue; they ordinarily produce suppuration, which must be treated as it would be under ordinary circumstances. The subject will be discussed under the heading of Septicopyæmia.

CONVALESCENCE

The management of this stage is beset with great difficulties. The patient is tired of his diet and begins to be very hungry; the physician is fearful of lurking dangers and does not compromise, so that both physician and patient are decidedly uncomfortable. Here, therefore, as well as in the treatment, rigid rules are of benefit; but these cannot be framed for the individual cases so much as for the average cases, for here again the physician must be able to individualize. After the fever has entirely disappeared—i. e., after the temperature has become normal throughout the twenty-four hours—one week is to be allowed during which the patient is to be looked upon as a probationer ready for further advancement. During this time the treatment must be the

same as it was during the fourth week; especially should no solids be allowed as food. In order somewhat to alleviate the pangs of hunger, I have allowed my typhoid fever patients to chew gum. I have done this for the last twenty years, without harm to the patient, and usually to his great comfort. During the fifth week the temperature need be taken only three times daily—i. e., 6 A.M., noon, and 6 P.M.—and if the patient is awake, only twice at night. Under no circumstances should sleep be interfered with. The temperature and pulse can be looked upon as reliable indices to complications, and no change in treatment should be made, as the bowels and heart are the principal organs to be taken into consideration. When the week is over, the patient must receive some solid food; my own choice is the white meat of chicken. If, after taking this, the temperature shows no change, other articles of diet may be quickly allowed, but always in small quantities; rare meats, beef, mutton, lamb; eggs, poached or boiled; toast or wheat bread twenty-four hours old; light desserts, blancmange, simple puddings; potatoes, mashed or thoroughly baked; fruit jellies or strained apple sauce. These, in addition to whatever the patient still enjoys of his typhoid diet, will be sufficient. At the same time the patient must be allowed to sit up; first, in bed in a semi-recumbent position, then erect, always being propped up with pillows. The physician will do well to watch the patient the first time he sits up in bed, to see that the pulse is not unduly accelerated by the exertion. After the patient has sat up in bed without support he may, the next day, try to sit upon a chair for a short time; the time is then gradually increased, until by the end of the seventh week he may be allowed to sit up as long as he chooses, and walk about in his room. During the whole course of the disease he should refrain from mental activity and excitement; everything calculated to induce these should be kept from him. The exceptions to the above rules are to be found in abortive cases and in those cases in which the fever continues an unusually long time, cases that have been called "bed fever," or, erroneously, as I believe, "typhoid sepsis." In the abortive form the convalescent treatment may be cut short, but the "one week without fever" rule ought always to be observed, as indicated above. According to the strength of the patient, the rest of the time may be much or little reduced. In those cases in which the elevation of the temperature continues for some time after the completion of the fourth week, it is the duty of the physician to search for the cause of this fever. If, after a diligent and conscientious search, all the modern methods of diagnosis having been applied, no cause is found, the patient must be fed with solid food; if, now, the elevation of temperature does not disappear, the patient must be allowed to sit up (Delafield). There is no doubt of the fact that the profession in some cases is overcautious as to feeding and removal from the bed; but, on the other hand, if one has seen a perforation in the sixth week of the disease, it leads one to conservatism. During the period of convalescence the bowels should be carefully examined and regulated. More than once I have seen febrile conditions kept up by fecal retention. Either rectal means, high injections of water or of sweet oil, followed after three or four hours by an injection of warm water, or the milder laxatives, may be used for this purpose.

The time to be allowed before the patient resumes his ordinary vocation and responsibilities varies very much, depending upon external conditions as

well as upon the patient himself. With children, it is well to let six months elapse before they are permitted to go to school, otherwise they will suffer from headaches for a long time. On the whole, it must be remembered that an accumulation of fat, which is the rule after typhoid fever, does not mean strength, and until physical endurance has been regained no patient should be allowed to return to his work. External conditions may make it necessary to assume the burdens of life before the proper time has arrived; frequently this is done without risk, but sometimes with permanent damage. Under all circumstances, a trip to some healthful, diverting, and well-provisioned resort is beneficial after typhoid; this, combined with graded exercise and plenty of sleep, will be followed by a return of strength in a shorter time than without change of scene and surroundings.

II. TYPHUS FEVER

PROPHYLAXIS

General.—Typhus fever is one of the most contagious of diseases. Its cause has not been discovered, therefore we are dependent upon experience, gained by centuries of observation of this great plague, to which has been added the knowledge acquired by the modern study of hygiene, for the measures to prevent its spread. The often quoted sentence of Hirsch, that "the history of typhus is that of human wretchedness," is abundantly true. To combat it in the place of its origin is, therefore, the work of civilization. Hunger, alcohol, overcrowding, filth, improper food, ignorance, poverty, social depravity, and all that may lead to loss of individual resistance (for as far as we know there is no immunity from typhus), must be met by those who wish to exterminate this disease. In civilized countries it is not so much the question of stamping out epidemics as of preventing them. For this purpose reasonable quarantine measures must be applied against those who come from infected countries. If they have been exposed to the disease, an allowance of two weeks should be made from the time of last exposure before they are discharged from observation. All their belongings—clothing, bedding, furniture—should be carefully disinfected, which is probably best done by an exposure to dry heat at 96° C. (205° F.); their persons should be thoroughly clean, and their excretions made harmless by boiling water. When a case of typhus occurs in a community the patient should immediately be isolated in a hospital, and those that have come in contact with him should be kept under observation until the longest known period of incubation (two weeks) shall have elapsed. In the presence of an epidemic, epidemic hospitals, barracks, should be erected, one for the observation of those who have been exposed, and another for the treatment of those having typhus. These two hospitals should be absolutely disconnected with each other, each having a separate service in every particular. When the epidemic is ended, they can be burned down, that we may be sure that the building itself cannot become a source of future infection.

Individual Prophylaxis.—The same rule is to be followed here as is laid down for all the acute infectious diseases. The individual must lead

his normal life, all excesses are to be avoided, but in the presence of an epidemic of typhus, sudden reforms—as in the case of habitual alcoholics, for instance—may be very dangerous experiments. In great epidemics, physicians have been especially predisposed to this infection, but this is no longer the case, unless the physician is exposed to the same cause that predisposed to the production of the epidemic. In 1875, the typhus patients were put into the medical wards in the large hospitals in Vienna; there was no spread of the disease, so far as we who were in attendance knew, and certainly none of those who studied these cases, although they remained in the wards, frequently sitting on the beds with the patients for an hour at a time, contracted typhus. It is strange, therefore, to find authors insisting that such physicians and nurses should be chosen for typhus patients as have had typhus. In this country, so rare is typhus fever at present that very few physicians or nurses could be found if this rule were followed.

TREATMENT

Symptomatic Treatment.—There is no specific medication or treatment; we must therefore depend entirely upon symptomatic treatment. When the disease has developed, the patient must immediately be put to bed, and care must be taken that he have a plentiful supply of fresh air, from 1,500 to 2,000 cubic feet (37 cb.m., Hertel). Alonzo Clark always spoke enthusiastically of the results he obtained in one of the old buildings connected with Bellevue Hospital, New York, in which he had all the windows and doors removed, although it was in the dead of winter. All observers unite in ascribing the utmost importance in this disease to fresh air, from its good effects upon the respiratory apparatus, with an absence of the danger from catching cold. Two beds, one for day and the other for night, are invaluable.

The *diet* should be that employed in all febrile diseases—fluid, nourishing, and easily digested; on account of the absence of intestinal lesions, digestibility and concentrations are of more importance than fluidity, notably during convalescence. In addition to the food, large quantities of fluid should be given to alleviate thirst and to dilute the blood. The intestinal symptoms must be treated as in typhoid; indeed, the symptomatic treatment of this disease is the same as that of typhoid fever; the bladder, the kidneys, the nervous symptoms, all require the same methods of treatment. *Antiseptic measures* should be used in the mouth and nose. All possible preventive measures should be adopted against the development of decubitus, which, in this disease, is of vital importance on account of the condition of the skin. The fever should be treated by *hydrotherapy*, as in typhoid fever; it does not change the course of the disease, as it does in typhoid fever, but it produces all those beneficial effects upon circulation, respiration, and the nervous system that have already been noted. Antipyretics are of little value; the temperature is not even very much reduced by them, but they may be used for special symptoms, as in typhoid.

The heart must be watched throughout the course of the disease; evidences of heart weakening must be immediately met with stimulants—alcohol, valerian and alcohol (Curschmann), hypodermic injections of camphor (dis-

solved 1:10 in oil—Dehio), or musk (Allbutt); strychnine has been recommended for constant use, especially in the adynamic forms. The collapse that may occur about the fourteenth or fifteenth day of the disease, with sudden defervescence, must be anticipated with one or the other of the rapidly acting stimulants mentioned before.

COMPLICATIONS

Complications must be treated according to their indications. The convalescence brings with it great debility and anæmia; the former should be met with good, nutritious food, solid and liquid, including small doses of alcohol; the latter with tonics and the proper ferruginous remedies. It is a good rule not to allow the patient to return to his occupation for at least a month after the complete cessation of symptoms.

III. RELAPSING FEVER (Febris recurrens)

PROPHYLAXIS

Relapsing fever is a contagious disease produced by the *Spirochæta* or *Spirillum Obermeieri.* These organisms have been known since 1873, and are at present universally accepted as the cause of this disease, although the requisites of Koch have not been fulfilled. The fact that the life cycle of the parasite has not been definitely determined explains why absolute laws for prophylaxis have not been established. Tictin, it is true, has shown that bedbugs may carry infection, for he found the spirilla in the blood of bedbugs that had bitten patients with relapsing fever, and he produced relapsing fever in monkeys by having them bitten by infected bedbugs. Unfortunately, this line of work has not been carried out with other insects, and from Tictin's observations we cannot determine whether the bedbug is to be looked upon as the host in which the spirillum goes through one phase of its life cycle, or as simply an innocent transmitter of the bacterium. In either case much has been gained for prophylaxis. The spirillum has not been found in any of the excretions, unless they contain blood, nor is there any evidence that it is found in fomites. There is, however, a small rodlike bacterium that is always found in the blood of afebrile relapsing fever patients; it is looked upon by some as a spore, but its relation to the spirillum, if any exists, has not been determined. Because we have no positive knowledge, we must, for the present, be guided in our prophylactic measures by the general rules that hold good in a large number of infectious diseases. So much can be stated positively, that neither food nor water, air nor earth, can be held responsible *per se* for the transmission of relapsing fever. The principles upon which prophylaxis is based are the same as those of typhus fever. The period of incubation may be as long as sixteen days, and this lengthens the time of detention in this disease. All the belongings of the patient and those with whom he has come in contact should be disinfected. This can be done most effectually by the use of dry heat; the bedding and the rooms, not only of the patient but also of those who have been exposed, should be thoroughly

cleaned with a solution of corrosive sublimate, and afterwards fumigated with sulphur.

TREATMENT

Specific Treatment.—Gabritschewski, in 1895, produced a serum by injecting blood containing spirilla into horses; this was tested upon monkeys with success. In 1896–97 Löwenthal used this serum in Moscow, treating 152 patients symptomatically and 131 with the serum, with the following results:

	TREATED WITH SERUM	TREATED WITHOUT SERUM
Without relapse	47.0 per cent.	12.8 per cent.
One relapse	37.3 "	32.9 "
Two relapses	13.1 "	46.5 "
Three relapses	1.3 "	7.1 "
Four relapses	1.3 "	0.7 "

While the number treated is too small to justify absolute conclusions, yet in the presence of these good results, and with the correct theoretical aspects of the subject, the outlook for the efficacy of this serum is excellent.

Symptomatic Treatment.—*Diet.*—During the attack the diet should be regulated with regard to the tendency to diarrhea. Boiled milk, cocoa, soups with barley, eggs, predigested foods, and, if the appetite is sufficiently good, rare meats and stale bread may be given. Fluid should be given copiously, but not too cold. If stimulants are required, brandy, well diluted with cool water, should be used. Rice or barley water is very grateful to the patient, and alleviates thirst. Constipation, when it exists, should be met by means applied by the rectum. During the afebrile period no special attention need be paid to diet except to bear in mind that it must be calculated to build up the patient for the succeeding febrile period.

The Fever.—This is treated as in typhoid.

In *diarrhea*, small doses of opium are indicated, combined with bismuth, salol, or tannigen. Lavage of the bowels is important, or, if there is evidence of fermentation, small doses of calomel may be administered.

The Heart.—Alcohol is of importance, especially in those accustomed to its use. The treatment is the same as in typhoid.

The Pains.—The antipyretics—phenacetin, antipyrin—given in small doses and tentatively, may do good service. For the headache it is wise to apply an ice bag. If this does not give relief to the pains, opium, morphine, or chloral should be used.

Collapse should be treated as described under typhoid. Saline transfusions are very valuable; *vide* typhoid hemorrhage. The so-called "bilious typhoid" of Griesinger is nothing more or less than a septic form of recurrent fever, and should be treated like septicopyæmia.

Complications should be treated as they arise.

The **convalescence** is uneventful, except in severe cases, when the symptoms must be met.

IV. SMALLPOX (Variola)

PROPHYLAXIS

Prophylaxis can, in this disease, be summed up in vaccination, isolation, and disinfection.

VACCINATION will be reserved for the following chapter.

ISOLATION.—As soon as the diagnosis of smallpox is made the patient should be removed from his surroundings, and those also who have been exposed should be placed under observation until the period of incubation is passed. These last should immediately be vaccinated, as it has been repeatedly shown that when vaccination is successful during the first week of the period of incubation, smallpox is either prevented or modified. The means of segregation must vary in accordance with the financial condition of the patient. The ideal method is the removal of all patients with infective diseases (the acute exanthemata, diphtheria, etc.) to a properly constructed hospital; but it is questionable whether the patient who can command every attention at home is benefited by removal to a public hospital. It is a nicely balanced question, also, to decide which is of more importance, the infraction of personal liberty or the prevention of the spread of disease; but, as in all things, compromise may be wisely and beneficially made, so that in individual cases both personal liberty and safety of the community may be retained. The erection of pay hospitals for infectious diseases would cut the Gordian knot, thus giving to the wealthy all the privileges the poor have in well-established hospitals and insuring perfect isolation. Under no circumstances should a physician consent to treat a patient with variola in a private house unless the means for isolation are good. The patient himself must be looked upon as a source of infection until all the crusts have fallen off, which occurs in some cases as late as the fourth or fifth week; the disease is rarely, if ever, contagious during the period of incubation.

When the decision has been reached that the patient shall remain in his own house, a room on the top floor should be selected, large, well ventilated, well lighted, and with an open fireplace, shut off from the rest of the house, but not too far from the bathroom and water closet. In other words, all possible precautions should be taken that infection shall not be carried by the air. The rooms should be stripped of everything that is not necessary for the comfort of the patient; therefore pictures and bric-a-brac should be removed, window curtains taken down, the closets, shelves, and drawers emptied, and the carpets taken up. The patient must be served from the kitchen, but the food must be transferred to dishes that cannot be taken outside of the sick room except to be disinfected and cleaned.

DISINFECTION.—As disinfection plays a very important part in all the eruptive fevers, it will be disposed of in this connection. It must be effected with the greatest care, and everything that comes in contact with the patient must be free from infectious material before others are exposed. The physician must be scrupulously careful not to become the carrier of infection. For this purpose it is best for him to take off his overcoat, coat, and vest downstairs, and, before going into the sick room, to put on outer garments which

can be sterilized and always kept on the same floor as the patient. Upon leaving the room these outer clothes are immediately taken off, and the physician must now sterilize himself as far as he has been exposed. The hands must be carefully washed—if the physician must come into very direct contact with the patient it is better that he wear rubber gloves, as sterile hands seem to be impossible. For the disinfection of the hair and beard alcohol may be used; with these precautions there is no danger of transmission of the disease. The nurses must not be allowed to come in contact with the rest of the family; they must live on the same floor with the patient, and before going out for exercise must change their clothing and sterilize their hair. Everything used by the patient should be kept in the sick room—thermometer, syringes, bedpan, etc. The water closet should be daily disinfected with a solution of corrosive sublimate (1 : 1,000). As boiling-hot water is an essential, the proximity of an apparatus for heating water is necessary; a gas stove, when perfectly arranged, may be kept in the sick room; if it vitiates the atmosphere, it is better to keep it in the bathroom. All secretions and excretions of the patient should be subjected to the action of boiling-hot water, corrosive sublimate, or formalin. All the linen and clothing used by the patient and nurse should be treated in the same way before they are washed. The strictest cleanliness of the patient and his surroundings should be insisted on. This includes clean air and plenty of it; in few diseases is fresh air of so much importance as in the eruptive fevers; the eloquent sermons that Hebra was wont to preach on the driving in of eruptions are still of use. If the fear of draught exists, the bed can be protected by screens; the wise physician knows how to do for his patient without giving offense to the entourage. Great care must be taken not to allow the patient to go out too soon. It is much better to err in the right direction—i. e., to keep the patient away from others for the maximum time—than to take the risk of spreading disease. As a rule, it is the mild case that spreads the disease; the patient with a severe one is kept in bed by his illness, the subject of a mild case goes out after the first febrile period has subsided. If the patient dies, it must be remembered that, especially in smallpox, the corpse is a source of infection. The corpse should be wrapped up in a sheet soaked in sublimate, and the funeral should take place as soon as possible. Public funerals in these cases should never be permitted.

When the patient is ready to leave his room he should be given a cleansing bath, his hair should be thoroughly disinfected, and he should then put on clothing that has never been in the sick room. The room itself should then be thoroughly cleaned and disinfected. Everything that can be destroyed by fire should be burned. This applies especially to books and playthings. Formaldehyde seems to be uncertain, but it does destroy superficial germs; therefore the room should be filled with formaldehyde gas and allowed to remain closed for twenty-four hours. After this comes the thorough cleansing: the walls, if papered, should be cleaned with dough containing corrosive sublimate; if painted, they may be washed with a solution of the same material; the ceilings must be cleaned in the same way. The floors must be thoroughly scrubbed, as well as all the furniture. The mattresses and pillows should be sterilized by dry heat; when this is not possible they should be burned or thoroughly cleaned; new covering should always be made for them. When

all this has been done, the windows should be opened, the doors closed, and the room left uninhabited for a week. As so laborious and expensive a method as the one just described must be justified by results, the writer has never, in a wide experience, known a second case develop when it has been carried out conscientiously. But under no circumstances should disinfection be used as a substitute for vaccination; it is only an aid to the prevention of the spread of the disease; any attempt at making it take the place of vaccination is followed by the usual result of laxity in vaccination, spread of the epidemic.

TREATMENT

Specific Treatment.—No one has ever been able to cure smallpox. Many attempts have been made at specific medication, all without avail. There is no serum therapy, and vaccination, after the first week of the period of incubation, does no good. During the period of invasion it may become necessary to give relief to the pains in the back and head. Antipyrin, phenacetin, lactophenin (for a review of the coal-tar products, see the chapter on Influenza) are used, and with some success. It frequently, however, becomes necessary to give to the patient a subcutaneous injection of morphine, or, if possible, opium or morphine by the mouth. The ice bag at the head is of value for headache. Insomnia is relieved by Dover's powder. During this period the enanthem develops, and there should be local therapy of the mouth and nose; not only will this conduce to the future comfort of the patient, but it may prevent secondary infections. For this purpose small doses of sodium salicylate (1 to 1.5 per cent aqueous solution—one teaspoonful every hour) may be used internally. In addition, local applications may be made to the nose by the "nose bath"—i. e., allowing the fluid to flow into the nose under little pressure; to the mouth and pharynx by means of gargles, sprays, or by douching the mouth. For these purposes the following may be used: Boric acid (two-per-cent solution); lime water, pure for the mouth, diluted for the nose; creolin (three quarter per cent) or carbolic acid (one per cent), neither to be used with children; listerine, resorcin (0.2–0.4 per cent), salicylic acid (three per cent); for the mouth only, potassium permanganate (one quarter to one per cent). Whatever is done in this direction should be done thoroughly; the applications should be made every three to four hours; even gargling with pure cold water or a normal saline solution is of value.

FORMS OF SMALLPOX

Variola Vera (discrete).—The diet should be the same as in all acute febrile diseases, yet it is a remarkable fact that even in confluent smallpox the appetite may be remarkably good. Under these circumstances the diet list may be extended so as to include meats, but care must always be had that the condition of the digestive apparatus warrants this addition. Fruit juices are of value because they allay thirst and may have a beneficial effect upon the bowels. Alcohol should be used only by those who use it habitually; as a rule, there is no necessity for its administration in this form of smallpox. Large quantities of fluid should be given. The patient should remain in bed; he may feel so well in the afebrile period that this seems ludicrous

to him, but he saves his strength for the fever of maturation and does not spread infection. Indeed, it is during this afebrile period, in mild cases of variola, that infection is commonly spread. In 1875 a widespread epidemic was started in Cincinnati by a colored roustabout, who, in the afebrile period, left his boat and walked through the streets; finally, after exposing very many people, he was sent to a hospital by the decree of an outdoor clinic.

The Period of Eruption.—This requires very little treatment. If any attempt is made at the prevention of pitting, it must be begun early. So much difference of opinion exists among authors as to the possibility of accomplishing this that a conclusion cannot be drawn until the whole subject is reinvestigated in a sufficiently large number of cases. In order to prevent pitting, it is necessary either to prevent the formation of the pustule, or to limit its development so that the true skin is not affected. For either purpose it has seemed that the exclusion of light and air is indispensable. The action of the actinic rays of light led Finsen to the theoretical conclusion that exclusion of these rays by filtration through red, or the exclusion of daylight altogether, would have a decided effect upon smallpox. This was enthusiastically verified by Danish and Swedish physicians (Lindholm, Svensden); the vesicles dried up, there was no fever of maturation, the disease became less fatal, there were fewer complications and no pitting. Sir John Moore, of Dublin, in his extensive article in "The Twentieth Century Practice of Medicine," tested the method in a severe case of smallpox, with eminently satisfactory results. Day and Juhel-Renoy assert that pitting is less—i. e., that suppuration is beneficially affected. Not all, however, who have tried this method agree as to its modifying the course of the disease. In order to carry it out, the window blinds or the window panes should be painted red, and the door be covered by a red hanging; in other words, the room should approximate as nearly as possible a photographer's dark room. It is absolutely necessary to obtain that shade of red which excludes all actinic rays. The difficulty to be overcome is ventilation: in a hospital with special ventilating apparatus this is not difficult; in a private house, an open fireplace is of great service; otherwise either a special apparatus must be constructed, or the treatment can be only partially carried out.

Most of the external applications have proved unsuccessful; opening the pustules has been given up; the exclusion of air by elastic collodium and cauterization with silver nitrate are delusions. The external application of antiseptics would naturally suggest itself, and has been tried in various ways; the patient wears a mask covered with some form of paste, and his hands and feet are bandaged. For this purpose carbolic acid has been recommended (four to ten per cent); it is of doubtful value, and the toxic effects are sometimes painfully in evidence. Ichthyol (twenty per cent in collodium or twelve to fifteen per cent with vaseline) is safer and just as efficacious. Gelatine colored red has been used with considerable success (Barlow). Mercurial plaster, corrosive sublimate, salicylic acid, boric acid, resorcin, dermatol, and many other substances, have been used. Cold compresses are recommended by Hebra and by Curschmann. In order to facilitate desquamation the crusts may be soaked with oil, glycerine and water may be frequently applied, or linseed poultices may be used.

Confluent Smallpox.—As this form presents a veritable septicopyæmia, some of the methods recommended in the section devoted to that subject might be tried. Otherwise, at the present time, there is only one method that serves to give any results—the use of the continuous warm bath. This method was first introduced by Hebra, and its efficacy is satisfactorily verified by such excellent authorities as Stokes, Curschmann, and Kaposi. In hospital practice there is no difficulty in applying this method; indeed, no special hospital ought to be without an arrangement for continuous baths; in private practice the difficulties are not insurmountable, as I know from personal experience. Even in discrete cases this method is of enormous value, especially in the removal of the crusts and the consequent shortening of confinement, and in preventing and allaying the skin symptoms. In hospital practice the bath may be arranged as directed by Hebra. In private practice the bathtub will have to be constructed for the purpose; its dimensions should be at least eight feet long, four feet wide, and three feet deep. A wire-woven mattress should be securely fixed in such a way as to leave from six to nine inches between it and the bottom of the tub; into this space an opening should be made for the intake of hot water. The cool water should be removed by a siphon from as near the top level of the fluid as possible. The patient being ready for the bath, blankets are put upon the mattress, and pillows at the opposite end from the intake. Water pillows or the ordinary pillows may be used. The water is now allowed to run into the bath; its temperature at the level of the patient should be 100° F., perhaps 105°, or even 110° F. In order to prevent too rapid cooling of the surface of the water by evaporation, as much of the bathtub as possible is to be covered over with a blanket. Hebra has introduced a special apparatus for the irrigation of the face, but in private practice a mask may be kept moist and compresses applied to the head. As in all cases of severe smallpox, the patient must be incessantly watched by the nurse, on account of the danger of his doing harm to himself. The nurse must also take the temperature of the water frequently. The patient may be allowed to remain in the bath for any length of time necessary to produce results; I once saw a patient in the General Hospital, at Vienna, with Pityriasis rubra, who had been in the continuous baths for months. In smallpox a minimum of from seven to eight hours is required to produce effects; in Sir William Stokes's case the results were "instantaneous and marvelous." The bath produces effects by reducing temperature; it acts upon the nervous system, lessening the excitement, the delirium, the insomnia; it improves the circulation and causes evacuation of the pustules and cleanses the ulcers; the latter is most important, because it is a causal indication. As the result of the bath, a wild, irrational, unmanageable patient becomes sane and docile, with a sense of relief to himself and to those about him. That the bath will act favorably in every case must not be expected, as in all infectious disease local, general, or individual conditions may exist that would resist any remedies. In this form of smallpox alcoholic stimulants must be given with a free hand, the dose to be increased or diminished as the effects are produced upon the condition of the heart and the pulse.

Hemorrhagic Smallpox.—(1) Purpura Variolosa.—Treatment is of no avail, as in all cases the patients die. It must be left to the intelligent physician to give such relief to the patient as the art of medicine provides. Stimu-

lants should be given freely from the beginning, as they serve to fulfill one indication—to prolong life with the remotest possibility of saving it.

(2) Variola Pustulosa Hæmorrhagica.—The continuous bath should be used here; Stokes's case, already referred to, belonged to this class, and the patient recovered. Lavage of the blood might be tried; transfusion has given no results. The tincture of the chloride of iron, given in large doses—thirty minims, well diluted, every two or three hours—has been recommended, as well as gallic and tannic acids and ergotine. Alcoholic stimulants must be freely used from the beginning. Hemorrhages must be treated according to their special indications; when there is a tendency to collapse, hypodermoclysis or transfusion of normal saline solution should be used.

COMPLICATIONS

Suppurative Processes.—In the skin, the muscles, the joints, the parotid, and the ears, these should be treated according to their indications. Erysipelas will be treated of in the proper chapter. The treatment of the complications on the part of the eyes belongs to the realm of specialism. Prophylactically the conjunctiva should be treated by instillations of boric acid, strict cleanliness in removing secretions, and by external application of ice water or small ice bags for the swelling of the lids.

The Respiratory Tract.—Epistaxis should be treated as in typhoid; the same can be said for laryngitis. Œdema of the glottis or severe perichondritis may require tracheotomy. The treatment of bronchitis, the pneumonias, pleurisies, etc., will be found under their respective headings.

Circulatory Apparatus.—Nothing need be added to what has been said under I, II, and III except that here again the heart should be constantly watched.

Digestive Apparatus.—The prophylactic measures described before hold good for the treatment of the complications of the mouth. Glossitis, when sufficiently well marked, should be treated by incisions, otherwise by the continuous application of cold in the form of ice or of small bags of cheese cloth filled with ice; these, in delirious patients, are perfectly safe, as they can be fastened to the outside, thus preventing the risk of their being swallowed. Vomiting should be treated as in typhoid. Diarrhea, which when excessive is very debilitating, can be controlled by bismuth preparations, the vegetable astringents, and opium. Constipation is easily controlled by the ordinary mild laxatives.

Nervous System.—The complications in the brain, the spinal cord, and the peripheral nerves are due either to toxic or bacillary causes, and will be described in their appropriate chapters. It may again be noted that the mental state of the patient in severe cases requires constant watching; the nurse must not be allowed to leave the patient for an instant. To quiet the excitability, whether it be motor, sensory, or psychic, the sovereign remedy is opium, given in large doses by the mouth, if possible; when this cannot be done, then morphine subcutaneously. Trional, tetronal, sulphonal, hypnal, all have been found of very little use in this disease. Next to morphine, chloral hydrate in sufficient quantities is of great service, given either by the mouth or by the rectum; the bromides give relief to the nervousness. Hyoscine

hydrobromate may be used for motor restlessness, provided the irritation is central.

Genitourinary Apparatus.—Orchitis, inflammation of the ovaries, menorrhagia, metrorrhagia, abortion, and premature delivery in pregnancy must be looked for and treated. Nephritis is to be treated according to the rules laid down in the respective chapters.

SEQUELÆ

Excessive results from pitting may, after a long time, be treated by plastic surgery. For the alopecia little need be done; if there has been destruction of the hair follicles, it is permanent; if this is not the case, the hair grows without artificial aid. When there is furfuraceous desquamation, this should be treated by the application of oils with disinfectants, chloral hydrate, or resorcin, and the head should be shampooed. For pigmentation, which may last a long time, nothing can be done. The psychoses that follow should be treated, although they usually end in recovery.

V. VACCINATION (Vaccinia)

From the time that Jenner published "An Inquiry into the Causes and Effects of the Variola Vaccinæ, a disease discovered in some of the Western Counties of England, particularly Gloucestershire, and known by the name of Cow-pox (London, 1798)," vaccination has been adopted by all civilized people. For one reason or another it has always met with opposition; at the present time this opposition has been united with the formation of a sect, the antivaccinationists.

The opposition to vaccination rests on two propositions: 1, That it does no good. 2, That it does harm. The first proposition is maintained by juggling with statistics and taking cognizance of the fact that, in a certain percentage of cases, vaccination does not protect. After all is said and done, the final decision of this subject rests with the medical profession; for, in the first place, it alone can properly interpret results; and, secondly, it is improbable that vaccination, if useless, would be approved by so many successive generations of medical men. The selfish motives that have been attributed to physicians by antivaccinationists, who cannot grasp the spirit of the medical profession, are best answered by the simple statement that vaccination is less remunerative than an epidemic of smallpox. That vaccination may do harm must be admitted; but the chances of ill effects are too slight to be considered, and modern methods are constantly lessening these chances. There is another class of opponents to vaccination, with "conscientious scruples," whose existence has been recognized by the last English vaccination act, but whose legal status has, unfortunately, not been defined. "Conscientious scruples" are outside the pale of science except as to their results, which in this case already show that they tend to aid the spread of smallpox. Compulsory vaccination and revaccination are our best means for the prevention of smallpox; as has been shown in Germany, where from 1889 to 1893 only 572 inhabitants, or 2.3 out of the one million, died of smallpox; without compulsory vaccination

in Belgium, the mortality during this period was 252.2 in a million; in Austria, 313.3; and in Russia, 836.4.

In English-speaking countries anything that is compulsory immediately meets with opposition; it is therefore necessary with vaccination, as with so many other subjects, for the physician to help by his influence in educating laymen.

THE METHOD OF VACCINATING

PRECAUTIONS.—The object of vaccination is to effect the utmost protection with the least possible bad results. The *operator* must see to it that he is aseptic; he must prepare his hands as he would for a surgical operation, or wear rubber gloves. The instruments should be carefully sterilized, vaccinators should never be used; in order to prevent secondary infection, it is a wise rule never to vaccinate twice successively with the same instruments. The best way to vaccinate is to use the ivory points, which must be thrown away after use, or needles, which can be sterilized by passing them through a flame. The patient's skin should be prepared by a good scrubbing with soap, then with weak sublimate, and finally with alcohol or sterilized water.

The *virus* should be from an unimpeachable source. Humanized virus should not be used unless a situation arises which compels it, and then only with the utmost precaution as to its source. Bovine virus alone should be used. In these days of commercial strenuousness, great care must be taken to select the proper kind of virus; in some States the vaccine farms are inspected by the proper authorities, which may mean much or little according to the character of the authorities. The comparatively frequent occurrence of tetanus after vaccination during the epidemic of 1902 has somewhat shaken the confidence in our vaccine purveyors; fortunately it was shown that the tetanus could not have been produced by the virus. Aseptic virus does not exist, in the strict sense of the word, but it is desirable to find virus containing few and nonvirulent pus producers.

The virus is collected by curetting the whole of the pustule from the calf, and is then mixed with glycerine and prepared for distribution; or the crust of the cowpock is taken off and then sold—a form of virus that should never be used. For the market the glycerine pulp is spread upon ivory or celluloid points, or diluted with glycerine and collected in capillary tubes, which are then hermetically sealed. The objections to the capillary tubes are several. It has been repeatedly shown experimentally, and verified by experiences, that glycerine destroys the organisms contained in the lymph; consequently, when the lymph is old it is no longer active; when the lymph is too fresh, it produces results that are too violent; the happy mean between virus too active and too inactive can be found with great difficulty. Virus preserved in this form should never be used until it is at least one month old. Copeman has used it with success after it had been kept for eight months, and he states that this same virus, forty-two weeks old, gave one hundred per cent success in Dr. Cary's hands. A very practical objection to the use of this form of virus is to be found in the fact that it takes very long to dry; in the rush of an epidemic, with its consequent number of vaccinations and revaccinations, time is very valuable to the practitioner. I have used the points ever since they have been introduced. The advantages are a reasonable guarantee of

freshness, because they cannot be kept for any great length of time without losing their activity; the fact that they are just as aseptic as the capillaries; that they give less trouble in transportation; that the point can be used as a safe vaccinator; that the virus can be applied more accurately and dries very rapidly; and finally that the results are quite as good as by any other method.

SITE OF OPERATION.—I vaccinate only on the arm; the leg may be scarified in adults, but never in children. My experience has shown me that post-vaccinal complications are much more frequent when the leg is vaccinated; this is due to the proximity of the genitals and the rectum, and to a difference in the circulation of the lymph and the blood. The only reason offered why the leg should be chosen is that in girls scars upon the arms are unsightly; very little trouble is found in overcoming the æsthetic objections of fond mothers by placing the marks high up on the arm, where they will be covered when the young lady is in full uniform.

The NUMBER OF INSERTIONS to be made is of vital importance. My medical parents taught me that one insertion protected as much as two or more; experience soon showed that the more thoroughly primary vaccination was done, the more unsuccessful revaccination became. Statistics have shown that at least four insertions are necessary, preferably one half inch apart. Mr. Gayton's table, reported by the late Sir Richard Thorne Thorne to the English Commission on Vaccination, is here appended:

THIRTEEN THOUSAND SEVEN HUNDRED AND FIFTY-FIVE CASES OF SMALLPOX, CLASSIFIED ACCORDING TO THE VACCINATION MARKS BORNE BY EACH PATIENT RESPECTIVELY.	PERCENTAGE OF DEATH IN EACH CLASS RESPECTIVELY.	
	From 1836 to 1851 3,094 cases.	From 1852 to 1867 10,661 cases.
Stated to have been vaccinated, but having no cicatrix ...	21.7	39.4
Having 1 vaccine cicatrix ...	7.6	13.8
" 2 " cicatrices ...	4.3	7.7
" 3 " " ...	1.8	3.0
" 4 " " ...	0.7	0.9
Unvaccinated ...	35.5	31.9

The results have been corroborated by Seaton, Gayton, Sir James Paget, Sir William Savory, Sir Michael Foster, and Sir Jonathan Hutchinson, who were members of the Royal Commission. But manifestly neither the number of insertions nor the number of cicatrices, although Ernest Hart showed that these had a direct relation to mortality in smallpox, can be considered in all cases as a perfect index of complete vaccination; hence the instructions of the Local Government Board, that "the total area of vesiculation on the same day in the week following the vaccination should not be less than half a square inch." The neglect of these precautions in this country abundantly explains the prevalence of smallpox (1902–3), and, at the same time, its mild nature.

INTRODUCTION OF THE VIRUS may be effected in three ways: by incision, by scarification, and subcutaneously. *Incision* has been given up as unnecessary, and as risking more or less washing off of the virus. *Scarification* is almost universally used in this country. No blood should be drawn during the operation; the lines should be drawn with the scarifier close together, in two directions,

at either right or obtuse angles to each other, and the area should not be too large, one inch of skin being left between the scarified places. After the scarification the virus is rubbed in and allowed to dry. When dry, a piece of sterilized absorbent cotton is applied, and held in place, if necessary, by a strip of zinc oxide surgical adhesive plaster. This may be allowed to remain undisturbed for three days, after which time the plaster is removed with care so that no abrasion of the skin shall take place, and the cotton so as not to disturb the vesicle formation. A vaccine shield, when properly constructed, may be used for the first three or four days, but should be taken off as soon as the areola forms, as its presence commonly results in producing increased inflammation and swelling, because of obstruction to the blood vessels and lymph vessels. After the third day of vaccination the arm should be sponged or douched twice daily with sterilized water, and aristol should be used, preferably in the form of a one-per-cent salve mixed with vaseline and thickly spread upon the cotton. By the use of salves the formation of the crust is somewhat delayed, but the danger of outside infection is lessened. The patient or the nurse should be instructed to handle the arm only after having provided for absolute cleanliness. Covering the arm with clean cotton prevents its coming into contact with the clothes, and also protects it to a certain extent against mechanical violence. *Subcutaneous introduction* of the virus has been unsatisfactory in my hands; before it can be accepted as the general practice we must have a better guarantee of the quality of the virus.

PRECAUTIONS REGARDING THE SUBJECT

Before vaccinating, the child ought to be carefully examined to see that it is well.

Age.—When a child has been exposed to variola it should be immediately vaccinated; but the idea that a newly born infant suffers less from vaccination than an older one is false. No child should be vaccinated before it is from three to six months old, unless there is an emergency. Old age does not secure immunity in smallpox, and consequently, during an epidemic, the old should also be vaccinated.

Season.—If it is possible to choose the time of the year, it is best to vaccinate in the early spring or the late autumn. In summer, diarrheal troubles are present, and in winter eruptive and pulmonary diseases.

Condition of the Child.—In undeveloped children vaccination should be postponed until the child has caught up with the average for its age. Syphilitic children should be thoroughly treated before vaccination is performed. If they must be vaccinated before treatment is completed, one insertion of virus should be made so that partial protection, at least, is afforded. A child with skin disease, especially if there be abrasion, should not be vaccinated unless necessity compels, when the utmost precautions should be taken that the diseased skin is not infected.

Condition of the Environment.—As injury from vaccination is most frequently produced in the children of those who are, from necessity or otherwise, most careless of themselves, special precautions should be taken with the dressings. In the presence of an acute contagious disease, vaccination should be performed only when absolutely necessary.

POST VACCINATION COMPLICATIONS

When all the foregoing precautions have been taken, complications are exceedingly rare. When the physician, thoroughly realizing that he is producing a source of infection, possibly the infection itself, impresses this fact upon the attendants, much will be done for prophylaxis. The attendants should therefore be instructed in the most painstaking and dogmatic manner, every act being reduced to a method. What may be done is clearly shown by the results of Voight in Hamburg, who, out of 100,000 vaccinations, had only nine complications, and but one death. A great deal of the opposition to vaccination will disappear when the medical profession has become thoroughly aroused to the importance of the surgical aspect of the question.

Erysipelas should be looked for, and directions must always be given insuring its early recognition, for the earlier it is treated the better the results. I always include this complication in my instructions by telling the attendant that when the areola covers a space greater than an inch in diameter, the child must come under observation and treatment. For the treatment see the appropriate chapter.

Ulceration.—The ulcers must be kept thoroughly clean by irrigation with sterilized water two or three times daily, large quantities being used. When shallow, the ulcers may be treated with aristol or bismuth subgallate as a dry dressing. When the ulcer is deep, ichthyol (five-per-cent salve) or aristol (one-per-cent salve) is thickly spread upon cotton or lint and the ulcer packed with it, the irrigation being continued.

Glandular abscesses are treated by cold or heat, and are opened early. For the treatment of **septicopyæmia** see the proper chapter. In *generalization of the vaccinia* the general and local symptoms should be treated as those of mild smallpox. The **fever** should be treated as all fevers are treated in the acute infectious diseases. In children the warm bath should be used. For restlessness full doses of bromide usually suffice. **Syphilis,** which was formerly so much dreaded, can no longer be ascribed to the vaccine virus when it is bovine. Transmission of syphilis from the surroundings or by instruments is possible, but it no longer affects the question of vaccination. **Tuberculosis.**—Copeman, Blaxall, and Klein have shown conclusively that the tubercle bacillus is destroyed in glycerinated lymph properly prepared; but even when humanized lymph was used, transmission of tuberculosis, if it ever occurred, was exceedingly rare.

SEQUELÆ

Eczema and impetigo contagiosa sometimes develop after vaccination, and require treatment. Enlargement of glands, which may persist for some time, also may require attention.

REVACCINATION

As immunity from vaccination is only temporary, revaccination should be carried out as faithfully as primary vaccination, and with the same precautions. Immunity after primary vaccination lasts for from seven to ten years;

in the German army ten years is accepted; it is safer, however, to revaccinate after seven years. Beyond this the indications are the same as those for vaccination; when exposure has taken place revaccination should be performed as soon as possible. During an epidemic those who have gone beyond the limit of time should be revaccinated. It is becoming the custom, sanctioned by public opinion, to have revaccination performed when one or more cases are reported in a community. When revaccination has been successful this is not necessary; if it has been unsuccessful, it is justified. The fact must not be lost sight of that vaccination is followed by a small number of casualties, so that when the physician is called upon to perform an unnecessary revaccination, this fact should be put in its proper light to the patient.

IMMUNITY

When can we accept an individual as immune to vaccinia? D'Espine asserts that less than one per cent are immune; Crookshank says immunity to vaccinia does not exist. I have never seen a child that could not be successfully vaccinated, although in one case six attempts were necessary; but such a case rarely occurs, and the difficulty in the case mentioned was probably due to lack of receptivity on the part of the child and to the quality of the virus. It is certainly safer to go on the theory that every child can be successfully vaccinated. In revaccination one attempt is sufficient, provided the virus is perfect; but in case of failure, there should be revaccination whenever occasion requires it. *Vaccinoid* must, at present, be looked upon as a partial success only.

VI. VARICELLA (Chicken Pox)

PROPHYLAXIS

In institutions children should be isolated and all the usual precautions should be taken; the disease is directly, and probably indirectly, contagious. In private practice, isolation will be found practically impossible; in a disease like chicken pox, in which a fatal issue is extremely rare, this should not be insisted upon by the physician except when the spread of chicken pox in the family might cause existing diseased conditions to be made much worse, or even to jeopardize life. The patients should be kept away from other children and not allowed to go to school, though both these rules are carried out only imperfectly. As there can be no compromise situation in regard to the spread of an infectious disease, the position of the medical profession as to the isolation of chicken pox is altogether wrong. Either isolate or pay no attention to chicken pox; there is no halfway place. Neither morbidity nor mortality has been reduced since the half-hearted attempts at isolation have been introduced. Mortality cannot be reduced; let us then try to reduce morbidity by isolation. But morbidity results in so little that the question can be answered only by the test whether enough good can be accomplished to warrant all precautions that are necessary in this disease to prevent its spread. As far as the family is concerned, with the exception before noted, I never prescribe any restrictions.

TREATMENT

The patient is usually allowed to be the judge whether he wishes to remain in bed or out of it. If the symptoms accompanying the beginning of the eruption warrant it, the patient must be forced to remain in bed; adults usually prefer the bed. The fever and accompanying symptoms receive the same treatment as in the other eruptive fevers. The itching, most marked in neurotic individuals, is best met with menthol applied as a salve (five per cent to ten per cent) or in alcoholic solution; alcohol and water in equal parts; compound zinc stearate, with menthol or some inert powder, such as talcum or wheat starch powder. The pitting can be prevented by the use of one or other of these external applications, but in some cases bromides, or even chloral, must be given, to relieve the intense nervousness which is produced by the irritation in the skin.

The mouth and throat may require special attention (v. Stomatitis). Desquamation can be facilitated by baths, and by the application of oils or glycerine and rose water to the crusts. When the condition of the patient and the weather permits, the patient may be allowed to go out of doors as early as the end of the first week; frequently, without permission, children go out much earlier, without harm.

COMPLICATIONS

The complications are so rare that they need not be feared; infection from the skin (ulceration and gangrene) must be guarded against; nephritis occurs (v. Diseases of the Kidney); intercurrent disease must be treated without reference to the chicken pox.

The disease is contagious until desquamation has been completed; therefore the patient should not be allowed to come into contact with others until all the crusts are removed.

VII. SCARLET FEVER (Scarlatina)

PROPHYLAXIS

Scarlet fever has the greatest radius of contagion; wherefore the greatest precaution, on the lines put down for smallpox, should be exercised to prevent its spread. The disease is not contagious during the period of incubation; little, if at all, during the period of invasion; most contagious during the period of eruption, and decidedly so during the period of desquamation.

During the prevalence of a scarlet-fever epidemic, as well as of other serious contagious diseases, the question always arises whether the schools should be closed. Country schools should be closed, because the children live so far from one another that infection may be prevented. City schools are best kept open because the children, especially in those schools in which the children come from overcrowded districts, are under better sanitary conditions in school than out of school, and are not so likely to come into such close contact, and for so long a time, with each other in school as out of school.

Exceptions will be found to the application of the latter ruling, especially where the sanitary conditions of the schools are bad. The method now introduced of having all children inspected by a physician immediately before they enter school has been followed by excellent results in the reduction of the morbidity and mortality of contagious disease, and should be adopted everywhere.

The room, the bed covering, the ventilation and temperature of the room, all are the same as noted under smallpox. In scarlet fever the hygiene of the mouth is of the utmost importance; it is asserted that the poison enters by the tonsil; certainly the streptococcus may enter the general circulation by this way, the prevention of which is of highest importance, not to mention the prevention of the various forms of bacillary manifestations that are found in the mouth and the throat (v. Smallpox).

Diet.—The importance of an absolute milk diet from the beginning has been overestimated; other observers have not been so fortunate as Jaccoud, with his fifteen years' experience in scarlatina without a case of postscarlatinal nephritis. During the first two or three days the diet must be regulated by the condition of the digestive organs, so that, as a rule, very little food can be taken by the patient. Afterwards and throughout the course of the disease the patient is put on two quarts of milk daily, for the following reasons: (1) A large quantity of fluid is added to the blood, reducing its toxicity and causing a greater amount of secretion by the kidneys; (2) this quantity of milk is sufficient to keep up a febrile child's nutrition, because usually it is easily digested and contains sufficient caloric value; (3) in the present state of our chemical knowledge, we are justified in assuming that the results of meat nuclein metabolism are more injurious than milk nuclein (paranuclein). When the patient cannot take milk, egg or vegetable albumen may be substituted, with the addition of carbohydrates (the latter as in typhoid). If, as occurs sometimes, the milk produces digestive troubles, it may be modified by the addition of lime water, gruels, cocoa, Mellin's or Horlick's food, or carbonated waters; kumyss or kefir may be tried, or predigested milk. Outside of digestive idiosyncrasies, the feeding must always be controlled by daily examination of the urine for albumin; in ordinary cases the method is kept up for four weeks; in nephritis, until the urine has been free from albumin for a week. In both conditions the patient is first tested by giving him meat; if albumin is not found in the urine, the patient may gradually, but quickly, be put upon his normal diet.

The rules for giving water and the diet will be found in the chapter on Acute Nephritis.

TREATMENT

It is necessary to premise that in scarlet fever all therapeutic results must be accepted with the greatest reserve. Remedies that seemed to have proved invaluable in one epidemic, or even a succession of epidemics, have been absolutely without value in another, in consequence principally of the change of type in the disease. When we have tens of thousands of cases, running through a number of years, to judge results by, as we have in the treatment of typhoid fever and in vaccination, our conclusions as to the efficiency of a remedy are of value.

SPECIFIC TREATMENT.—The methods of using specific treatment in scarlatina are:

(*a*) The injection of *serum of convalescents* into scarlatina patients, as reported by Huber and Blumenthal (12 cases) and Leyden (3 cases). Without discussing the results, this method should not be used, because it involves too much risk to the patients.

(*b*) *The use of a serum.*—The preparation of the sera used in scarlet fever is based upon the principle that the manifestations in this disease are due to two causes—the scarlatina virus itself and a specific streptococcus. The streptococcus is used for the preparation of the serum under consideration. The work has been done by two observers independently of each other: Moser, working with Paltauf and Escherich, in Vienna, the latter confirming the results, and Charlton in the J. H. R. Molson Pathological Laboratory, McGill University, Montreal.

Moser's serum is the result of injecting living cultures of streptococci, taken from the blood of patients who died of the disease, into horses. Charlton does not give the details of the preparation of the serum that was used by him. Moser has injected 84 cases, selecting especially the bad cases, with the following results: (1) The earlier the injection the better the result; (2) the larger the dose the better the result; (3) fever is abruptly cut short, the exanthem does not develop fully or disappears early, nervous symptoms disappear, the pulse is reduced in frequency, the heart improves, the throat improves, and other complications (pus-producer infection, nephritis) are lessened in frequency of occurrence; (4) the serum acts by producing immunity; (5) the ordinary results of serum injection are produced; (6) the mortality is reduced (the average of mortality without serum in the Vienna children's hospital for the year being 13.09 per cent; with serum, 8.99 per cent).

Charlton's results, based on 15 cases only, in the main agree with those of Moser. He says: "It does not cure scarlet fever, but its timely administration in the severe cases tends to allay unfavorable symptoms, overcome complications, and, given at an early stage of the disease, it prevents a fatal termination." In the few cases in which I have seen this serum (which can be obtained in this country) used, it has produced the effects claimed for it, notably on pulse and temperature. It must be added that, especially theoretically, the whole subject is still very undecided. Aronson states that there is no specific scarlet-fever serum.

SYMPTOMATIC TREATMENT.—*Fever.*—The use of hydrotherapy in scarlet fever has become thoroughly established; indeed, it is one of the first of the eruptive fevers to have been treated in this way (Currie, 1798). The various means that have already been described must be used in ratio to the severity of the case, the temperature and the existence of nervous symptoms being the guides. In very severe cases the patient should be bathed every two hours night and day, the temperature of the bath varying from 16° C. (60° F.), in older children, to 20° C. (68° F.) in younger ones. To give relief for the nervous symptoms, sopor, stupor, or coma, the patient should be put into the cold bath and cold water poured over his head. Great judgment must be used in the application of these apparently harsh methods. Jürgensen gives the following as contraindications to the cold bath: (1) When there exists heart

weakness from any cause (inclusive of anatomical changes, pericarditis, endocarditis, myocarditis) which is not relieved by stimulants; (2) dyspnœa produced by narrowing of the upper air passages; (3) hemorrhages (nose, throat, eroded blood vessels, or the hemorrhagic diathesis); (4) all inflammations of joints. Here the method is too painful, and therefore defeats itself. I would add to these that scarlet fever in young infants should also be excluded, as dangerous collapse must always be feared; in them the bath at 100° F. may be used, and for the milder nervous symptoms the hot bath at 110° F. Antipyretics should not be used for reasons stated in the chapter on typhoid. The *general infection* will be treated of in connection with septicopyæmia. The routine use of alcohol in scarlet fever is to be deprecated; it is not required for food, as the fever is of short duration; for the purpose of stimulation it may be used in appropriate cases; but even then there are remedies the action of which is more efficient. The fact must not be lost sight of that alcohol irritates the kidneys, and this is one of the most important things to be prevented.

COMPLICATIONS

Nose and Throat.—The same rules hold good here as in smallpox. In streptococcus pseudomembranous affections, streptococcus serum should be used; if in the throat, Löffler's iron-toluol solution [1] should be applied directly twice daily (v. Diphtheria); if in the nose, the use of some mild antiseptic (boric acid, salicylic acid), well diluted and injected frequently into the nose with little pressure by means of a large syringe; or the ordinary douche may be used with the same precautions as mentioned in smallpox. Frequent applications of irritating substances, like Löffler's solution or hydrogen peroxide, must be avoided. Löffler's solution is painful, and its application to the nose, even when diluted, would give rise to great resistance in children, as a result of which more harm than good would be done. Heubner has recommended the injection of carbolic acid, by means of an especially constructed syringe, into the tonsils and soft palate. Good results seem to have been obtained by Seibert and many other authors. In gangrenous sore throat the method applied for stomatitis gangrenosa might be used.

The ears always require watching in scarlet fever. The slightest evidence of collection of fluid in the middle ear should be followed up by paracentesis tympani and by local treatment. Involvement of the mastoid region should be relieved by the mastoid operation; the earlier it is done the better the results. Especially is this the case in children, where fatalities from the operation are rare.

The Lymphatics.—Moderate enlargement of the lymphatics is a normal condition in scarlet fever. But when, after the first fever has disappeared, the lymph nodes become painful and swollen, active measures must be taken. They consist in attempts to control the inflammation or to hasten the process so that it may be reduced to a surgical condition. The first indication is fulfilled by the ice bag and by moderate pressure upon the gland. The ice bag must be properly applied—i. e., so as to lie upon the glands; a layer of

[1] Löffler's solution: Menthol, 10; solve in toluol ad 36 c.c.; alcohol absolut., 60 c.c.; liq. ferri perchlorid., 4 c.c.

new flannel should be put upon the skin, and the ice bag should remain day and night. Pressure is applied by the use of flexile collodium (49 parts of collodium, 1 part of castor oil—Austrian Pharm.—without turpentine, as is directed in the British, German, and United States pharmacopœias), the coating to be kept intact by repeated applications. If fever continues and the gland does not become smaller, poultices should be applied, the use of collodium being continued, especially around the periphery of the node, in order to prevent infection of the superficial lymphatics (v. Erysipelas). After three or four days of poulticing, a small, deep incision should be made, sooner if fluctuation is present, the poultices to be continued. Even if pus has not been found, the incision does good: it relieves tension and makes a place of less resistance into which the pus can flow when found in larger quantities. Injections of weak antiseptics, carbolic acid, hydrogen peroxide (not to exceed one per cent), are made into the incision. If large quantities of pus form, a deep and large incision should be immediately made. If, notwithstanding all that has been done, cellulitis or angina Ludovici develops, the skin should be incised wherever there is swelling, and collargol or unguentum Credé applied, so as to be introduced into the subcutaneous tissue. Enlargement of lymph nodes after the disease has run its course is best met with syr. ferri iodidi or small doses of pure creosote (℥ ss.–ij three times daily).

For *nephritis* and *uræmia*, as well as the heart complications, the reader is referred to the proper sections.

The *rheumatism* is either septic, tuberculous, or genuine articular rheumatism, and must be treated accordingly (v. chapters on these respective subjects).

The Gastrointestinal Tract.—The vomiting should be treated as outlined under typhoid fever; as a rule, it ceases with the appearance of the eruption. Diarrhea should be treated as to the portion of the bowel from which it comes: if from the small intestine, by diet and bismuth, astringents, or opium; if from the large intestine, by means of injections (v. Diseases of the Bowels).

SEQUELÆ

The debilitated condition in which serious attacks leave patients is to be met with iron preparations, and plenty of food and fresh air. The local damage to the joints, ears, and heart is to be met by appropriate treatment.

CONVALESCENCE

When desquamation begins, it is wise to take measures to shorten the period of convalescence. This can be done by hastening the process of desquamation itself. Schneeman was the first to use inunctions in scarlet fever, claiming specific properties for them. While there is no evidence that they act in this way, they undoubtedly prevent the dissipation of the scaling skin, and they facilitate its removal. For these purposes I have my patients rubbed twice daily with some clean fat containing much water—cacao butter, cold cream, or lanoline—and daily the patient receives a warm bath, the water of which is carefully disinfected after it has been used. For the feet and hands, frequent soaking in warm water is of value. No patient should be allowed

to leave his room until desquamation has been completed; this refers only to the desquamation of the disease itself, not to that which frequently follows it, due to irritative processes in the skin. The mild cases are those which must be especially watched; not only do they spread contagion, but also, when normal complications develop, especially nephritis, the physician is usually blamed. For the present, it is absolutely futile to argue against the "catching cold" theory of the origin of nephritis in scarlet fever, although that has been abundantly disproved by a number of observers. In order to prevent the development of nephritis and to disarm criticism, the patient, in a normal case of scarlet fever, should be kept in bed for three weeks at least. In no case of scarlet fever should the patient be permitted to leave the room under four weeks, and in a large number of cases desquamation is not completed until the end of the sixth week. It is doubtful how long a patient who has had only the enanthem without any eruption should be kept isolated; unfortunately, these are the cases which frequently spread contagion; certain it is that they should be kept under observation until there is no probability of desquamation appearing, which, when there has been no eruption, should be at least two weeks. If after this time the throat is perfectly normal, the risk of carrying contagion is reduced to a minimum. It has been stated before that contagion exists during the period of desquamation, although this has been denied in some quarters (Lemoine). While this question has not been settled beyond doubt, yet circumstantial evidence is so complete (Sanné's case and others), that in order to do our patient full justice we must act as if all scientific evidences were perfect in the direction of contagiousness of the scales. In all other directions the convalescence is to be treated as it is in all the other eruptive diseases. When the physician has observed carefully every symptom of his patient, it is not likely that he will make the mistake of discharging him too early.

VIII. MEASLES

PROPHYLAXIS

Of all the eruptive fevers, the spread of measles is the most difficult to prevent. This is due to various peculiarities of the disease. There is practically no natural immunity, as is shown by the fact that when a population which has not been protected by former epidemics is attacked, nearly everyone becomes infected (Faroë Islands, Samoa); no age is exempt; second and third attacks of the disease are more common than in any of the other exanthemata. While it is positively stated that measles is only directly contagious (Kerschensteiner), a statement that cannot be accepted positively until the cause of the disease has been discovered, measles is the one disease that is most contagious during the period of incubation before a diagnosis can be made. On account of the fact that people know that most children will have the measles, and erroneously suppose that the disease is more dangerous to adults than to children, it is much more difficult to carry out isolation than in other diseases. Frequently children are purposely exposed to contagion. This must be opposed by all right-minded physicians; we have no right to advise or to further

morbidity; besides, although an epidemic may be very mild, we have no sort of guarantee that one or the other patient may not develop complications which may terminate fatally. But in addition to this, there is a class of children who should be especially protected: children under two years of age; children that have an inherited or local tendency to tuberculosis; rachitic and so-called scrofulous children. The mortality in public institutions is much higher than in private practice; all prophylactic measures should be carefully carried out by their authorities. In measles the closing of the schools must be seriously taken into consideration, because of the contagiousness of the disease during the period of invasion. If the children are examined immediately before entering school, no interruption in school attendance need be required. In order to prevent contagion, the healthy children must be kept from school for at least two weeks; those in whom there is an absolute necessity for preventing an attack of measles should be sent away from home, so as not to take the risk of exposure, until a time more favorable to them has arrived. The patient should be isolated, as in the eruptive diseases; but as the radius of infection in measles is small the precautions recommended in smallpox and scarlatina need not be carried out so minutely. If measles can be carried by a third person, it is only by contact with the secretions (eyes, nose, bronchial tubes) or, possibly, with the desquamation, so that the wearing of an outer garment, washing the hands, face, and hair is all that need be done by the attendants or physicians before coming in contact with others. As a matter of fact, most physicians pay very little attention to self-disinfection in measles, but the least that can be expected is that the physician shall arrange so that a certain length of time elapses before visiting healthy children.

Hygiene.—In no other eruptive disease is there so much room left for hygienic reform as in measles. As nearly all the symptoms and all the complications of measles are those that have been ascribed to "catching cold," to prevent this the ingenuity of man has been exhausted in devising means to exclude fresh air from the patient. This has been impressed upon the laity so long and so often that the wise physician must frequently compromise, and do only those things that are necessary to the welfare of his patient. In all infectious diseases, and especially in those in which respiratory troubles exist, fresh air is of paramount importance, even at the risk of a draught, which, however, can always be prevented. Fresh air does more good to the patient than the draught does harm; as Jürgensen says, "better draughts, notwithstanding winter cold, than bad air."

The patient's room should be one of which the ventilation is as good as possible; except for special indications it is unnecessary to have more than the normal amount of moisture in the air, therefore no extra evaporation of water, as has been so often recommended, is advisable. The temperature, as in all sick rooms, should be between 60° and 70° F.; the higher the temperature, the less oxygen inspired with every inspiration, the more active the skin, which in a great many cases is undesirable. The room should not be kept dark, unless the condition of the eyes demands it; for prophylactic purposes it is not necessary.

If the light hurts the patient's eyes, it can be excluded from him by changing his position or the position of the bed, or by using screens. If

photophobia exists, then the room should be darkened; but it must always be remembered that light is beneficial in all infective diseases, and that darkness, as a rule, prevents the thorough carrying out of the physician's measures and depresses the patient.

The clothing and bedclothes should be light; there is nothing gained by keeping the patient in a constant sweat. If there is anything in the catching cold hypothesis, disease is courted in this way, unless the patient is hermetically inclosed. The clothing should be changed as often as is found necessary for cleanliness; Heim's pathognomonic odors of the exanthemata were principally due to lack of cleanliness, not to the disease. To insure cleanliness further, lukewarm baths may be given every day or every other day; if they meet with great opposition, sponging the patient under the bedclothes with equal parts of warm water and alcohol is nearly as efficient.

Cleanliness of the nose and mouth should be looked to as in the eruptive diseases already described.

DIET.—During the period of fever, the diet should be the same as in all diseases characterized by a short febrile period. Cold water can be given in large quantities, but not too cold, as we do not wish to stimulate peristalsis too much. When the fever has disappeared the diet may be normal, except that laxative foods should be avoided, as diarrhea is justly feared in measles; therefore not too much fruit, cold articles of diet, or laxative drinks. In severe cases with complications the diet should be prescribed according to the nature of the complications and the condition of the patient.

The patient should be kept in bed until the exanthem has entirely disappeared. Desquamation cannot be relied upon to determine the time of getting up, because of its frequent absence. If it is present, the patient should certainly be kept in the room until it has ceased. When the patient gets out of bed, he may be allowed to amuse himself as he chooses. Unless some contraindication is present, after two weeks from the beginning of the disease the patient may go out of doors.

The room in which the patient has been kept must be thoroughly aired before being occupied again—formaldehyde disinfection is useful—and all the clothing should be disinfected and aired.

TREATMENT

We have nothing that approaches causal treatment; therefore it is only the symptoms that can be met. An ordinary case of measles requires little, if any, treatment except the hygienic one.

The FEVER, when not productive of nervous symptoms, may be met by giving lukewarm baths (96°–98° F.); if the fever is prolonged, these may be given every two hours. Only when severe nervous symptoms develop should the more active hydropathic measures be used; even with convulsions, the lukewarm bath, as a rule, is sufficient. But in very bad cases of measles the method of Currie may be tried.

Antipyretic remedies should not be used, except in very minute doses, for the relief of nervous symptoms, headache, or great restlessness. If these are not sufficient, an ice bag at the head, a mustard plaster at the nape of the neck, leeches at the mastoid, are recommended, and the latter do

no harm in robust children. The bowels should be emptied by rectal injections.

If CONVULSIONS are not checked by hydrotherapy, chloral hydrate may be given by the rectum or by the mouth. Large doses are well borne by children, and in the intervals between the convulsions the bromides should be given. The action of chloral is so satisfactory that as a rule other remedies are unnecessary. (See chapter on Infantile Convulsions.)

The cough always requires attention; if it is well-marked and dry, moisture should be added to the air by a croup kettle or a pan of water on the stove or the radiator, or by hanging strips of moistened material in the room, or by using an inhaling apparatus. An expectorant mixture may be given containing ipecac, ammonia, or very small doses of apomorphine. The following has been found useful:

℞ Infus. radicis ipecacuanhæ, 0.05–0.10 (gr. ss.–gr. 1) ad..... 75.00 (℥ jss.).
Ammonii chloridi ..... 0.3–1.00 (gr. v–x).
Syrupi tolutani ..... 25.00 (℥ ss.).
S. One teaspoonful every two hours.

Opium and codeine phosphate should be given to children only when the cough comes from the larynx, the trachea, or the larger bronchi; to adults, codeine may be given with impunity.

When, in children, the cough is of a croupy nature, prompt relief may be given by round doses of sodium bromide. For the treatment of bronchitis see the appropriate chapter. The itching of the skin can be relieved by menthol.

COMPLICATIONS

The Respiratory Tract.—For the treatment of epistaxis, laryngitis (catarrhal or diphtheritic), bronchitis, pneumonia, pleurisy, consult the proper chapters. It may be well to remember that the ordinary inflammations—i. e., exclusive of Klebs-Löffler diphtheria or gangrenous processes—are due to the specific manifestations of the measles poison. Both Cornil and Babes and Köster have described a form of pneumonia peculiar to measles. Köster believes that pneumonia, in this disease, is a form of measles infection, the desquamation which takes place in the smallest bronchi leading to inflammation, which is conducted by means of the interstitial pulmonary tissue along the blood vessels. Thus even here the physician may have an easy conscience if his patient should, by any chance, have "caught cold." More importance should be attached to secondary infections; to cleanliness of the mouth and upper air passages; to clean air; and to the removal of patients with pneumonia from others who have measles. Under all circumstances, as long as the physician finds it necessary to visit the patient, the lungs should be examined daily in order to recognize the complications early, at a time when therapeutic efforts are most successful.

The Gastrointestinal Tract.—Stomatitis ulcerosa and rarely noma must be looked for and treated. Diarrhea should be immediately attended to, especially in the lower section of the bowel, as it may become very dangerous.

The Eyes.—These should be kept clean; no secretion should be allowed to collect; frequent washing with boiled or distilled water should be resorted to. If violent conjunctivitis, keratitis, or iritis occurs, it should be treated as recommended in the special works on these subjects.

The Ears.—For earache, small doses of phenacetin or a few drops of a two-per-cent solution of atropine and cocaine may be warmed and dropped into the ear. As soon as the tympanum bulges it must be punctured; the otorrhœa is to be treated from the point of view of the specialist.

Septicopyæmia.—All localized or generalized pus-produced infections should be treated as described in the appropriate chapters.

SEQUELÆ

These are not so common as they were twenty-five years ago, as we not only guard against them in a scientific way, but also more effectually treat the original trouble so that no sequela is produced. Of all these sequelæ tuberculosis is the most common, and mindful of this we ought to meet any persistent consolidation of the lung with all prophylactic measures necessary to prevent tuberculous infection. (For the treatment of Tuberculosis consult the proper chapter.) Chronic otorrhœa is very stubborn, and frequently requires all the resources of the trained specialist, but the earlier that treatment is begun the better will be the results. The chronic diarrheas, very rare nowadays, tax the therapeutic skill of the practitioner to the utmost.

CONVALESCENCE

No specific treatment is needed except for severe cases, which require tonics such as iron and quinine, creosote, cod-liver oil, and plenty of easily digested food in sufficient quantity, with change of air when necessary. Under all circumstances, measles convalescents must be kept away from possible infections: whooping-cough, tuberculosis, or diphtheria.

IX. GERMAN MEASLES (Rubella)

PROPHYLAXIS

It is not necessary to isolate in this disease in private practice, as there is no mortality. In hospital practice, where mortality has been observed, the same precautions should be taken as in scarlet fever. The patient should be kept isolated for two weeks, certainly until desquamation has been completed.

TREATMENT

Only symptoms can be met by treatment; as a rule it consists of a light diet, with hydrotherapy for the fever, but this does not become necessary in the majority of cases. Treatment of gastrointestinal and respiratory symptoms may become necessary. Nephritis occurred in one of my cases; before discharging the patient the urine, therefore, should be examined.

X. EPIDEMIC PAROTITIS (Mumps)

PROPHYLAXIS

Mumps is looked upon as a disease of very little importance. From the point of view of mortality alone there is some justification for this opinion, but on the other hand occasionally a patient dies from a complication. During the period of sexual activity lesions develop in the sexual apparatus; in adults the disease is accompanied by much suffering, and in schools or garrisons by much morbidity; therefore great expense and loss of time are incurred. For these reasons cases of mumps should be isolated; as a rule this meets with great opposition, as there is no unanimity of opinion in the profession, and as the layman has a contempt for mumps, unless he is himself infected. There are practical difficulties in the way also: mumps is very contagious during the period of incubation, which may last as long as five days, and the contagiousness may last from two to three weeks, being lessened after the eighth day of the disease, and it is both direct and indirect. In the adult this means a great loss of time to one who feels himself perfectly well, but by pointing out the possibility of sexual complications, the patient can usually be prevailed upon to keep quiet for eight or ten days at least. In children this complication does not occur, unless it be in a sexually precocious child, so that the fear of infecting adults must be used as an argument for isolation. Little can be done as to the indirect carrying of contagion, for it is doubtful whether there is necessity for strict precautions in this direction, as the cause of mumps has not been discovered, and especially as mumps is looked upon as a trifling matter. Laveran's advice, that children should be exposed to infection, should not be heeded, for the reasons given in connection with measles.

The patient should be kept away from others for two weeks after the swelling has developed. Taking the natural history of the contagion into consideration, disinfection of the room and clothing of the patient should be attended to; in schools, barracks, or hospitals, all these precautions are absolutely necessary; in private practice I have never seen it done; indeed, I have never found it necessary.

TREATMENT

Mild cases require no treatment beyond rest. In children, as well as in adults, the fever may require attention, the same as has been recommended in the preceding febrile diseases. The diet need not be restricted except as the condition of the patient requires; no patient at rest should receive the same diet as he is accustomed to when at work. Not infrequently the swelling of the parotid gland interferes with mastication; then the diet should be made up of semisolid or liquid food: milk, ice cream, oysters, soups, gruels, paps, scraped meats, jellies, bread soaked in milk or water. I have never found it necessary to feed by the nose or by the rectum, but complications making this necessary may arise. The necessity rarely arises to put the patient on an absolute milk diet.

The swollen gland should be covered with cotton; if the pain is very great, warm applications may be made, as heat is better borne than cold; inunctions

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may be used—lanolin with menthol or camphor (two per cent), camphorated oil, chloroform liniment, opium, cocaine, belladonna, hyoscyamus, have been recommended. Any one of, or all, these external applications are of doubtful utility, as far as the local condition is concerned, except the warmth, but they give relief to the patient. The pains become so great at times that antipyrine, chloral hydrate when insomnia is also present, or even the subcutaneous use of morphine must be resorted to. As in all the other febrile infections, it is necessary to guard against secondary infections from the mouth and nose.

In the excessively developed cases, with hyperthermia and nervous symptoms, the treatment should be the same as in all the other infections.

COMPLICATIONS

The most common is orchitis in the male; in the female, much more rarely, inflammation of the external genitalia, the breasts, and the ovaries. We are still in the dark as to the ætiology of these complications, although we can reasonably claim that the morbid agent of mumps produces them. All that we can do to prevent them is to keep the patient quiet; when once they have been developed they are treated according to the special methods prescribed. The still rarer complications on the part of remote glands—lachrymal, thyroid, the lymph nodes; of the heart, the kidneys, the respiratory apparatus, the gastrointestinal tract, the nervous system, and the ears, are treated in the manner stated in the chapters devoted to these diseases.

XI. WHOOPING COUGH

PROPHYLAXIS

In few diseases can so much be done by prophylaxis; in few is so little done. A glance at some mortality statistics will show how necessary prophylaxis is for whooping cough. In this country, in 1896, the mortality in whooping cough was next to that from scarlet fever (10,201 in the former, 11,045 in the latter); in 1880, 10,313 died of whooping cough, 10,142 of scarlet fever, and 5,481 of measles. W. W. Johnston has shown that in Washington, D. C., more (358) died of whooping cough than of scarlatina (274) or measles (175); he furthermore makes the statement that in this country more than 100,000 children die of whooping cough every ten years. The average mortality varies from five to fifteen per cent, depending largely upon the nature of the population, being greater in very young children among the lower classes than among the well to do, and much greater in hospitals than in private practice.

With this in view, prophylaxis becomes very important; indeed, of equal importance with that in any infectious disease. Fortunately, whooping cough, in the majority of cases, is directly contagious. It has been shown that the secretions from the respiratory tract carry the infection; these, then, must be looked to with great care. The infectiousness of the disease begins immediately with its onset, reaches its maximum in the paroxysmal stage, and then declines. It is impossible to determine accurately when infectiousness ceases.

Filatow and Fischel assert that this continues as long as the patient coughs at all. I have always followed the following rules: No case of whooping cough should be considered free from infection (1) unless six weeks from the onset of the disease shall have elapsed; (2) until the whoop shall have disappeared completely; the whoop that may recur with ordinary infections of the respiratory tract is not taken into consideration; (3) until expectoration shall have practically ceased; a recrudescence of expectoration as the result of a secondary infection is not to be counted. It will be seen that this means a variable period of isolation—from six to ten weeks, and sometimes more. The patient should be kept away from all who have not had whooping cough. One attack confers immunity. Children under two years of age or debilitated children should be most carefully guarded against infection; also subjects with a tuberculous predisposition or valvular cardiac trouble, or convalescents from any disease which has caused debility. A child with whooping cough should not be allowed to sleep in the same room with healthy children, to go to school, or to any place where a number of people are confined in large or small rooms. Exceptions to the latter may be made when the expectoration can be collected and disinfected; best upon linen, muslin, or Chinese napkins, which then can be burned. It is impossible to collect the expectoration, as can be done in tuberculosis, because we are dealing mostly with children, who cannot control themselves as adults do. The attendants must see that they do not carry the disease to others, being minutely careful to clean away from themselves all traces of expectoration. It is wise to have the room in which the patient has slept thoroughly cleaned and disinfected with formaldehyde gas.

HYGIENE.—Only in the severe and complicated form is it necessary to keep the patient in bed. It has been shown that the number of attacks is directly dependent upon the amount of CO_2 present in the atmosphere. For this reason alone the children ought to be kept in the open air as much as possible, provided the air is clean—i. e., free from dust. In cities, days must be selected when they can be out of doors all the time; under all circumstances they must be protected against the dust; veils should be worn by younger children especially.

When the air is pure, secondary infections are less liable to occur than when the patient is kept indoors. The fact that in cities the air is apt to be the carrier of infection is the only reason why children should be sent away; change of climate does not cut short the disease, but the number of attacks is diminished and complications are avoided. The principal thing to be looked for in the place to which the patients are sent is the sanitary condition; the seashore, the mountains, or a removal a short distance into the country are all suitable, provided the place is otherwise satisfactory. There is no difficulty about finding a place; the difficulty lies in finding a place where the patient is acceptable on account of his disease, and this is the natural result of the carelessness in preventing contagion in whooping cough.

The FOOD must be adapted to the individual case, but it is principally a question of feeding the child sufficiently; for, unless the general condition is reduced, digestion is very little impaired. When the appetite remains unimpaired, the child may keep to its normal diet, given at short intervals; if this is below normal or entirely gone, then easily digested concentrated foods should be given. The food should be mechanically unirritating, as every

irritation of the pharynx will be followed by an attack. Trousseau's advice, that the food be made up principally of solids, holds good for mild cases in older children. Every meal that is lost by vomiting should immediately be replaced by another. Medicinal means for prophylaxis have failed.

TREATMENT

The ideal treatment would consist in absolute prophylaxis and causal medication, to prevent the disease from running its course when once developed. What can be done in the first direction has been pointed out; it will now be shown what can be done in the latter.

Causal Treatment.—In order to determine the efficiency of any agent it is necessary to keep an account of the number of attacks in twenty-four hours; in doing this we also get an idea of the severity of the disease. We divide the patients into three classes: in the first class, the mild, the attacks number fifteen or less in twenty-four hours; in the second, moderately severe, between fifteen and thirty; in the third, severe, more than thirty, an attack being counted only when the cough is accompanied by the whoop. A convenient record can be kept by piercing a hole with a pin in a card; this is especially recommended for the night, when the greatest number of attacks usually occurs. The number can then be transferred to a chart.

It must be stated that the earlier any drug is used the better the result. For causal treatment, a number of remedies have been used in order to destroy the bacilli; these have been applied locally and internally. The local application of drugs has been made to the pharynx, the nose, and the larynx, in the form of solutions, inhalations, sprays, or insufflations, and a large number of drugs has been used—carbolic acid, salicylic acid, turpentine, tar compounds for inhalations, silver nitrate, resorcin, cocaine, potassium bromide, corrosive sublimate, quinine, boric acid, etc.—and good results have been reported from their use. I have had excellent results by insufflating quinine into the larynx, using a modification of Letzerich's formula (quininæ sulph., 2 gm. (gr. xxx); sodii bicarbonatis, pulv. acaciæ, āā 1 gm. (gr. xv), of which a small quantity is blown into the larynx twice daily. But I have given up all local therapy, except in very severe cases, because, as will be shown later, quinine does just as well when administered *per os*. At present the tendency is to give up local therapy except for special indications, such as hypersecretion, which is best controlled by turpentine inhalations. It has been shown how important fresh air is in whooping cough; the inclosure for any length of time in rooms saturated with moisture, or any medicament, therefore, should be discouraged.

Symptomatic Treatment.—Great stress must be laid upon the psychical management of children with whooping cough; this element makes it very difficult to estimate accurately the value of a remedy, and to explain adequately the good results obtained by excellent observers which have not been verified by others. It is a notorious fact that children are very amenable to suggestion. In some children any psychical irritation is followed by an attack; care, then, must be taken not to cause this irritation; if possible, the patient must not be crossed or allowed to play; he must be kept absolutely quiet or amused in a simple way. It is a well-known fact that children are more or less able

to inhibit attacks of whooping cough; they should be encouraged in this, and by proper suggestion a large number of attacks can be prevented.

The most useful drug in whooping cough is quinine, which probably acts both causatively upon the organism of pertussis and symptomatically upon the nervous system of the patient. It was first used as calisaya bark by Rosen von Rosenstein and by Cullen, and its use was rehabilitated by Binz, who has done more than any other individual in working out its physiological properties. In order to produce the desired effect it should be given in large doses —i. e., 1 cgm. (gr. $\frac{1}{6}$) for each month of age, and 1 dcgm. (gr. jss.) for each year up to 3 dcgm. (gr. v), three times daily. Unless there is an idiosyncrasy, the administration of quinine to children offers no difficulties. Neither the sulphate nor the tannate should be used: the former on account of its taste and bad effects upon the stomach, while the latter, given with chocolate, always produces constipation. Euquinine, dissolved in water without sugar, is taken without difficulty by children, and does not produce vomiting, but otherwise is followed by all the good and bad physiological effects of quinine. It must be given in nearly double the dose advised for quinine. I have never found it necessary to use quinine subcutaneously, as advised by Ungar, but I should not hesitate to do so in a very severe case, especially when nothing can be retained on the stomach. Unbelievers in the efficacy of quinine in this disease can be easily converted by the observation that when the drug is discontinued too early, the attacks increase in frequency and severity.

The other remedies that have been used can be conveniently classed under the headings of those that affect the nervous system and the so-called expectorants; the latter are of little value, and only to be used as secondary treatment.

First among the *nervines* comes belladonna; atropine is difficult of administration to young children. So excellent an observer as Jacobi believes belladonna to be the best remedy in whooping cough, and when used properly good results follow. One great advantage produced by belladonna is that results follow, even when the treatment is begun late in the paroxysmal stage.

The best preparations are the tincture and the Extractum belladonnæ radicis fluidum (U. S. P.); it is best to begin with small doses, and increase them until physiological effects are produced on the pupils. In the fluid extract care must be taken to get the extract made from a good quality of root; otherwise no effects will be produced, even with enormous dosage, and much time will be lost.

The coal-tar products—antipyrine, phenacetin, acetanilide—and their combinations have been largely used, but the effects are not so satisfactory as those noted by using the two preceding drugs. Antipyrine is much in use in France; Comby says of it that when used in sufficiently large doses—0.25 to 0.50 gm. (gr. iij$\frac{3}{4}$ to gr. vijss.) (this to be multiplied by the number of years of the patient for each dose)—its "action is certain," but the careful paper of Ganghofner does not confirm this statement. My experience with this drug is satisfactory; it lessens the number of attacks but not the duration of the disease.

Upon the authority of Henoch, morphine has been used; the danger associated with its administration, particularly to young children, should, in my opinion, be a sufficient contraindication, especially as codeine, which is harmless, produces the same effect upon the cough with no unpleasant after-

effects. If a narcotic is to be used, chloral hydrate is the safest and the best with children. The bromides may be used in conjunction with quinine or belladonna, and sometimes are of value. Stepp's recommendation of bromoform has found little favor, on account of the uncertainty of its action and the danger attending its continued use, to say nothing of the cases of accidental poisoning by taking overdoses.

Vaccination should not be used as a remedy against whooping cough; the results are doubtful, and it is adding another disease to one which may require the patient's whole resistance.

The number of remedies mentioned in the United States Dispensatory as being used in this disease is 71. Until a specific is found, those mentioned in the text should be sufficient for ordinary use.

In *excessively developed* cases, it is asserted that the number of paroxysms has gone to 100 in twenty-four hours; I have seen 62. The object of the treatment here must be to reduce the number of attacks, for by them the patient is reduced to a pitiable and dangerous condition. Chloral hydrate has served me very well, when given according to Bouchut's method in chorea (q. v.); the drug can be given by the rectum, if necessary, with excellent results. Codeine, also, in large doses is very valuable. Here the *feeding* is of great importance: the food should be given in small quantities, immediately after the attack, in the form of concentrated foods—eggs, somatose, predigested milk, beef juice, and the carbohydrates; stimulants must be given.

The acute dilatation of the heart which usually occurs in these cases requires digitalis; the routine administration of digitalis in whooping cough is unnecessary, and may do harm.

COMPLICATIONS

Most of the complications are due to the strain of coughing; for this reason, if for no other, the reduction of the number of attacks frequently obviates complications; thus interstitial emphysema, pneumothorax, subcutaneous emphysema, the various hemorrhages (subconjunctival, cerebral), the hernias and prolapsus ani, and the sublingual ulcer may be largely prevented. For the last the application of potassium permanganate (one-per-cent solution) every two hours, or occasionally touching with the mitigated stick (nitrate of silver), is necessary to give relief from pain and to prevent secondary infection. The most common complication of whooping cough is bronchopneumonia, which is attended by great fatality, especially in children under one year of age (v. Pneumonia). Spasm of the glottis, which occurs to a greater or less extent in all cases, may become very serious. O'Dwyer and Northrup suggest intubation in these conditions.

CONVALESCENCE

Here the treatment must take into consideration the inanition, the psychic state bordering sometimes on melancholia, and especially the question of tuberculosis and emphysema. Food, tonics, are indicated, and the removal to a proper climate should be seriously taken into consideration after bad cases of whooping cough.

XII. INFLUENZA

PROPHYLAXIS

During a pandemic, prophylactic measures are usually neglected. In this disease, oftener than in others, this neglect occurs because its importance is underestimated and because prophylaxis is so difficult. We know the cause of the disease and the habitat of the bacillus, and yet the disease continues to become epidemic. If we look more carefully for the reasons we find many; the period of incubation is very short, therefore the disease spreads to a large number in an incredibly short time; among this number a large percentage is not sufficiently ill to be confined to the house; therefore, as influenza is directly very contagious, these unconfined persons contribute to the increase of cases; and, lastly, one attack does not produce immunity for any great length of time, possibly, even, it induces a predisposition. In addition, all attempts at producing artificial immunity have failed; and it has been shown that the influenza bacillus may live for years in the human body—in the cavities of phthisical subjects, for instance—so that at any time these patients may give rise to a local or general epidemic.

Another difficulty presents itself in the fact that during the last ten epidemics Pfeiffer's bacillus could be found only in the first few days of the infection, so that the diagnosis could not be made from the expectoration so accurately as it is in tuberculosis. A subjective diagnosis varies very much according to the individuality of the physician; where one speaks of a cold, the other calls an attack influenza; all widespread epidemics of "colds" should be looked upon as influenza, call it influenza vera or influenza nostras, with or without the presence of Pfeiffer's bacillus. We have seen repeatedly how factories have been closed, railways hampered, industry crippled, and commerce injured by epidemics of influenza. We also frequently see that when money value and life value are weighed against each other, money value weighs the more.

Influenza is carried along the line of human travel; quarantine would, therefore, be a logical consequence. This is impossible, on account of the low mortality and the number of patients. Yet, with all these apparently insurmountable difficulties, much may be done in the way of prophylaxis. The method of treating the individual consists in a measure of prophylaxis. All discharges from the nose and expectorated material should be collected and disinfected; the influenza bacillus is easily destroyed by the milder antiseptics or by heat (60° C. or 140° F.). Immediate contact between healthy and sick should be restricted. The aged, the sick, the phthisical patients, and those suffering from bronchial, renal, and cardiac affections should be protected from infection. The removal of these to other localities has been suggested; where could they go when the disease exists throughout a whole country? It is better for them to stay at home, where they are thoroughly familiar with all external conditions and, therefore, better able to protect themselves from contagion.

Individual Prophylaxis.—This is restricted to leading a normal life and the minimum of exposure to contagion. The room in which a patient

has been confined should be disinfected with formaldehyde; I have obtained good results with this, notably in preventing recurrent attacks in families. It is not uncommon to have individual members of a family attacked more than once within a month or two; indeed, in the recent epidemics there have been at least two epidemic outbreaks. Quinine has been recommended as a prophylactic by Graeser—0.5 gm. (gr. vijss.) daily in 15 gm. (℥ss.) of whisky for a period of twenty-two days; I have had no experience with this method.

TREATMENT

Regimen.—The patient should be put to bed, under all circumstances; in the relatively rare afebrile cases he should be kept in bed for two days at least; in the febrile cases he should not be allowed to get up until the evening temperature is below 100° F., or to go out, everything else being equal, until the evening temperature has remained below 100° F. for two days. This is indicated because of the complications, and especially the sequelæ, of influenza—a patient who has once had influenza will gladly subject himself to this loss of time, fully appreciating the future gain. Those who will not submit do so at their own risk. The diet should be bland, but not necessarily restricted, except for special indications.

Medicinal.—Specifics exist only for those physicians who are not strictly objective and—for the manufacturers of drugs. Excepting quinine, which has been recommended especially by the French authors and condemned by many others, particularly Leichtenstern, they have a curious and interesting history. Their origin is to be traced back to a desire to obtain a cheap substitute for quinine; resulting first in Kolbe's producing synthetic salicylic acid from phenol, and Knorr's discovery of antipyrine. After this, a new group of drugs owed its origin to the discovery, by Cohn and Hepp, that aniline (C_6H_5–NH_2) had very great antiseptic properties and could be used in the less dangerous form of acetanilide (found by Gerhard in 1852), which was quickly patented in Germany under the name of "antifebrin" and exploited. But still its effects were too marked (collapse and methemoglobinuria) and too dangerous, so that phenacetin (acetphenetidin, Hinsberg), also patented and exploited, was soon introduced by Kast and Bäumler. All the various medicinal antipyretics and so-called specifics are the result of these three bodies—salicylic acid, antipyrine, and phenacetin, and therefore acetanilide—by the changes produced in the molecules of one of them, either by combination of salicylic-acid molecules or with some other organic molecule. It would be impossible, in this connection, to give all the various combinations that have been produced; a few of the more common ones may be mentioned: From salicylic acid—salol, salophen, aspirin; from antipyrine—salipyrine, pyramidon; from phenacetin—salophen, lactophenin, citrophen, exalgine, malakine, kryofine, and phenocoll. As for the effects of these drugs, they are the resultant of the parent drug or drugs, and depend upon the rapidity with which they are changed to these primary drugs in the system and the number of molecules of the parent drugs in the combination. In so far as the former is accomplished, good has been done, especially in the acetanilide, the antipyrine, and phenacetin combinations. But the dose must be increased, so that, with the increasing avidity of the manufacturers in introducing new

compounds, the parent molecule will be finally represented in such small quantity that it will have no effects; only such effects will be noticed as are produced by the substituting molecule, or the change will go on so slowly that no general effects can be noticed, unless the medicine is given in enormous doses—a desideratum much sought by the manufacturers. Every physician is flooded with announcements of these new combinations, frequently, unfortunately, signed by men of eminence in the profession. How can he best perform his duty to his patients and to himself? To his patients, in neglecting the use of a drug which might do good; to himself, in not having done this and in being looked upon as a nonprogressive man for failing to use a new drug which his neighbor has used with such eminent success? The matter is perfectly simple; learn to use that drug which is followed by the best results—i. e., by prompt action and the minimum amount of damage—and use this drug until satisfied that something better has been offered. In adhering to one drug, the administration and effects of which are thoroughly understood by the physician, both he and his patients will fare better than by taking up new, unknown drugs, whose number promises to be without end. In influenza many of these produce good effects for the nervous, the gastrointestinal, and the febrile symptoms; not any one of them is a specific, notwithstanding statements to the contrary. It must be remembered that phenacetin derivatives produce collapse and blood changes; that acetanilide should never be used at the present day; that synthetic salicylic acid produces most unpleasant and sometimes fatal heart complications; and that antipyrine, especially in fever, may produce collapse. It is wrong, therefore, to use any of them in continued fevers in large doses, because of their bad effects, because the cause of the lesion is not removed—indeed, there is a retention of it in the blood—and because the recovery of the patient is postponed. When the temperature produces dangerous symptoms not to be removed by other means, they should be used. In hyperthermia in diseases in which the febrile course is very short, they may be used; unfortunately, without affecting the final result. Their action on the nervous system is of great importance. Antipyrine was at one time supposed by excellent French observers to take the place of morphine for the relief of pain, and was used in its stead. While this therapeutic enthusiasm in the use of every new drug is common enough, the fact remains that in influenza the use of some of these substances is invaluable. They must be used to meet indications only, and not for too long a time; the after-effects of influenza are depression, and it is my opinion that, in adults, this depression is distinctly increased by the prolonged use of the acetanilide, and therefore of the phenacetin group. With all this in view, I have used salipyrine in comparatively small doses, 0.3–0.5 gm. (gr. v–vijss.) every three to four hours; sometimes also antipyrine. For the great pains with or without fever this drug should be given. When these pains are very intense, subcutaneous injections of antipyrine or morphine should be used.

Hydrotherapy, in this disease, should be used in the form of warm or hot baths. It is the distinct impression of most writers that, in this disease, cold is not so valuable as in the other infective diseases; at all events, the patient does not find the same relief from cold as he does from heat. *Quinine* should be given in large doses, for it frequently makes a very much

more lasting impression than the antipyretics. The septic or typhoid form of influenza is best treated in this way, to which may be added any one or all of the remedies suggested in septicopyæmia.

SPECIAL FORMS OF INFLUENZA

The Respiratory Form.—The ordinary bronchitis is satisfactorily controlled by the use of sodium benzoate, 8 gm. (ʒij), in aq. menth. pip., 120 gm. (ʒiv)—of which a tablespoonful is given every two hours for several days to an adult; to children in proportion to age. If the cough is especially dry, Ems water with hot milk, equal parts, four or five times daily, or the ammonia preparations, may be added. When the cough becomes paroxysmal, quinine in the same doses as those recommended for whooping cough is of great value; also morphine or heroine may be given, as recommended there.

The coryza may be treated locally (v. Coryza), belladonna and camphor preparations given internally are of value. Influenza pneumonia should always be looked for and treated (v. Pneumonia). The septic forms, produced by the respiratory type of influenza, require the same treatment as is recommended for septicopyæmia (q. v.).

The Gastrointestinal Form.—Vomiting should be controlled (see Typhoid and Scarlatina). The diarrhea is best met by diet (v. Intestinal Diseases), quinine tannate, bismuth subgallate or subcarbonate, with or without intestinal antiseptics (salol, benzosol, β-naphthol, or menthol). In all debilitating forms of influenza stimulants should be prescribed; whisky or brandy, Bordeaux or Burgundy, or port or sherry wine—medicinal wines are of value, but they can be made at home, thus guaranteeing the quality of the wine.

The affections of the tonsils produced by the influenza bacillus, the pneumococcus, the ordinary pus producers, or by mixed infections, must always be carefully treated (v. Diseases of the Tonsils).

The Toxic Form.—This should be treated as to cause and as to the special localization of the toxine. For the first, the use of normal saline solution by one method or another is indicated here, as well as an attempt at elimination by means of the bowels, the urine, or the skin, any one or all, in severe cases, unfortunately of doubtful value. The most dangerous localization of the toxine is found in the heart; in the most acute forms no treatment avails, as the course of the disease is too rapid to permit medication; when this is possible, large doses of camphor, ether, or digitalis should be used subcutaneously (v. Acute Myocardial Insufficiency). Localization in the brain, producing symptoms of meningitis or encephalitis, should be treated as recommended in the proper chapters; very frequently the bacillus is found in the brain itself and in the spinal cord.

Localization of the toxine in nerves, producing neuritis with its consequences, or simply functional manifestations, requires special attention (v. Neuritis). The neuralgias in influenza are at times intolerable, but are easily relieved by one or another of the antipyretics, though they sometimes require morphine.

The Hemorrhagic Form.—Hemorrhages occur from the mucous membranes, from the kidneys, into the skin, and into the various solid organs of the body. When they are amenable to treatment, they may be treated by

either local or general medication. For the latter, a good preparation of ergot, the fluid extract, ergotol, adrenalin chloride, tannic or gallic acid, lead acetate, hydrastinine hydrochloride (for uterine hemorrhages), or morphine may be used. For both the local and the general treatment of hemorrhage the reader is referred to the proper chapters.

COMPLICATIONS

The complications are so numerous, for every organ and tissue of the body may become affected by the influenza or its bacillus, that their treatment, in so far as special treatment is required, will be given in connection with diseases of the various organs. A great many of them cannot be prevented by the greatest care and the best treatment. Some are due to carelessness, to overexertion, to secondary infections, all of which must be guarded against.

SEQUELÆ

The number and intensity of the sequelæ are altogether out of proportion to the intensity of the attack. Of no disease is this so true as of influenza. A severe attack is always, a mild attack usually, followed by some sequela. The most common is debility, frequently extreme and of great duration. Prophylactic measures are of great importance here; nux vomica, strychnine, cinchona preparations, iron, are all indicated in proper cases. Above all, adequate feeding, if necessary overfeeding, should be insisted upon. Physical and psychical rest is of great importance, but care must be taken not to suggest invalidism. The sequelæ on the part of the nervous system are very common; they are found affecting the brain, the spinal cord, and the peripheral nerves, due both to anatomical and functional causes. The frequency of neurasthenia and suicide after influenza has been frequently commented upon. It would be hazardous to state whether neurasthenia or psychoses could be prevented by proper treatment, as both occur where there is a temporary or permanent predisposition. Possibly influenza *per se* is to be looked upon as the temporary predisposition, but as yet this has not been definitely established. Under all circumstances, when such predispositions exist, the utmost care must be taken in the treatment of the patient; the early and long-continued use of quinine; the careful watching of the food, quantity and quality; the enforcement of long absence from occupation and exertion have in some instances seemed to be beneficial. In more than one instance I have been able to prevent an attack of neurasthenia in a patient who had become pliable, the result of his having suffered from neurasthenia after a previous attack. Nearly all existing diseases are made worse by influenza; so that a patient with cardiac disease, nephritis, or disease of the respiratory apparatus, should be especially watched as to the already existing affection.

CONVALESCENCE

The climatic treatment for the convalescence is one that must be carefully considered in each individual case. Much harm may be done by sending convalescents away from home. In some conditions, such as debility, the

milder forms of neurasthenia, pulmonary tuberculosis, removal of the patient to a proper place is invaluable.

XIII. DENGUE

PROPHYLAXIS

Dengue is a contagious disease and belongs to the class of the acute exanthemata (P. Manson). Whether this is accepted or not, it should guide us in our preventive measures until the cause of the disease has been found. Unfortunately for preventive measures, we meet with the same conditions as are found in influenza, the same method of infection in the beginning of the disease, the enormous morbidity, the short period of incubation, and, to some extent, the same popular notions regarding its unimportance. The same precautions should be taken in this disease as in influenza, but, in addition, the eruption must be taken into consideration, therefore isolation is called for until evidences of the eruption have disappeared.

It is unsettled whether the disease is also contagious during the period of desquamation of the terminal eruption. Occurring as it does most commonly in tropical countries, it seems almost impossible to use any preventive measures against the disease, though in this country this course should be feasible. In temperate zones precautions need be taken only during the summer. The disease has appeared in epidemic form as far north as Philadelphia. In a number of cases seen by me in Cincinnati no one coming into contact with the patients was infected.

TREATMENT

Treatment must, for the present, be entirely symptomatic. The patient does best if kept in bed, not only during the febrile period when he is forced to stay there, but until the terminal eruption has disappeared. It is more than likely that the disease is spread, like smallpox, during the febrile period, and besides, as in influenza, complications, and especially sequelæ, are less common when the patient is kept in bed. The usual antithermic or antipyretic measures may be used against the fever when it becomes necessary. The pains which cause the disease to be called "breakbone fever" can be relieved by the antipyrine group; belladonna is also highly recommended. Sir Joseph Fayrer gives three doses of fifteen drops of the tincture every ten hours; when these do not give relief, morphine should be used subcutaneously.

Regimen.—The diet should be the same as in febrile diseases of short duration; stimulants are rarely necessary except, at times, for complications and during the convalescence. Nothing that disturbs the patient very much should be done during the attack; neither strong purgatives nor emetics should be given; the latter are without value. For the enormous thirst, acidulated drinks, rice or barley water, all cooled, should be given.

COMPLICATIONS

These are rare. In children hyperpyrexia may produce convulsions. The disease, like all others of its class, predisposes to secondary infections—pneu-

monia, tuberculosis, or any disease that may be endemic, such as dysentery or malaria (v. the respective sections).

SEQUELÆ

These are very numerous, especially pains, for which a large number of remedies have been used; the salicylic-acid group, the iodides, electricity, massage, quinine, external applications, camphor, belladonna, opium, all more or less valuable, in that temporary relief may be given; time is the best remedy. The consecutive debility should be treated as in the convalescence of all infectious diseases.

XIV. CEREBROSPINAL FEVER

PROPHYLAXIS

For the purpose of prophylaxis we refer especially to the epidemic form, although to some extent the measures recommended may be applied to prevent the occurrence of sporadic cases. In order to prevent the spread of cerebrospinal meningitis two things must be looked into: A, the pathogenic organism; B, the predisposing causes.

Pathogenic Organisms.—Granted that this disease is produced by a bacterium, whether it be the *Diplococcus intracellularis meningitidis* of Weichselbaum, the *Micrococcus lanceolatus*, or any other lower form of life, it follows that, under proper circumstances, the organism can be transferred from one human being to another. The evidence is all in favor of the fact that the organism can be transferred both directly and indirectly from man to man, and therefore that the disease is contagious. The various organisms accused of producing this form of disease have been found in the nose, the mouth, the expectoration, in pus, and in the urine; all necessary precautions, then, should be taken for their careful disinfection. The attendants, including the physician, should be careful to keep themselves thoroughly clean as to hands, face, hair, and clothing, and the nurses should be especially cautioned in these directions. As there is reason to believe that the nose and the tonsils are portals of infection, these should be carefully examined in healthy subjects that have been exposed and should be treated; bacteriological examination is indispensable. Netter and Leichtenstern believe that the pulmonary alveoli are the most common portals of entrance, and that under all circumstances infection of the blood is produced; most necessary, then, is the destruction of the bacillus. The room and the patient should be made free from contagion, as has been recommended in Scarlatina.

Predisposition.—Physical and mental overexertion should be avoided, for it is probable that in both ways the central nervous system is made a *locus minoris resistentiæ*. The influence of cold, exposure, cold baths, etc., has been cited as constituting predisposing causes. Alcohol should not be used to excess; excesses in *rebus veneriis et bacchicis* predispose to nervous affections. Traumatism and existing nervous disease demand extra precautions in the way of prophylaxis. As it has been repeatedly shown that, like

pneumonia, cerebrospinal fever especially attacks robust and healthy people, general resistance is of less importance than loss of temporary local resistance. For this reason, until we find additional portals of entrance for the bacillus, everything should be done to prevent infections from the nose, tonsils, mouth, or respiratory apparatus. When diseased conditions have been established, they should be treated (v. chapters on the Nose, Tonsils, Mouth, and Respiratory Apparatus).

Hygiene.—The ordinary rules as to hygiene and diet, as recommended in other infectious diseases, should be adhered to. Special care must be taken in this disease against bedsores; I have seen them develop in very unusual places, in the lobe of the ear and upon the heels. A water bed for the patient is desirable. All outside irritations should be kept from the patient, as reflex acts are exaggerated; the room should be kept darkened; the patient should be moved as little as possible, and then slowly and carefully; defecation and urination should be regularly insisted upon, the bedpan always being used. If there is constipation, a mild laxative should be given—calomel, a saline, or castor oil; if there is retention of urine, the catheter should be used, as in all infectious diseases.

TREATMENT

Specific Treatment.—Various procedures have been recommended which, in a measure, can be looked upon as causal therapy. I have used unguentum Credé (v. Septicopyæmia) with apparent success in children, recovery having occurred in ten out of fifteen cases.

Hypodermic injections of corrosive sublimate (0.005–0.01 gm—gr. $\frac{1}{13}$ to $\frac{1}{6}$) given daily, and later, when improvement occurs, every two days, have been recommended. These injections, first recommended by Consalvi, have been used by Dazio (all nine of his cases recovered), and by Béla Angyám, with a recovery of seventy-three per cent.

Lumbar puncture has been recommended as curative (Concetti, Netter, Koplik); by it a certain number of bacteria are withdrawn, the toxicity of the spinal fluid is diminished, pus is removed, and pressure upon the central nervous system is relieved.

Symptomatic Treatment.—Foremost I place lumbar puncture, for in ordinary cases the whole picture is thereby changed; the headaches, the delirium, the convulsions, even the coma disappears; fever is reduced, the general condition of the patient is materially improved (see also Tuberculous Meningitis), and the mortality lessened. Lumbar puncture should be performed with all surgical aseptic precautions and in the following way: the surface may be rendered insensible, when necessary, by the use of ethyl chloride or the subcutaneous injection of cocaine; the cannula—a short one may be used for children—is then introduced. This is best done between the third and fourth lumbar vertebræ, about one centimeter to one side of the median line, the operator feeling his way, and when resistance ceases the trocar is removed. The patient should be in bed and lying upon the side; a proper posture, attained by putting pillows under the patient, frequently makes the small operation easier. The fluid should be allowed to flow off on account of the intraspinal pressure, with no attempts at aspiration. If the cannula becomes plugged, it should be drawn out a little and the trocar again

introduced; the blowing of sterilized air into the cannula has been recommended. When performed with care in inflammatory meningeal cases, the operation is without danger, and it may be repeated indefinitely. I have performed it fourteen times in one patient; Concetti, fifty-three times. Not more than 15 c.c. (℥ss.) should be withdrawn at one time.

The older methods, by using purgatives, emetics, or mercurials, have been discarded. A most valuable remedy in cerebrospinal meningitis is the hot bath (90°–105° F.), a cold compress being put upon the head. The bath produces vasodilatation, accompanied by increased heat radiation and a marked sedative effect upon the nervous system. The patient should be allowed to remain in the bath from twenty to twenty-five minutes, and every two or three hours, day and night, he should have a bath, being carefully lifted out of the bath and rapidly put between blankets.

Opium, morphine, and the bromides may be used to allay pain and restlessness, either singly or in combination.

Local bloodletting is no longer necessary with lumbar puncture; still, a few leeches upon the mastoid, the temples, or the nape of the neck give great relief for headache and restlessness. General bloodletting should never be used.

External applications have been recommended in various forms; the ice bag, which sometimes is grateful to the patient, cold compresses, or even heat may be used; inunctions of medicinal salves upon the head are not supposed to influence the process directly, yet in so serious a disease, where no harm is done, the use of any method is justifiable. Salves containing iodoform, iodol, or mercurials have been most recommended. One of the great objections to their use is the necessity of shaving the patient's head. Counter-irritants, in the form of cantharides, croton oil, tartar emetic ointment, setons, or the actual cautery, are no longer used in the active stage of cerebrospinal meningitis.

In the foudroyant form little can be done: as this form of the disease frequently occurs in the beginning of an epidemic, the diagnosis is not always made, and the cases run their course very rapidly; the measures recommended in severe septicopyæmia (q. v.) might be tried. The abortive form should be treated with the same care as the well-developed case.

COMPLICATIONS

These are found principally in the lungs—pneumonia, pleurisy; in the heart—pericarditis, endocarditis; in the central nervous system—chronic hydrocephalus, abscess; in the ear—suppuration of the middle ear, of the labyrinth; and as lesions of the nervous system, due to pressure or inflammatory changes, resulting in paralysis; of the optic, the abducens, the nerves of the tongue; aphasias, monoplegia, hemiplegia, and paraplegia (v. respective chapters). As for infections of the skin, we have bedsores and abscesses; arthritis is found in one or many of the larger joints.

SEQUELÆ AND CONVALESCENCE

All the complications may remain as sequelæ, in addition to which there may be neuralgias. The arthritides lead to anchylosis in severe cases. Dis-

eases of the ear are frequently the cause of deaf-mutism. The conditions in the optic nerve and in the choroid and retina lead to blindness. Keratitis may be treated with better results than the other changes in the eyes.

The *convalescence* in abortive cases is uneventful; in well-developed cases it lasts a long time, and is accompanied by neuroses, psychoses, and especially changes in metabolism, which seem to make it impossible for the patient to gain weight. In very many cases, as soon as the patient begins to gain in weight he regains health. The question of feeding, then, is paramount, the quality of food depending principally on the condition of the bowels. The patient should be overfed with easily assimilated and digested food, given frequently, but in small quantities (v. Overfeeding). The appetite should be stimulated by small quantities of alcohol, by the bitters, quinine, and cinchona. A change of climate should be recommended only when all local symptoms have disappeared. Chalybeate springs may then be recommended, or, depending upon the season of the year, warm or cool places.

XV. LOBAR PNEUMONIA

PROPHYLAXIS

The term lobar pneumonia must still be looked upon as an anatomical, not an ætiological concept, for it is by no means settled that the disease is not produced by a large number of lower forms of life. These lower forms of life are the immediate cause of pneumonia, the predisposing causes being but imperfectly understood (for these see the Prophylaxis of Respiratory Diseases). The mode of entrance of these lower forms of life has not been definitely determined for all cases, but their frequent appearance upon the tonsils, first noted by Bezançon and Griffon (1897–98) and now to be verified by anyone who will take the trouble to look for them, and their occurrence in the blood in a large percentage of the cases (Prochaska), seems to point to one method of producing pneumonia. The absence of the normal protective functions of the respiratory tract, so that the bacteria may be inhaled, points to another and direct method of causing pneumonia. For prophylaxis, then, these two factors must always be taken into consideration: the provoking cause, the individual cause. Whether the disease is contagious or not, the fact remains that no pneumonia exists unless produced by bacteria. Their destruction, therefore, means much for prophylaxis, and a pneumonia patient should always be looked upon as a source of multiplication of these bacteria and of the consequent propagation of the disease. All those precautions then should be taken that have been recommended before, both for direct and indirect contagion. As pneumonia kills so many people in some places—in Chicago and other cities, for instance, for the last ten years the mortality from this disease has exceeded that from tuberculosis—it ought to be our duty to find the habitat of the pneumococcus outside of man and to take measures for its destruction. Bordoni-Uffreduzzi and Spolverini have shown that the pneumococcus retains its viability in dust for a long time, and the experiences in Chicago seem to verify their observations. In order to keep the dust from rising the roads and streets should be sprinkled with petroleum, as has been done in Monaco,

Geneva, Paris, London, and on various railroad routes in this country. This is efficacious for only a very short time, not exceeding from six to eight weeks, and is expensive. In its stead Guglielminetti, of Monte Carlo, has recommended the covering of the surface of city streets and macadamized roads with a layer of coal tar, a method that is being successfully used at Monte Carlo, Cannes, Nice, and Mentone. Overcrowding in dwellings, halls, theaters, and cars should be avoided.

Individual Prophylaxis.—For the individual, the upper air passages should be kept in good condition; attention should be given to the nose, pharynx, larynx, trachea, and the tonsils. Exposure to cold has been shown experimentally (Fischl) to be a contributory cause for the production of pneumococcus infection, but the relation of pneumonia to "catching cold" has been too much dwelt upon, and people should be informed of this. Alcohol reduces the resistance to pneumonia very greatly; alcoholics should therefore be especially cautioned. In the very young, as well as in the old, the predisposition is markedly increased, and special care about exposure to infection should be exercised. As one attack of pneumonia predisposes to other attacks, cognizance must be taken of this fact. Pneumonia is frequently the result of secondary infection, therefore all possible precautions should be taken in those diseases in which this is the case, and especially in convalescents from disease. Ether pneumonias can, in a measure, be prevented by seeing that the air passages are normal, by keeping the stomach empty, and by having the mouth thoroughly clean before the anæsthetic is administered. The prophylaxis of pneumonia in all conditions could be summed up in (1) absence of contact with virulent bacteria; (2) cleanliness of mouth, nose, and upper air passages; (3) the prevention of exposure of individuals locally or generally predisposed.

TREATMENT

Causal Treatment.—Serum therapy has been used by many investigators —the Klemperer brothers, Foà and Carbone, Pane in Italy, Washbourne in this country, and others. The testimony of most observers who have used the antipneumococcic serum is that it has a decided effect upon the temperature; there is no reduction in mortality, however. Under all circumstances, in pneumonia, bacteriological examination of the sputum must be made; it would be folly to suppose that a serum produced from the *Micrococcus lanceolatus* would be useful in a croupous pneumonia, the result of streptococcus, influenza, or other infection. My results in streptococcus pneumonia with streptococcus serum have been encouraging. All other methods of causal treatment—the antiphlogistic measures, bleedings *coup sur coup,* mercurials, and tartar emetic—have practically been given up.

Abortive Treatment.—For this purpose large doses of calomel (1.5–2 gm.—gr. xx–xxx), quinine subcutaneously or by the mouth, aconite, veratrum viride, creosote, sodium salicylate, chloroform, ether, pilocarpine, and other remedies have been suggested. A large number of cases, properly observed, must be put on record before the possibility of preventing the further development of croupous pneumonia can be accepted. This has been done for diphtheria and malaria, where numberless cases show that it is possible. I

have seen a large number of cases of abortive pneumonia, but the remedies used at the same time in some cases were without effect in others. We are in hopes that in the future pneumonia, like all diseases belonging to its class, may be aborted. The question whether this has already been done must, for the present, be answered negatively; indeed, there are theoretical considerations that make it seem almost impossible.

FORMS OF PNEUMONIA

Typical (Normal) Pneumonia.—General Management.—The patient's room should be well ventilated, well lighted, and best heated by an open fireplace. In no disease is fresh air so important as in croupous pneumonia; fresh air reduces the toxicity of the blood, stimulates the respiratory centers, increases the depth and diminishes the frequency of the breathing, and therefore prevents waste and improves metabolism to the extent of reducing cyanosis, the bad symptoms of the nervous system, and delirium; it increases urinary elimination and adds much to the comfort of the patient. The windows of the room should then always be kept open day and night. In hospitals, special rooms or wards should be reserved for pneumonic patients. The outer temperature, especially cold, need not be taken into consideration, as the temperature of the room can always be kept high enough to prevent increase in cough by local irritation of the patient's upper respiratory apparatus. As the first result of the use of this method, the number of respirations is always diminished (ten per minute on the average); how much additional work is saved for the heart can easily be calculated. The experiment can be made of closing the windows, but when the patient is sufficiently conscious he always asks that they be again opened. For this reason this method, as a rule, meets with little opposition from the members of the family, probably also because of a peculiar course of reasoning that the patient has already got enough cold and "can't catch any more." Within the limits made necessary, as stated before, the cooler the air the better are the indications fulfilled (v. Cough), and as air is circulating freely, the various impurities contained in the expired air are quickly removed. In spite of this, the method has not been largely used, on account of passive resistance on the part of the nurses—to prevent which I had the window sashes taken out in the pneumonic ward of a hospital with which I was formerly connected—and decided resistance and opposition on the part of the friends. The method may then be modified by having the windows kept open for as long a time as possible and then closed for half this time. The routine use of inhalation of oxygen may be tried as a substitute, but the results are not the same, as the impurities in expired air are not carried off.

The *diet* should consist principally of milk, gelatinized substances, and easily digested carbohydrates, except in such cases as have already been noted under Typhoid Fever. For the thirst small quantities of cooled water or small pieces of ice should be given; very large quantities of fluid should not be given, as they increase the work of the heart, and organic acids should not be added in large quantities to the fluids because of their tendency to produce diarrhea. The routine use of alcohol is unnecessary and to be deprecated; it is not necessary as a food, does not "lessen the combination of

troubles" (Cushny), and stimulation is not always required. Exceptionally, even in the normal case, this may be necessary before or during the crisis, but under all circumstances the condition of the pulse will guide the practitioner. Gerhardt says that strength does not come from the cellar, but from the kitchen; alcohol, however, is valuable during convalescence.

External Applications.—These may be used to fulfill various indications. Active counterirritants should not be used; the production of a surface that can be infected is not without some danger in an acute infectious disease. For the pain the ice bag is very valuable; it has also a slight antipyretic function, and probably some destructive effect upon bacteria in subjacent tissues. It should not be used in the very old, in infants, or in very young children. In the latter a Priessnitz application may be used—wringing out a cloth in water at between 60° and 70° F., which can be covered over by successive layers of cloth. In some cases heat gives more relief than cold; the patient can be relied upon to decide this question.

Treatment of Symptoms—*Pain.*—Besides the hydropathic treatment it may become necessary to give morphine or to use dry cups; the latter are very effective and give more lasting relief.

The Cough.—This should be treated as in bronchitis (q. v.), with these exceptions: I have given up the use of inhalations since I have adopted the fresh-air method. When there is very much cough, due to a large amount of expectoration, the opium preparations should be given very sparingly, for by lessening the cough we are retarding the tendency to recovery and may invite the development of complications. In children, opium and its derivatives should never be used in this disease. Creosote carbonate is valuable when there is much secretion from the bronchial tubes; a specific effect is also claimed for it in doses of 0.3 gm. (gr. v) every two to four hours; turpentine and its derivative, terpene hydrate, may also be valuable.

The Fever.—Normal cases of lobar pneumonia bear the normal fluctuations of temperature (102°–104.5° F.) without damage. Where the nervous symptoms are well developed, hydrotherapy or a single dose of one of the antipyretics may be used. Their routine use is to be deprecated in this disease; everyone with large experience in pneumonia has been impressed with the fact that the results are worse than when these drugs are not administered. The fever must be looked upon, in a measure, as a normal reaction.

The crisis sometimes requires symptomatic treatment. Here stimulants are required: alcohol, ether, camphor, ammonia, musk. The idea that the crisis may be facilitated, or even hastened, can hardly be justified by our present knowledge of the pneumonic process.

The dyspnœa usually depends upon inhibition of respiration, the result of the pleuritic process; the treatment of the pain gives relief for this. When due to toxæmia or enormously developed local lesion, the fresh-air treatment or oxygen may give relief.

Upon the whole, therefore, it will be seen that a typical lobar pneumonia occurring in a healthy robust adult requires very little treatment, and the fact must not be lost sight of that under these circumstances the disease is self-limited, and tends to recovery. The hygienic measures are paramount; if a prescription is absolutely necessary, and as a rule it is, one or the other

symptom may be attended to, care always being taken not to do harm; meddlesome medication does more harm than good.

Atypical Pneumonia.—All forms of lobar pneumonia belong to this type when their course varies from that of the normal as to duration, intensity, complications, and the individual attacked; to this class belong those pneumonias that have been called asthenic, typhoid, bilious, malignant, or putrid pneumonia. Here again the treatment is purely symptomatic.

Hydrotherapy.—The cold bath with effusion has been highly recommended by v. Jürgensen for the fever and the heart weakness. Before putting the patient into the bath he should receive a dose of alcohol, as there is always danger of collapse. My experience leads me to reserve this form of treatment for cases with very high temperature (106° F.); the routine use of this method is not followed by the same good results as we find in typhoid fever. Liebermeister recommends cool baths (70°–80° F.) in the beginning, 85° F. toward the end of the pyrexial stage; they are of ten minutes' duration, given when the temperature of the patient is 104° F., especially between 7 P.M. and 7 A.M.; no baths during the daytime, but cold sponging; by using this method in 230 cases he has reduced his hospital mortality, during four years, from 25.3 per cent to 16.5 per cent. This method has the advantage of being less objectionable to the patient than v. Jürgensen's, and is of the greatest service in those cases in which the febrile symptoms are not so marked. The hot bath has also been used to great advantage, even in the normal cases, for reducing temperature, possibly toxæmia, at all events for its general sedative effect. It is not followed by the same marked effects upon the pulse as is the case in the other two methods.

Medicinal Treatment.—Quinine, given by the mouth or subcutaneously, is of decided value in this form. By the mouth, 1–2.5 gm. (gr. xv–xxxviiss.) are given, divided into a number of doses, to be taken in two hours late in the afternoon, to control the temperature during the night; hypodermically it is given in one dose, in the form of the bisulphate, the hydrobromate, or the carbaminate. Attention has again been called to a supposed specific effect upon the microbes by quinine—a theory taught by Binz, but not yet conclusively proved. In this form of pneumonia the coal-tar products have also been recommended; they should be used sparingly (v. Influenza) because of their effect upon the heart, and should be combined with caffeine. The temptation to reduce temperature is very great, it is true, and is always appreciated by those about the patient, but we should treat the patient and not the temperature.

Alcohol should be used in the majority of these cases in large doses and continuously, the pulse being the guide.

Venesection has come into disuse, but in the asthenic form of this disease there is, in my opinion, one indication—an embarrassment of the right heart, characterized by dilatation, great cyanosis, and bad pulse. In these cases from 150 to 350 gm. ($\overline{3}$v to $\overline{3}$x) may be drawn. The effect is rapid, but unfortunately transitory, and this procedure should be used only in great emergencies, carefully counting the cost to the patient.

Symptomatic Treatment—*The Heart.*—To prevent heart collapse, strychnine is commonly used, in small doses—0.001–0.002 gm. (gr. $\frac{1}{60}$–$\frac{1}{30}$)—because in these doses it stimulates the vasomotors, retarding and strengthen-

ing the heart, while at the same time it stimulates the respiratory centers. It has been shown, however, that for the relief of the vasomotor embarrassment this drug is singularly inefficient, as it seems to have no effect upon the blood vessels that are especially affected—those of the splanchnic area (v. Acute Myocardial Insufficiency). That this is the case has been verified by blood-pressure observations (R. Cabot), which demonstrate that strychnine does not increase the blood pressure. Its routine use, therefore, is not necessary, and the use of this drug in such doses as to produce physiological effects —a use common at the present day—should not be encouraged in this disease, as it produces respiratory paralysis.

Aconite, given in small but repeated doses, is very serviceable, especially when the heart embarrassment is due to obstruction in the pulmonary circulation; it slows the heart and diminishes its output in this way, thus saving the heart and at the same time affecting the process in the lungs. It should be used only with a strong, full pulse, and is most serviceable during the first and the beginning of the second stage of the disease. The effects of veratrum viride resemble those of aconite; I have perhaps been overcautious in its use on account of its depressing effects, therefore my testimony may have little value. The routine use of digitalis comes from Traube, but it received new impetus by the publication of some remarkable results by Petresco. This author recommends 4 gm. (℥j) of digitalis to be given in twenty-four hours for four or five days, so that the whole amount given equals from 20 to 24 gm. (gr. ccc–cccl x). Lop has recommended 10 gm. (gr. cl). A number of French authors, including Huchard, came to the conclusion that these doses were permissible, and even beneficial. A. Fränkel gives from 3 to 4 gm. a day, in the first three days of the disease, in order to avoid causing myocardial insufficiency and vasomotor paralysis, which are manifested by high pulse rate. The contraindications are organic heart disease, diseased kidneys or blood vessels, alcoholics, and elderly individuals. I have followed the method of Petresco in a sufficiently large number of cases to have satisfied myself that it is without appreciable value in forms of pneumonia that have come under my observation. It remains to be seen whether Fränkel's results will be better with the continued use of his method. Caffeine is invaluable for its effects upon the heart and the vasomotor nerves; it acts more rapidly than digitalis, and its effects are those that can be expected to be most beneficial in pneumonia. (For further details the reader is referred to the chapter on Acute Myocardial Insufficiency.)

In chronic myocardial insufficiency, digitalis should be administered as if pneumonia were not present in the patient.

In overfilling of the right heart venesection is of great value; there is no difficulty in recognizing this condition, and the relief given by bleeding is very striking. In all other respects the heart should be treated as recommended in the chapter on Acute Myocardial Insufficiency.

The Toxæmia.—Besides the use of the remedies already referred to, we possess in the transfusion of an isotonic saline solution (0.9 per cent) a very valuable aid in the treatment of this condition, and it is also beneficial for heart weakness. The second pulmonary heart sound should be watched; if decided accentuation occurs the transfusion should be interrupted (Williams). For the use of other methods v. Septicopyæmia.

The Respiratory Center.—On account of the continuous high temperature, the toxæmia, and the accumulation of CO_2 in the blood the respiratory center may become paretic. Under these circumstances oxygen inhalations are invaluable. The oxygen should be pure, it should be allowed to pass through a wash bottle, and it should not be crowded upon the patient; therefore it is not to be used with a mask, nor is it advisable to allow the gas to enter the respiratory apparatus directly. It is better to place the nozzle of the conducting tube some distance from the mouth. The effects—disappearance of cyanosis, diminution of frequency, and increase in depth of respiration—must be the guide for quantity and frequency of use. In addition, strychnine may be used hypodermically.

The complications of the various organs—heart, lungs, gastrointestinal apparatus, the nervous system, the joints, etc.—will receive attention in their respective chapters.

Œdema of the Lungs.—Here dry cups are invaluable—as many as can be put on the side affected. If possible, venesection should be practiced, and the remedies used should be those that strengthen the heart. Hypodermic injection of a solution of adrenalin chloride has proved very valuable to me.

Lobar Pneumonia in Infants.—This should be treated as in adults. The convulsions, which may replace the chill, should be treated (v. Infantile Convulsions). The principal line of treatment is directed against the bronchitis. All violent hydropathic measures should be avoided. This form of pneumonia is, like the normal in adults, rarely fatal.

Pneumonia of the Aged.—This form should not be looked upon as a terminal pneumonia, although the prognosis is bad. I have seen many aged people recover from lobar pneumonia; one female patient of seventy-two years recovered from a double pneumonia and lived for fifteen years, dying of an apoplexy. In treating this form the peculiarities of the aged must be taken into consideration. Laxatives should not be given, notwithstanding the love for laxatives displayed by old people. The heart must be carefully looked to; as some old people do not bear digitalis well therefore strophanthus and nux vomica or caffeine must be used. Alcohol should always be used in moderate doses. Strychnine is one of the best tonics and stimulants in old age. External applications should be tepid or warm. The diet should consist of strong soups, eggs, scraped meat, beef juice, gelatine, and carefully cooked carbohydrates. The normal functions of the bowels and bladder should be looked after; the former by rectal suppositories or injections, the latter, if necessary, by catheterization. Diarrhea must be treated by astringents, bismuth preparations; when necessary, by opium in very small quantities. The bronchitis must be treated (v. Bronchitis). Above all, the patient must be kept quiet and in bed; under no circumstances should he be allowed to get up; and in this direction there will be opposition by the patient, for frequently the symptoms are of such a nature that it is difficult for him to recognize the gravity of his condition. The fresh-air treatment is not necessary on account of the peculiar metabolism of old age, but efficient ventilation should be secured.

Pneumonia in Drinkers.—Because temperance is good for mankind at large, it is supposed to be good for a drinker with pneumonia. If the fact that the alcoholic has been living with all his cells stimulated or partially

paralyzed by alcohol is taken into consideration, it will be seen how the sudden withdrawal of alcohol must, and does, produce direful results. Especially will these be noticed as affecting the nervous system, which in alcoholics with pneumonia is apt to suffer. The only rule as to alcohol that can be followed with safety is to give sufficient to keep up the pulse as to rate and rhythm. The first desideratum in these cases is to secure a nurse that can prevent the patient from doing harm to himself or to others, also to select a room so located that successful attempts at escape may not produce bad results. After this the object of the treatment must be to prevent the patient from wearing himself out on account of his nervous symptoms (v. Alcoholism). The food should be principally liquid; topers are always thirsty, and notably so in febrile diseases; and as too much fluid does harm, it is best to give little water, and this will insure the patient's taking enough food. In addition, the heart must be controlled, being treated as described above. The gastro-intestinal tract always requires attention, either simply dietetic or to control diarrhea.

Pneumonia in Heart Disease.—The disease is very fatal, especially with patients having chronic valvular disease or myocarditis. As the myocardium, the most important part of the heart, is affected by the pneumonic process, by overexertion, by the toxine, and by the bacteria, acute failure of compensation is added to the existing disease. When failure of compensation already exists the outlook is very bad. Patients with a full compensation have a fairly good chance, depending upon the myocardial structure and its involvement. Failure of the right heart, which occurs principally in tricuspid insufficiency and mitral stenosis, must be treated by venesection. In other conditions of myocardial insufficiency digitalis is invaluable, but it fails signally in many cases of chronic myocarditis. Digitalis should not be used in a routine way when compensation is undisturbed. Its use must depend upon the character of the pulse, the general circulation, and the condition of the heart and kidneys. Its use as a preventive of more serious heart trouble should be confined to cases of acute dilatation, as found in influenza and whooping cough. Of great importance in this form are the diet and general hygiene, quiet, rest, small quantities of food given frequently. Stimulants should be withheld until there are proper indications, usually preceding or during the crisis.

Pneumonia in Obesity.—Here the danger comes from two sources—the heart and the general condition of perverse nutrition of the body. In these patients digitalis is usually not well borne. Strophanthus, with strychnine or nux vomica, sometimes acts better. The routine use of strychnine in these people may be of value. Very active antipyretic measures should not be used, and stimulants are valuable. The general condition may be treated with iron preparations, especially in the anæmic form of obesity. In severe instances, in my experience, the tincture of the chloride of iron has seemed to be of value. Quinine may be given, either in tonic doses or larger, to have some effect upon the temperature.

Pneumonia in Bright's Disease.—Here, besides the pneumonia, two organs —the heart and the kidneys—must especially be taken into consideration. For the heart, strophanthus and digitalis and squill may be indicated because of their action on both heart and kidneys. Venesection also has its indica-

tion here, especially in the presence of uræmic symptoms (v. Uræmia); alcohol should be used with great caution. The kidneys will require fluid diet—if the heart permits, large quantities of fluid; if diuretics are used, those of the caffeine group are most valuable, notably the sodium benzoate of caffeine in large doses. The inorganic, as well as the organic, diuretics have been recommended; they may be tried.

Bilious Pneumonia.—In the majority of cases this form—i. e., pneumonia with jaundice—the jaundice must be looked upon as a result of pneumonic septicæmia, not as arising from the gastrointestinal tract. In the milder cases the jaundice, more or less of which occurs in most cases of pneumonia, can be disregarded. In the severer cases it must be treated (see Jaundice). In these forms the toxæmia, the heart, and the general condition should be looked to. The administration of remedies which act upon the liver is of doubtful value, but the use of calomel in small doses is indicated by the presence of vomiting or intestinal disturbance. The diet should always be regulated by the requirements of the patient and the condition of his digestion. Alcoholic stimulants should be used sparingly, better not at all unless absolutely necessary and warranted by a favorable digestive situation. Patients with well-marked jaundice bear cold, applied externally, very badly.

COMPLICATIONS

Complications may arise (1) with other diseases; (2) with disease in other organs.

1. This form may be due to the cause of the primary disease or to one or the other of the causes of lobar pneumonia, or to mixed infection. When the pneumonia is superimposed upon malaria, or upon most acute infections, it requires only such treatment as has been indicated, combined with that of the original disease. In tuberculosis of the lungs the usual methods may be used; the creosote preparations are very useful, especially during the stage of resolution.

2. Pleurisy with exudation should always be looked for, and when found the fluid should be removed (v. Pleurisy). This is of special importance in children: metapneumonic purulent pleurisy should be treated as early as possible; nowhere do we get better results in this form of trouble than by its early recognition and treatment in children. The treatment of complications in other organs—the heart, the kidneys, the gastrointestinal tract, the brain, etc.—will be found in the appropriate sections. Œdema of the lungs has already been referred to.

SEQUELÆ

Delayed resolution, which is also a complication, resists all treatment: the iodides have been recommended, also creosote, iron, quinine, pilocarpine. Undoubtedly some good may be done by this indirect medication, to which should be added a generous diet and fresh air, but I have never been able to satisfy myself that anything done affected directly the condition of the lung. The bronchitis should be treated and great care taken to prevent infection with tuberculosis. *Abscess and gangrene* of the lung, chronic pneumonia, tuberculosis require special treatment (v. the respective chapters). In *relapses* the

treatment need not materially differ from that of the first attack, except that the patient should be more carefully watched, especially as to his heart condition; a fresh endocarditis, the result of the first attack, requires most judicious care, especially when there is no compensation—fortunately a rare occurrence. The anæmia, which may require treatment from the onset of the disease, is best met by generous diet and the various iron preparations (v. Anæmia).

CONVALESCENCE

The time when a patient should be allowed to get out of bed is determined by his condition in regard to his strength. As in all acute infectious diseases, the patient should not be allowed to get up too early: one week from the time the local process has come to an end is a reasonable time. The getting up should be controlled by the physician, as in typhoid fever. The fact must not be lost sight of that heart weakness, sometimes fatal, occurs unexpectedly in convalescence of pneumonia. This must especially be guarded against in those cases in which heart lesions are known to exist; even without this, when the functional manifestations of the heart, especially rhythm, have been markedly changed during the course of the disease, great care must be exercised. Worry, care, excitement should be avoided. I have seen one case of fatal heart weakness brought on by excitement due to an attendant's having an epileptic attack in the sick room. The complications usually keep the patient in bed a longer time, with the notable exception of tuberculosis of the lungs, when the patient ought to be taken out into the fresh air as soon as possible. The medication should be controlled by individual, temporary or permanent indications; tonics are nearly always to be given. The diet should be regulated with regard to the appetite and digestion of the patient, but no special rules are necessary in pneumonia. The loss of weight may be very great—as much as 1 kgm. (2⅕ lbs.) for every day of fever in severe cases (Liebermeister)—and it is the patient's desire, as well as the physician's, that this loss should be made up, but not too hastily. The physician will consequently feel his way as to the quantity and quality of food that may be necessary. Change of climate is beneficial in this stage, but, as stated before, it has its drawbacks, at least in this country, where in most resorts invalids are not looked upon as *personæ gratissimæ*. There is no doubt that a pneumonic patient may cut short the convalescence and gain strength more rapidly by changing to a proper climate under favorable surroundings.

XVI. DIPHTHERIA

PROPHYLAXIS

Diphtheria is a disease the cause of which is known—viz., the Klebs-Löffler bacillus. The natural history of the plant is known—its habitat in nature, its biology, and, although to a less degree, its chemistry. While there are some points still under discussion, our knowledge is sufficiently great to guide us in the prevention of infection. Diphtheria is directly and indirectly contagious, the bacillus being transmitted directly and indirectly from man to

man. Transmission through other animals is of very rare occurrence, but the disease has been observed in cats and horses. As a result, those precautions should be taken that have been recommended in other infectious diseases that are contagious in the same way (v. Scarlatina, Influenza), with some additions necessary on account of the peculiarities of the Klebs-Löffler bacillus.

The patient may be the source of infection even after he seems well, bacteria still remaining when the disease has ceased to produce local manifestations. No patient should then be considered safe in regard to others until it has been shown by cultures that there are no longer specific bacilli present, and these have been shown to remain in the throat for from three to nine months. When they remain for so long a time the fact should be determined whether they are still virulent. Persons coming into contact with diphtheria patients should be reminded of the fact that they, while themselves remaining perfectly healthy, may carry infection in the form of the bacillus in their own mouths. Physicians and nurses should be very careful to get out of the way of a patient when he coughs or sneezes, and for this reason to come into direct contact with the patient as little as is consistent with the performance of their duties. Under all circumstances they should look to careful general asepsis of themselves, but especially as to their mouths and throats. Gargling with large quantities of water, with listerine or boric acid, when possibility of deposit of infectious material in the mouth has occurred, or with weak corrosive sublimate solution (1 : 10,000), should be resorted to.

For *individual prophylaxis* much may be done in the presence of an epidemic by care of the nose and the mouth. As those who have diseased tonsils or noses, notably adenoids, are especially liable to infection, these abnormal conditions should be treated. Special hospitals should here again be recommended (v. Smallpox) ; the value of these has been shown by the experience in the infectious ward of the Boston City Hospital, where there was reduction both in general morbidity and mortality.

The use of *diphtheria antitoxine* has been recommended and has been carried out. For this purpose from 300 to 500 units should be administered (1 c.c. of a serum, which is considered sufficient to counteract ten times the lethal dose of diphtheria toxine, is considered one unit). In hospital practice this method is of great value in order to prevent the development of house epidemics, as has been repeatedly shown, so that in some children's hospitals—the children's ward, for instance, of the Charité, in Berlin (Heubner), every child that enters is immunized. The only objection to this method is that immunity lasts only from two to three weeks, so that in order to keep up immunity these injections must be repeated. In private practice, except under unusual circumstances, such as overcrowding and bad ventilation, these injections are unnecessary. Adults need never be immunized, and the children of families in good circumstances can be watched so that, when sore throat develops, they may be given antitoxine in sufficient quantity, much more than would be represented by the immunizing dose. Besides, when an individual has been exposed, it does not necessarily follow that diphtheria will be the result, and the short-lived immunity produced by the injections gives rise to a feeling of protection, which in its turn is followed by carelessness as to isolation and exposure. For these reasons I have practically discarded immunization in private practice.

TREATMENT

General Treatment.—*Regimen.*—Absolute rest in bed. After the membrane has entirely disappeared the patient should be kept quiet for at least one week; if the pulse has shown any deviation from that which is normal in diphtheria, the patient should not be allowed to exert himself in anything; he must be fed, the bedpan used, his movements in bed should be limited and slow. The *room* in which the patient is confined should be selected as in other contagious diseases. The diet should in the febrile period be confined to fluid concentrated food, when possible given cold; milk, ice cream, eggs, meat jellies, beef juice, frozen puddings made of strained carbohydrates, rice, barley, oatmeal. In older individuals alcoholic stimulants are valuable—milk punch, eggnog, wine whey, whisky, brandy, or the heavier wines—but the taste and digestion of the patient should be regarded. With the present mode of treating diphtheria, the routine use of stimulants has become unnecessary. The *fever* requires no special treatment for the same reason.

Specific Treatment.—The antitoxine of diphtheria is the remedy that now is almost universally used. There are, it is true, those who still refuse to accept the remedy, and it cannot be denied that diphtheria may have changed its character since the introduction of antitoxine, which may make our present statistics too optimistic. But aside from this, the attitude of the objectors is the same as is found with every well-recognized method of procedure. The legitimate objections and the proper method of using the antitoxine will be given.

The antitoxine should come from a maker whose methods are beyond suspicion. Too much care cannot be taken in this direction; if bad results follow the administration of antitoxine, both the method and the physician will be blamed, and in this country we have seen how diphtheria antitoxine may produce tetanus, unfortunately, through a faulty method of its production. In order to be able to place the legal responsibility where it belongs, it is better to choose antitoxine of home, not of foreign, manufacture. The antitoxine should not be too old, the more concentrated it is the sooner does it lose in efficacy; up to the present time it has not been shown that harmful decomposition products are formed, but it is possible that they may be. The bad effects that follow the use of antitoxine—febrile, skin, and joint symptoms—are due in by far the greatest number of instances to the horse serum; therefore little serum and as much of the antitoxic body as is required should be used for injection—a concentrated antitoxine. It cannot be denied that sudden deaths have followed the injection of antitoxine, but they are as rare as are the deaths following the subcutaneous administration of any drug, and represent a very minute chance of risk to the patient. Certainly this risk, while all precautions should be taken to prevent it, need not be considered when weighed against the benefits produced by antitoxine. All antiseptic and aseptic precautions should be taken in injecting the antitoxine: the syringe, the needles, the skin of the patient should be sterile, and the hands of the operator thoroughly clean. At the present time several manufacturers take upon themselves the responsibility of supplying syringes in which the antitoxine has been packed and also needles, thus saving loss of time to the physician. As little ado as possible should be made of the operation to

the patient, and the injection should be made so that the patient cannot see what is going on. For this reason the interscapular space, the thighs, or the abdominal region in the hypochondrium should be selected as favorable places; the last two cannot be seen by the patient when he is lying upon his side. The needle should be introduced into the loose subcutaneous connective tissue and the injection should be made very slowly. Authors have warned against the possibility of injecting the antitoxine into the vein; this is not likely to occur, and unless the fluid is too cold it is doubtful whether it would do harm. After the fluid is injected the needle is slowly withdrawn; no massage or rubbing is to be used, and the point of entrance is to be covered up with sterile absorbent cotton or a piece of adhesive plaster.

When should antitoxine be used? In adults only in severe tonsilar diphtheria, or when the membrane has a tendency to spread. In children it should be used as soon as the diagnosis is made. Always in children, because extension is more apt to occur and the mortality is great. In them there is no need of waiting for a bacteriological diagnosis; if the clinical diagnosis is not confirmed, the antitoxine does no harm; indeed, in many cases of staphylococcus or streptococcus diphtheria it does a great deal of good, as has been shown by a number of observers, and has been my own experience. We do not wait for the culture, which takes from twelve to twenty-four hours, because if statistics have proved anything it is the fact that the sooner antitoxine is used the better the results.

The dose should be large, for it is better to err in the direction of the maximum than of the minimum number of units. As a routine method I give to children under two years of age 1,500 units; to older children and to adults 3,000 units, which is repeated in twelve hours in bad cases—always in twenty-four hours if the effects of the first injection are not beginning to show themselves. One reason for giving the large dose is that no one can calculate the amount of toxine that is present in the blood of a given case, and to prevent the deleterious effects of this toxine we prefer the large to the small dose. When extension, especially to the larynx, has occurred, the initial dose need not be larger—3,000 units—but it must be repeated early. Even in apparently hopeless cases of diphtheria, as we do not know whether they are the results of diphtheria (bacillus or toxine) or of secondary blood invasion of other lower forms of life, the antitoxine should be used in large doses. Evidently too much time would be lost in waiting for the results of a blood culture; from 4,000 to 10,000 units may be used as an initial dose, to be repeated as above in the extreme cases; my experience, although much more limited, agrees with that of McCollom, that no case of diphtheria should be considered hopeless during the first stage. McCollom has given as many as 80,000 units in one case; I have given 64,000 units. Theoretically the serum should not have any effects upon the so-called septic diphtheria; practically it frequently has such effects when given in large enough doses, frequently repeated.

The results following the use of antitoxine differ somewhat from those expected by von Behring, its discoverer, but the value of the discovery is not diminished by the fact that the discoverer took for granted that that which ought to happen would happen. The most important effect is *upon the membrane*; this changes color, begins to shrivel, is detached at the edges, and then

disappears. This change occurs in a short space of time, beginning from eight to twelve hours after the first administration, and reaches completion in from thirty to forty-eight hours, provided the dose has been large enough. Nowhere can this effect be better noted than upon the conjunctiva or the cornea; the excellent results in laryngeal diphtheria, which can be observed with the laryngoscope, are also witness to this fact. Nasal diphtheria usually requires larger doses and longer time. The next effect is *reduction in temperature*, by crisis or by lysis; persistence of temperature always requires repetition of antitoxine. The postdiphtheritic paralyses and the albuminuria are not diminished by the use of antitoxine. (The former is explained by the fact that in more cases than formerly recovery takes place; but if, as has been conclusively shown by Roux and Yersin, the toxine produces the changes in the nerves, either the theory of antitoxine is at fault or our doses of antitoxine are still too small.) The *mortality* has been enormously reduced, as has been shown by statistics from all countries where the antitoxine has been used. But even a prejudiced observer, as I was before my conviction by experience, will be converted to the use of antitoxine if he uses it of good quality, early enough, and enough at one time. Theoretically every case of diphtheria should be cured; practically this ideal result will hardly be attained.

Medicinal.—Other remedies for general treatment are still recommended: the tincture of the chloride of iron, potassium chlorate alone or in combination with the former, mercuric cyanide, corrosive sublimate, and many other remedies. Jacobi recommended especially the Tinctura ferri chloridi and corrosive sublimate. Potassium chlorate should never be used (v. Stomatitis), and mercuric cyanide is also toxic. Aside from the administration of iron preparations, I rarely find it necessary to give internal remedies.

Local Treatment.—This should be used in order to disinfect the places affected, and thus to prevent secondary infection, and mechanically to facilitate the removal of the membrane. *Fœtor oris*, which was formerly considered a classical symptom in diphtheria, rarely occurs in well-treated cases. No violent measures or irritants should be applied, as abrasion of the epithelium is apt to lead to renewed infection; swabbing the throat gently, gargles, sprays, or inhalations should be used. Since the introduction of antitoxine the very active agents for destroying the bacilli have been largely discarded.

In children a local therapy with a brush or swab must be used according to the tractability of the child; if a child uses its full strength to resist applications to the throat more harm is done than good, and the possibility of doing local harm and the danger of producing overexertion of the heart must always be taken under consideration. Upon the whole, this method should not be used except in adults and older children. Löffler's solution, carbolic acid, or hydrogen peroxide (v. Scarlatina) may be applied. The hydrogen peroxide should be pure, fresh, not too acid; it should not be applied too frequently, and should not be used stronger than a three-per-cent solution. It is especially valuable to prevent fœtor, but when applied too frequently I have seen hemorrhagic, crustlike coating develop upon the tonsil. Gargles should contain indifferent substances—sodium bicarbonate (two-per-cent solution), diluted lime water, boric acid—each one used frequently, every two to three hours, and in large quantities. In laryngeal cases it is best to have the room

filled with moisture; otherwise vapors are best applied to children by means of sprays or inhalations with the steam atomizer. Many substances have been used here: eucalyptus oil and equal parts of alcohol (20 to 30 drops in water), corrosive sublimate (1:10,000), potassium permanganate (six to eight per cent), salicylic acid (one to five per cent), hydrogen peroxide (one to three per cent). In laryngeal diphtheria fumigations with calomel—0.5–1 gm. (gr. vijss.–xv)—the patient being confined in a small room or under a tent, are highly spoken of. All local applications can be expected only to fulfill the indications before stated, and the attempts at affecting the diphtheria bacillus where membrane has developed are now abandoned.

Externally an ice bag should be put upon the neck in all cases in which there is any marked involvement of the lymph glands at the angle of the lower jaw (v. Scarlatina).

Nasal Diphtheria.—This requires most active local treatment for the removal of the membrane, as the danger from infection by continuity and contiguity is great, always provided the membrane does not disappear after the proper use of antitoxine. Here the child's head must be held between the knees of the nurse, if necessary, and the application be made to the nose. It does not matter so much what is used as that something is used, and used thoroughly. The mildest substances should, however, be chosen, slightly warmed, or when endurable ice cold; a normal saline solution, boric acid, or any one of those that have been already mentioned. In refractory children the syringe is the best mode of applying the fluid; next to this comes the douche with low pressure; in older children and adults direct application of stronger substances can be made by means of the cotton-wrapped probe. Hemorrhages are apt to follow any but the gentlest of manipulations (v. Epistaxis in Typhoid).

Laryngeal Diphtheria.—The ice bag should be put upon the larynx; the sprays and inhalations should be continued. Outside of the serum, internal medication is without value; the routine use of emetics should be abandoned, for it is more than questionable, with our present treatment, whether any indication exists for their use in diphtheritic croup (v. Croup). Laryngeal obstruction can be more easily relieved by other means, and the after-effects of emetics in a debilitating disease—depression, gastrointestinal troubles—must be considered. The means used for treating laryngeal stenosis are (*a*) intubation, (*b*) tracheotomy.

(*a*) *Intubation of the Larynx.*—The credit of perfecting this method, indeed of making it practicable, belongs to O'Dwyer. Substances had been introduced into the larynx, so-called catheterization of the larynx, by Trousseau, Loiseau, and Dieffenbach; but this was only for the purpose of introducing medicaments, principally silver nitrate. Bouchut and Weinlechner both used intubation in that they introduced tubes into the larynx for the purpose of giving relief to the dyspnœa. But the value of Weinlechner's method can be best estimated by the fact that in 1874–75, when his tubes could be obtained from any instrument maker, I never saw him use them, as he always preferred tracheotomy. As for Bouchut, Sevestre and L. Martin say of his instruments that "they possess historical interest only." This, coming from his own compatriots, is the proper view; Bouchut played an important rôle in the evolution of intubation, but not more so than his predecessors. The opera-

tion itself should be performed according to the rules laid down by O'Dwyer, for his method has not been improved on. It is easily performed in most cases by the trained operator; this means that the physician should first learn upon the cadaver how to operate; special physicians have a special talent for this operation, so that in all the larger cities of this country men will be found who can be relied upon to perform it well. But it is the duty of every physician to learn this operation, as the emergency of relieving laryngeal stenosis may arrive at the most unexpected time. In this country intubation has practically taken the place of tracheotomy in croup, and only in exceptional cases—for instance, accidents during the operation—does a sudden tracheotomy become necessary. The indication for the operation is well-marked laryngeal stenosis, indicated by the characteristic symptoms of dyspnœa. After the operation the patient should be constantly under the direct observation of a physician, for the tube may become obstructed, it may be coughed up, or other adverse conditions may occur. The best place for an intubated child is the hospital. The feeding must be carried out in the manner described by the inventor and his pupils.

The advantages of this operation over tracheotomy are many and apparent: no anæsthesia is required, no external wound is made, the air enters the lungs naturally, and there is little opposition from the patient. The objections that have been raised are also many: the skill required is considerable and the after-treatment difficult to carry out in private practice; certain contraindications exist—very young children, asphyxiated children. In very young children and infants the operation is difficult, but the more practiced the operator the less this difficulty becomes; in asphyxia, if any operation is indicated intubation is, and unless death is imminent, in which case rapid tracheotomy is indicated, there should be intubation. As for the bad results, decubitus and necrosis, the better the operator the less frequent they become. The results from antitoxine and intubation can be summed up in the statement that the percentage of recoveries when they are used is about the same as the percentage of deaths without their use. The report of the American Pædiatric Society (1897) shows that of 1,704 cases of laryngeal diphtheria treated in private practice there was a death rate of 21.12 per cent; in the cases requiring no operation (1,036), eighteen per cent died; in those in which operation was necessary, 27.24 per cent died. Dillon Brown's results are very instructive as to the combined effects of antitoxine and intubation; of 442 cases of intubation without antitoxine, 73.7 per cent died; of 69 cases with antitoxine, 67.8 per cent recovered.

(*b*) *Tracheotomy.*—Intubation is the operation of choice (tracheotomy should be performed only when this fails to give relief). If we could recognize before operating those cases in which the membrane extends below the trachea, they might be tracheotomized immediately; unfortunately one cannot do this, and as a rule these are desperate cases. The idea of following up every intubation with tracheotomy seems to us in this country untenable.

COMPLICATIONS

The Heart.—Heart failure may occur at any time during the course of the disease or the convalescence. Attempts should be made to prevent its

occurrence; the condition of the heart should be observed; embryocardia, gallop rhythm, arrhythmia, great increase in beat, weakness should be watched for, as any one or all precede heart failure. Rest in bed, already insisted upon, must become absolute physical and mental rest; all exciting and unnecessary medication must be avoided; for the time all local treatment should be interrupted. To prevent collapse, digitalis, strophanthus, strychnine have been recommended. The reader is referred to the chapter on acute myocardial insufficiency for the treatment of this complication as well as of the others connected with diphtheria.

Nephritis should be treated as in all other diseases (v. Nephritis).

Diphtheritic Paralysis.—Strychnine is the remedy that seems to be indicated above all others; its effect is limited by the amount of involvement of nerve and by its dose. The involvement of nerve is of special importance in neuritis of the vagus; no amount of strychnine can prevent paralysis of inhibition if these nerves are affected in their totality. In diphtheritic paralysis of the larynx and pharynx, besides the use of this remedy, in order to prevent aspiration pneumonia feeding by the stomach tube must be resorted to; as I have even then seen complications arise, gastrostomy should be thought of. In children rectal alimentation is even more unsatisfactory than in adults, notably so in diphtheria. Paralysis of respiration is sometimes successfully treated by artificial respiration, for which O'Dwyer has invented a very ingenious apparatus, and by stimulation with faradism. All other paralyses that are not diagnosticated as fatal to life, it must be remembered, get well without any treatment. Here it is a question whether treatment can do much good except in an indirect way, keeping the involved muscles in good condition so that complete recovery may be hastened. Here again strychnine has been recommended, a subcutaneous injection to be given daily, then every other day for some time (the dose varying from 0.0005 to 0.001 gm—gr. $\frac{1}{30}$–$\frac{1}{60}$—more or less, according to age). Decidedly more important is the use of massage and electricity.

The use of braces should be advised in cases in which there is paraplegia; the object of treatment is to have the required tonicity of muscle best secured by voluntary motion; failing that, by passive motion. When the paralysis is nearly complete, braces will prevent deformity and permit the patient to go about. Both the galvanic and the faradic currents have been recommended; the former does no harm, the latter does good. External applications do no good, but all reasonable methods of suggestion may be used; the more done for the patient the better for him and the entourage.

CONVALESCENCE

The *heart* must always be taken into consideration. The *general health* usually needs looking after—iron and quinine and nux vomica find their indications; anæmia is apt to be present, and the depression is best met by nux vomica, the glycerophosphates with alcohol, phosphide of zinc, or the valerian preparations. The *adenopathy* is best controlled by the iron iodide or creosote preparations. The *diet* should be adapted to the individual, as in the convalescence from other acute infectious diseases. Gymnastics, exercise in moderation, especially in the open air, are very valuable.

XVII. ERYSIPELAS

PROPHYLAXIS

There can be no doubt that erysipelas is a contagious disease, but experience has shown that its contagiousness is not a constant quantity. In private practice this quantity is very small, in hospital practice very great. In the latter there is no question of what should be done; erysipelas patients should be refused admission into a hospital that is not properly equipped; under all circumstances the transference of erysipelas to a large, general ward is to be looked upon as almost criminal. If the patient is admitted into a hospital, there must be a septic ward or building or, which is admissible, specific rooms with special attendants. The reasons for the great contagiousness of erysipelas are to be found in diminished resistance of those exposed, in the fact that a certain number of patients are attended by the same nurse, and, furthermore, in that the Fehleisen streptococcus, as Germano has shown, retains its virulence for a long time (months) in dust. Ucke has found virulent streptococci in the ventilators of a hospital ward, and D. Eiselberg has shown that the erysipelas streptococcus is found in the air surrounding patients. It will then be seen that also from a theoretical point of view the strict isolation of erysipelatous patients in a hospital is absolutely necessary; the surgeon and the obstetrician cannot have these patients, and for the physician an erysipelas patient is a source of absolute danger to his other patients.

In private practice things are simpler; isolation should always be recommended, but with care this can be avoided. The physician should look to himself (v. Scarlatina); his relation to obstetrical and surgical practice is the same as in scarlatina; with great care the risk of infection is not great; there seems to me just as much risk in the handling of pus cases, and, as a matter of fact, I see surgeons constantly attending to virulent streptococcus infections and continuing their operative work, apparently without bad results. The responsibility in the matter lies after all with the individual physician; my own attitude is that absolute protection from the chance of carrying contagion is the best course to be pursued. The attendants should be warned of the contagiousness of the disease, but, at the same time, instructed as to the mode of contagion. Individual prophylaxis should then be looked to. As erysipelas is also indirectly contagious, all the precautions must be taken, as in other contagious diseases, with regard to clothing, bedclothes, and room of the patient.

Individual Prophylaxis.—The portal of entrance is an abraded surface upon the skin, the nose, the tonsils, the marginal junctions of skin and mucous membranes. A very small place of entrance, which cannot be seen with the naked eye (whence arises cryptogenetic or idiopathic erysipelas), is sufficient. Vaccination may be followed by erysipelas. In erysipelas neonatorum the streptococcus gains entrance through the umbilicus; midwives have been known to be responsible for epidemics of this form of disease.

Local predisposition is more important than general, although for the latter one attack of erysipelas predisposes to others, and a marked reduction in general health (typhoid, cholera, variola, or any reducing disease) must

always be taken into consideration for prophylaxis. Under all circumstances in the presence of erysipelas all local conditions should be treated; there should be cleanliness of nose, throat, and mouth. People with wounds or abrasions should not be allowed to come in contact with erysipelas. The presence of a sore throat should always, under these circumstances, be looked upon as suspicious, although a streptococcus sore throat does not, by any means, signify erysipelas of the throat.

TREATMENT

Serum.—Theoretically, this method is without value; practically, many good results have been obtained. This contradiction is explained by the nature of the streptococcus, its variability as to virulence, and the fact that no great amount of antibodies is formed by its injection into animals and human beings; consequently, from the theoretical point of view, no anti-streptococcus serum can exist for erysipelas. From the view point of experience it can be shown that the streptococcus serum does good; but we are not in a position to predetermine just when it will do good, the number of cases that will be benefited, or the way in which it acts. A routine use of serum should not be advised; erysipelas is a self-limited disease with a small mortality, except in hospitals, epidemics, or in the newly born, and the injection of serum may be followed by certain unpleasant results (Diphtheria Antitoxine). In very severe cases it may be tried; whoever has used it in this disease will never confound its effects upon the temperature with those of the normal, so-called streptococcus charts.

Abortive Treatment.—Any method which will prevent the spread of erysipelas in a number of cases and cure it in the newly born can be looked upon as successful, for this form is usually fatal; that such a method exists has been shown to be the case by Baginsky and Felsenthal, and I have been able to verify it. In order to be able to carry out any one of these methods, due attention must be given to the normal spread of erysipelas in the skin, which occurs by the lymphatics, so that even those parts which are not reddened in the direct neighborhood of an erysipelas may be already infected. In most cases the infected area can be outlined by a slight elevation, due to the development of the leucocytic barrier; but this is not always well marked, and it is therefore a good rule to accept as infected all the tissue one inch outside the area of redness, and all this area must be treated, whatever method is used. The methods can be classified under (*a*) inclusion; (*b*) direct treatment of the whole infected area.

(*a*) *The inclusion method* is valuable in those localities, the extremities or the trunk, in which it can be easily used. Besides inclusion, a certain amount of pressure must be applied. Wölfler, who first recommended this method, used adhesive plasters, then rubber strips were recommended, and the application of tincture of iodine. I have used collodium with success, especially in vaccinal erysipelas, where its origin and spread should be observed from the beginning (v. Vaccinia). Inclusion without pressure has been recommended in two ways: the method of Hueter and that of Kraske-Riedel. Hueter used three-per-cent carbolic-acid injections beyond the infected zone; corrosive sublimate and biniodide of mercury have also been

used. I have never tried the Hueter method, on account of the danger of producing carbolic-acid poisoning; of its uncertainty, because a sufficient number of injections cannot be made to include the whole area; and because the effects are only temporary, and thus repetitions are necessary, unless this treatment is used at the very beginning of the disease. The Kraske-Riedel method consists in surrounding the infected area with a fence-rail incision, into which a solution of corrosive sublimate (1:1,000) is rubbed and then kept constantly applied upon lint (carbolic acid was originally recommended). The incision is to be made deep enough just to bleed; generally it gives very little pain; if the patient objects very much, local anæsthesia may be used; the accusation that this method is cruel and painful is based upon its improper carrying out. I have used this method very frequently and have been able repeatedly to demonstrate its efficacy to a large number of students and physicians. For the face and head it can be used with great satisfaction—no scars being left—and when the applications are cold, additional relief is given. The head must be shaved; the method therefore presents difficulties on account of the hair and has not given me such good results as in other places, although Kiliani recommends it especially in this situation.

(*b*) *Direct Treatment of the Whole Infected Area.*—This method should be used especially in erysipelas neonatorum, but it may be used in all very severe cases. Here incisions are made into the skin, a large number, about an inch long, without bleeding; the whole infected area is then massaged, the fluid pressed out of the lymphatics, then a sixty-per-cent ichthyol salve is rubbed in, and the whole covered with this salve, for which lanolin is used as an excipient. Corrosive sublimate (one-per-cent solution) has been used instead of the ichthyol (Lauenstein).

The objections to the use of this method are: (1) That it is a cruel one. Even if we admit this, I consider it trivial under the circumstances, and I have never found it necessary to chloroform my patients, which has seemed necessary to some authors. (2) That it does not always succeed. This is not the fault of the method. No local method can be applied with mathematical accuracy. The newly born, furthermore, do not possess adequate leucocytic protection, and therefore septicæmia is so common with them. But even when this is considered, the method is rational and gives better results than any other that I have ever used.

Local Treatment.—Unless the medicament is used by one of the methods just described, its action depends entirely upon chance; this explains the great number of remedies recommended on the one hand, and therapeutic nihilism on the other. Of all the modern remedies ichthyol holds the first place; it should be used as a thirty- to fifty-per-cent lanolin salve, which should be rubbed over the area. Alcohol, turpentine, corrosive sublimate, carbolic acid, creolin, iodine, iodoform, camphor, and a number of other drugs belonging to the group of antiseptics, have found favor with a number of observers. Another class of external applications, intended to destroy the streptococcus by excluding air, has also been used; collodium, gutta percha, the application of various varnishes (siccatif) or plasters, Emplastrum hydrargyri, which is thought to combine air-excluding and antiseptic properties. Powders of various sorts are also used, zinc oxide, starch, boric acid, the skin afterwards being covered with cotton wool; these in part relieve the painful

local sensations, are cleanly, and do no harm (Watson Cheyne). Ice-cold applications are of great value, they give relief and have some effect upon the process itself. Köster has come to the conclusion that vaseline alone is sufficient, because it relieves the tension in the skin, is cheap, and has no after-effects. He has treated 130 cases in this way and compares the results with those in 129 other cases treated in various other ways, a statistical research that is in no way conclusive, except as to results he has obtained in regard to the harmlessness of vaseline. Statistics may be very valuable; in erysipelas the statistics published all suffer, for the reason that a sufficiently large number of cases treated by one or the other method has not been taken into consideration.

Erysipelas of mucous membranes should receive great attention; on account of spread and complications it must be treated locally, by salicylates, corrosive sublimate, frequent application of cold.

General Treatment.—The fever should be treated by the milder hydropathic procedures; the coal-tar products need rarely be used. The tincture of the chloride of iron, in large doses—1–2 gm. (℥ xv–xxx) every two hours —is used by a large number of observers and may do good. The cerebral symptoms, so common with erysipelas intoxication, require bromides, chloral hydrate, sometimes hyoscine hydrobromate or morphine. Alcohol is of service, especially in erysipelas in alcoholics; here digitalis, strychnine, or the lukewarm bath may be indicated. The diet is that of ordinary acute febrile diseases.

COMPLICATIONS

For the treatment of these as they affect the nervous system, the gastro-intestinal tract, the heart, the respiratory system, the kidneys, and the joints, the reader is referred to the respective sections. In erysipelas of the pharynx we find that most dreaded complication, œdema of the glottis, for which relief should be given by scarification; if there are indications of deeper extension, intubation may become necessary; to prevent the deepest extension in the form of a terminal pneumonia nothing more can be done. Collections of pus should be looked for, and when found immediately evacuated. Puerperal erysipelas is greatly to be feared, and must be treated always as severe erysipelas.

SEQUELÆ

These are unimportant, except as produced by the complications. No cicatrices are produced by the process unless there have been deep abscesses or gangrene of the skin.

The hair may come out after erysipelas of the head. The treatment, if any is required, is the same as that recommended in typhoid fever (q. v.). The convalescence is rapid, and in a very short time the patient is restored to full health.

XVIII. SEPTICOPYÆMIA

PROPHYLAXIS

In septicæmia we have a bacillary invasion of the blood from some infection. For our purposes it is not necessary to confine the term to the invasion of pus-producers. When the invasion produces pus foci we speak of pyæmia; clinically, the two are so often combined without our being able to distinguish pure septicæmia from pure pyæmia that, with v. Leube, I prefer to use the term septicopyæmia. The primary invasion always comes from without, but the bacteria may become localized, remain dormant for some reason, suddenly multiply or increase in virulence, and enter the blood vessels, to multiply there and produce an attack of septicopyæmia. When the source of the infection cannot be found, we accept the term cryptogenetic septicæmia (v. Leube); but it goes without saying that, the more carefully and thoroughly we can look into the cause, the rarer will cases of cryptogenetic septicæmia become. It is important to note that, though formerly septicopyæmia was always considered within the province of surgery, it now belongs to the physician, and is more fully discussed in medical than in surgical works. The reason for this is that the modern surgeon has largely done away with sepsis, and his methods of asepsis are those we must employ as a prophylactic. Antisepsis is of importance, but asepsis is paramount; to a large extent the physician cannot carry out the latter, both on account of the locality of the infection and because the patient comes to him when the damage has already been done. But he can do much, as has already been shown in the various preceding chapters. The physician must be thoroughly alive to the fact that any infection, it does not matter how or where it originates, may be followed by septicæmia. The infection coming from without may enter through the most trivial wound, as many medical men have found out at their own cost (septicopyæmia, tuberculosis, dissection wounds, producing various kinds of infection). While immunity is produced by being frequently exposed to certain bacteria, notably in pathologists, yet this immunity is only temporary, as was first shown by Sir James Paget in his own case. Medical men owe it to themselves, as well as to others, to take the utmost care to prevent self-infection and to teach the laity how to treat wounds, even the most trivial, according to antiseptic and aseptic methods. The efficacy of the latter has been fully demonstrated in the war with Spain.

The methods of infection from within are more subtle, but much can also be done here. The danger of infection from the mucous membranes can be lessened by proper treatment; from the gastrointestinal tract by internal and local treatment, especially the proper treatment of appendicitis; from the genitourinary tract by the proper local or general treatment of the urethra, the uterus, the ovaries and adnexa, and the bladder. From and for the heart, acute ulcerative endocarditis being only one form of septicopyæmia, much also may be done. For all these the reader is referred to the chapters devoted to the various subjects. For a number of causes little or nothing can be done, because they cannot be detected *intra vitam*, and if detected, the cause cannot be removed; among these we have old abscesses in the bronchial or the

mesenteric glands, and in the various organs producing no symptoms; the results of old perityphlitic or peritoneal inflammations; the presence of tumors, malignant or benign, etc. All precautions should be taken in the infant and the aged, as the natural protective forces are diminished in them. Convalescents from serious illness, debility from all sources, alcoholism, the puerperal state, must all be looked upon as diminishing resistance to bacterial invasion.

TREATMENT

As all the constitutional evidences of septicopyæmia are produced by the presence in the blood of bacteria or of their toxines, the causal treatment must be applied to affect them both. While I am fully aware of the inadequacy of the methods that are recommended, they are in line with the methods that are sure to come, and are valuable in a large number of cases. For the destruction of bacteria in the blood we must depend upon such agents as are bactericidal directly, or indirectly as complements (therefore producing bacteriolysins or agglutinins).

The soluble silver preparations of Credé have been of service in my hands; collargolum used locally upon infected wounds and the Unguentum Credé by inunction. The latter has proved very serviceable in septicæmia in children, for the reason that in them a sufficient amount of the silver is absorbed. In adults the results have not been so good; here rectal injections of collargolum dissolved in water (0.3–0.5 gm.—gr. v–vijss.) have seemed more efficacious. The inunction must be made at least once daily, in bad cases as often as three times daily; the ointment must not be washed off, and the dose must be sufficiently large, for infants not less than 4 gm. (℥j); in children I have used as much as 15 gm. (℥ss.) morning and evening; if there is bathing, oftener. When used in large doses inunctions will produce an effect, if at all, in from thirty-six to forty-eight hours, by causing reduction in temperature, not infrequently by crisis. In very severe cases even larger doses may be tried; I have never seen any bad results follow. The ointment is to be used in cases in which there are no pus deposits. I have not used collargolum internally or by intravenous injections; the latter have been recommended in malignant endocarditis.

Specific Treatment.—The serum treatment is calculated to destroy the bacteria either by way of producing agglutinins or by phagocytosis. Since the days of Marmorek, streptococcus serum has been much changed by taking into consideration that all streptococci are related to each other—i. e., belong to the same species, though differing in their effects. Furthermore, as shown by Tavel and verified by all subsequent observers, in order to obtain antistreptococcic serum which is of value, virulent human streptococci must be used; these must be injected into large animals, whose serum is then employed. This method is diametrically opposed to that of Marmorek, who increased the virulence of his streptococci by repeated animal passage. The various streptococcus sera that are now used, or are properly prepared, are those of Moser for scarlatina, of Menzer, and of Aronson; there is also one serum of this kind produced in this country. Menzer's serum differs from that of Aronson in that the latter uses for injection into horses both virulent human streptococci and those derived from animals. Menzer claims for

his serum that it produces leucocytosis, and states that it should not be used in cases in which there is pus, as this will be increased thereby. Aronson does not admit that there is any deleterious reaction resulting from the use of his serum. But these authors assert that all streptococci are the same. As far as the use of the serum itself is concerned that is prepared upon this principle, time alone will show whether or not the principle is correct. It is stated that we cannot hope for so much as we have gained in diphtheria, for an active process in the individual is required with the streptococcus; when the individual does not react by leucocytosis, it is supposed by Menzer, but is as yet to be proved, that the serum will not produce results. For this reason this author recommends that the serum be not administered in pus cases unless the pus can be evacuated; he says that if the individual reacts to the serum, pus will be increased. Another form of serum is that made upon the recommendation of Denys, by taking various strains of streptococci, thus producing a polyvalent serum. Here the theoretical conception is diametrically opposed to the one underlying Menzer's and Aronson's serum. But with the use of this serum also I have obtained good results.

The practical outcome for the patient is that the streptococcus serum does good in a number of cases, possibly by various modes of activity. The indications for its use are septicæmias produced only by streptococci and of sufficient gravity to warrant its use. Outside the hypothesis of Menzer, it does little good where there is much pus, because in such cases there is intoxication, which must be relieved by evacuation of the pus. This serum does no more harm than follows the use of antitoxine, except that the bad effects of horse serum are rather more common. For the reasons given in the case of diphtheria antitoxine, in addition to others that need not be mentioned, only products of home manufacture should be administered.

The use of formalin intravenously injected is also followed by good results in some cases. In the hospital service of G. L. Peabody it has been used with signal success in cases in which the serum has failed completely. In the administration of all remedies theoretical and other prejudices should be cast aside; only in this way can justice be done, for, after all, our knowledge of the *modus operandi* of all medication is very limited, so that the experience of one competent, unbiased observer is worth more than all the evidence collected from unreliable sources.

Toxæmia.—For the treatment of toxæmia there are various methods, all depending upon the use of normal saline solutions and mentioned in the order of therapeutic indication as to the severity of the case:

(*a*) *Rectal Injection.*—The use of a normal isotonic solution (0.90 per cent) by the rectum; by means of an elastic catheter a large quantity of this solution, warmed, is put into the colon and allowed to remain there.

(*b*) *Hypodermoclysis.*—From one half to a whole liter, or more, of this solution is slowly injected into the loose subcutaneous connective tissue, into the thighs, the buttocks, or the interscapular space. There is no need for any kind of special apparatus; an aspirator needle attached to the tube of a fountain syringe is as good as any, but everything must be absolutely sterile. The solution should be about the temperature of the body and be allowed to flow with as little pressure as possible.

(*c*) *Intravenous Injection.*—Here a large needle can, under favorable cir-

cumstances, be directly introduced into the vein, or the vein may have to be exposed. The apparatus to be used consists of a glass vessel, to the perforated bottom of which is attached a rubber tube and in which a thermometer is placed. In using a glass receptacle the outflow of the fluid can be watched, and entrance of air into the vein, whether it means much or little, can be prevented. Properly constructed glass cannulæ, such as are used in the physiological laboratory, are best adapted for introduction into the vein after it has been opened. Everything must be perfectly aseptic; the solution should be sufficiently warm, not below 100° F., as it cools off in flowing through the rubber tube. I have seen damage done by transfusion of cold solution; if it would not complicate asepsis, a thermometer near the outlet of the tube would be of great value in determining the temperature of the solution before it enters the vein. The pressure must not be too great, and from one to two liters of fluid can be used. In the main these methods act by dilution of the blood, making the toxine less harmful; they also increase blood pressure, and in both ways elimination of the toxine is increased.

(*d*) *Lavage of the Blood* (Sahli).—This consists of venesection and transfusion; the former to get rid of toxines, the latter to replace the volume of blood lost by bleeding and to dilute the toxine still existing. Usually it is not necessary to do both simultaneously, but in emergencies this must be done. The method applies to all malignant or severe intoxications threatening life. In more than one instance it has seemed to me to have been the means of saving life; I have found it of great value in uræmia. Like all heroic measures, it should be done early, for unless the deleterious cellular effects of toxine can be prevented all measures will be hopeless.

General Treatment: *Medicinal.*—On account of the peculiar temperature curve frequently observed in septicopyæmia, quinine is the drug most commonly given. Very few cases run their course without at one time or another receiving large doses of quinine, and a number of cases are on record in which the patients have been apparently cured by it. I have never seen any material benefit follow the use of these large doses. While there is a theoretical reason for the administration of quinine, none exists for the use of the antipyrine or acetanilide groups, beyond the bare fact that they reduce temperature, although good results have been obtained from antipyrine. Salicylic acid has also been extensively used; it seems to have no effect whatever, even upon the symptoms that are present in joints.

Hydropathic treatment is without value; the fever may be reduced, but the course of the disease is not affected and the patient feels no better for it.

Alcohol is required in all these cases; they bear large doses without bad effects, and its use, in common with other stimulants, frequently tides the patient over dangerous periods.

The *diet* should be as nutritive and as liberal as is warranted by the condition of the gastrointestinal tract.

Whenever there is *pus* it should be evacuated; it matters not whether it be in the brain, the peritoneal cavity, the joints, or anywhere else, provided only its removal be not probably attended by a fatal result, on account of its locality or the condition of the patient. This chance must be given the patient, for no one can know that the danger already done is too great to prevent recovery. Where there are multiple deposits of pus the indication is

a different one. The number, the size, the localities of the foci, the condition of the patient, all must be taken into consideration before operative interference can be resorted to.

Treatment of Special Symptoms.—The chills, when severe, after successive repetitions, are sometimes followed or accompanied by collapse, at times fatal; stimulants are required. These may sometimes be given in anticipation of the chill by watching the temperature of the patient; with ascending temperature the patient may require stimulants (alcohol, ammonia, camphor, sometimes ether or camphor subcutaneously); the increase in the already rapid, arrhythmic, weak pulse should also put the physician on his guard. The subnormal temperature during or after the colliquative sweats may also be attended by dangerous debility.

Pains in the bones or joints are best relieved by opium or morphine, if sufficiently great, otherwise hot applications, with or without some medicament (camphor, opium, lead and opium wash).

Osteomyelitis should be recognized early and operative relief given.

The **skin** frequently requires special care; abscesses should be opened; pustules, when small, should be treated by antiseptic salves or lotions (corrosive sublimate, ichthyol, salicylic acid); when large, they should be opened and properly dressed. Cellulitis should be treated as in scarlatina (q. v.).

The **heart** symptoms may require attention (v. Endocarditis, Pericarditis, Myocarditis).

The **nervous system** is usually affected in one way or another, with variations from the ordinary febrile symptoms to organic changes in both the central and the peripheral nerves (v. Diseases of the Nervous System).

CONVALESCENCE

The convalescence is very slow in prolonged cases, depending not only upon the organic damage done, but also upon the general effects of the disease. The former must be treated according to circumstances, the latter require all possible attention. Jürgensen's rule, that the patient must stay in bed for two weeks after the temperature has become normal, is a good one to follow. We never know when the process has come to an end; in the great majority of cases the heart is affected, nor can we always tell how much, and the loss of weight and strength is marked in this disease. In following this rule we prevent relapses and complications, which may result fatally. Relapses occur quite frequently, and two weeks without fever is a safe limit for leaving the bed, provided all marked symptoms have disappeared. The time required for complete recovery varies very much. In children it may be short; in adults I have seen it last for a year and longer. The recurrent pains, when purely neuralgic, require small doses of the antipyretics, but care must be taken not to establish a drug habit. In this stage the whole armamentarium of tonics and restoratives may be required, and under all circumstances the anæmia must be looked after; plenty of food, wholesome, nourishing, and frequently taken; open-air life, moderation in exertion, both psychical and physical, should be recommended. In this disease the treatment frequently calls into play all the resources of the physician.

XIX. RHEUMATIC FEVER

PROPHYLAXIS

Rheumatic fever is looked upon as an acute, infectious, noncontagious disease, due to various bacteria—by most investigators to a streptococcus form. As in all infectious diseases, we accept predisposing causes, which in this disease have been carefully studied and verified by experience. As predisposition is produced by one attack, the predisposing cause should be looked for in each individual; wherefore prophylaxis varies with the individual. Exposure to cold holds the first place; for the prevention of its bad effects the reader is referred to the chapter on Diseases of the Respiratory Apparatus. When there is an hereditary tendency it should be the duty of the physician to find out whether this has produced a local or general predisposition; in the first instance, there is trouble with the throat; in the latter, chlorosis, anæmia, a neuropathic tendency. Occupation must be looked to; day-laborers and servants are more predisposed than those in higher stations of life. Overexertion or fatigue should be prevented. It has been shown that the joints most frequently used are especially liable to be attacked. The personal hygiene should be directed; there should be cleanliness of the body. daily cold sponges or tub baths, daily exercise, wholesome food, very little if any alcohol, no excesses of any sort. The clothing should be adapted to the individual; a man who lives in a furnace-heated house, spends his days in an overheated office, to and from which he comes and goes in a closed carriage, does not require flannels, least of all red flannel, unless it has been frequently and thoroughly washed. For him, the thinner the underclothing, the thickness of which need not be changed with the season, the better. Let him change his outer clothing according to the temperature. For the hard-working man, flannel is better, even red flannel if it produces beneficial auto-suggestion. A selection of a good climate is very valuable in the prevention of relapses—in Europe, Meran, Malaga; Egypt; in this country, especially southern California, and good results are also obtained in the extreme North and South.

The only *local predisposition* that has been positively established is to be found in the throat, where Menzer has found a pathogenic streptococcus in the peritonsilar tissue. Experience had long ago taught us that angina tonsillarum may precede acute rheumatism. It is probable that there are other portals of entrance, such as suppurative processes in the skin, and these should be looked after. For the present, all patients with a rheumatic tendency should be taught to keep their mouths and noses in proper condition (v. Pneumonia). In children rheumatic fever is frequently overlooked. because of the easy acceptance of "growing pains" as a diagnosis.

TREATMENT

Streptococcus serum has been used, but its value has not been determined, there being conflicting reports of its efficacy. All other routine methods of treatment have been supplanted by the use of salicylic acid and its com-

pounds. Credit is due to Stricker for the proper valuation of this drug and the introduction of a method for its use in this disease. In order to get the best results from salicylic acid the proper preparation should be used, and this should always be made from gaultheria; the synthetic product is apt to cause more unpleasant symptoms than the natural salicylic acid. Uncombined salicylic acid produces more local effects upon the stomach than sodium salicylate, which is soluble and can be given well diluted. If, notwithstanding, epigastric pain or vomiting is produced, the remedy should be given in large quantities of milk, preceded and followed by an adequate dose of pepsin (essence of pepsin is my favorite), for the reason that salicylic acid precipitates pepsin in the stomach. The adoption of this method usually prevents also the development of nervous and cardiac symptoms. If the patient cannot take salicylic acid—and there are such; indeed, whole families in whose members salicylic acid produces alarming symptoms—substitutes must be used. The administration of salicylic acid by the rectum is indicated only in patients whose stomachs reject the drug; here its use is tentative, vomiting not infrequently occurring when absorption takes place from the rectum with sufficient rapidity, and the results are unsatisfactory. Sodium salicylate should be given to adults in the dose of 1 gm. (gr. xv) every hour until the pain is relieved, for twenty-four hours, but not during the night; then every two to four hours, according to the effect, for from one to two weeks. In children, small doses should be given until tolerance has been proved, then larger doses may be given. Of the many substitutes for salicylic acid we may mention salicin, which can be given in a dose of 0.6 gm. (gr. x), in water or wafers, every two hours, but the results are unsatisfactory as compared with those of salicylic acid. Oil of gaultheria has been recommended; Kinnicutt gives it in milk, twenty drops every two hours, or it may be given in capsules; it is better borne than salicylic acid, but it is not so efficacious, and many patients object to its use on account of its all-pervading odor; nevertheless it is a valuable method, sometimes used with great benefit. We also have the synthetic substitutes, salophen, salipyrine, and aspirine; they have the advantage of being more easily taken, and their effects are those that have been described (v. Influenza). Salipyrine, in my experience, is most adapted for use in this disease; the claims of Grawitz, for aspirine—that it causes no gastric intestinal disturbance, no collapse, no kidney symptoms—have not been verified by subsequent observers, as might have been expected when the principle of its action is taken into consideration, but it is also a valuable drug. The anæmia following the prolonged use of salicylic-acid compounds can be controlled by organic iron.

What are the results of this treatment? When it acts it relieves pain, reduces temperature, favorably affects the joints involved, and improves the patient's general condition. According to the British "Rheumatism Collective Investigation" (Cheadle), it does not diminish the frequency of heart complications.

The choice, after salicylic compounds, falls upon the alkaline method of treatment; whatever were the theoretical reasons that prompted Garrod and Fuller to use this method, it has been followed by good results and sanctioned by experience. Any alkali may be given, sodium bicarbonate by itself or as an effervescent draught, sodium citrate, 1–2 gm. (gr. xv–xxx) every hour

or two, or potassium citrate or acetate in about the same doses. Under all circumstances the urine must be rendered alkaline, and must be kept so for from one to two weeks. The internal administration of citric acid, as again recommended by Ewald, acts in the same manner as the administration of alkalies. The advantages of this method are that it produces no gastrointestinal symptoms nor any of the bad effects of the salicylic-acid compounds; this method, especially the use of citrates, is not objectionable to the patients; frequently, indeed, it is very grateful, in that it relieves thirst, cleans the tongue, and does not spoil the appetite, and may help to keep the bowels and kidneys in order. Its effects are not so marked as those of salicylic acid, it does not give prompt relief to the local symptoms, it has not the marked effect upon temperature, but it is said to diminish the frequency of heart complications. A combination of salicylic acid and alkaline treatment, given together or in alternation, is valuable.

Antipyrine has been highly recommended by German authors (Lenhartz, Neumann, Romberg, and many others), and its efficacy is put on a par with that of salicylic acid. It is used because it reduces temperature, produces sweating, and gives relief to pain. *A priori* one would be afraid to use it in heart diseases, and yet it has been especially recommended to prevent renewed valvular infection. In chronic Bright's disease or the various conditions accompanying arteriosclerosis it is contraindicated. It is given in large doses —0.5–1 gm. (gr. vijss.–xv)—so that the patient receives 5–8 gm. (gr. lxxv–ʒij) a day. In children, I dcgm. (gr. jss.) for each year of age, repeated from two to four times daily, has a very good effect. It is asserted that the usual bad effects of antipyrine are not produced in this disease. That the results are good can be demonstrated in many cases; to prove that it is equally efficient with salicylic acid or the alkaline treatment further experience is required. Because salicylic acid and antipyrine have such excellent effects it is not astonishing that, as in influenza, many combinations have also been recommended as specifics. The acetanilide group, because of its decided effect upon the heart, has not found so much favor, although also recommended as specific; its combinations with salicylic acid (malatin especially) have also been used.

General Treatment.—Even in the mildest cases the patient should be put to bed and kept there until convalescence is well established. All precautions should be taken so that the patient need not be moved too much, as in well-developed cases rheumatic fever is one of the most painful diseases; consequently the bedpan, urinal, and goose-neck cups should be used. All pressure should be removed from the affected joints; the bed clothing should be light, supported when necessary by hoops; the patient sometimes feels more comfortable between blankets, but this is not to be insisted upon as a routine method. The clothing should be so arranged that it can be easily removed on account of the profuse acid sweats; the ordinary nightgown should be slit all the way in front and behind, the sleeves should be slit along their outer margins. Special supports—air pillows, pillows, blankets—should be put under affected joints. All precautions should be taken to prevent bedsores; the bed should not be too hard or too soft, but should consist of a wire-woven mattress and a hair mattress, upon which are placed rubber sheeting and a double blanket. The room of the patient should be kept at an equable tem-

perature, not too warm—about 60° F. Upon everyone in the sick room should be impressed the fact that the least motion may give pain to the patient, even that caused by their walking across the room, and therefore the attendants should be instructed to move about slowly and gently. All disturbance of the patient not strictly necessary should be avoided; the temperature should not be taken too often, ordinarily three times a day will suffice, and then in the locality—mouth, rectum, axilla, or groin—where it disturbs the patient least. The *diet* should consist of fluids—milk, beef juice, broths, soups, ice cream; fruit juices in the form of lemonades or water ices are very grateful, and help to keep the bowels open; cooled water may be given in large quantities to allay thirst; but when gastric disturbance follows, rice, barley, or oatmeal water may be used, and these may also in a measure be looked upon as foods. Cold carbonated waters are frequently much relished by the patient. After the febrile stage has passed no special diet is required. The *bowels* should be kept open by saline cathartics or rectal methods as the exigencies of the case may require. Alcohol should be used only when absolutely necessary.

Local Treatment.—The more rest the affected joints have the less is the pain and the more rapidly does the local process run its course; this rest is brought about by posture, by wrapping in cotton, but best by complete immobilization, preferably by the use of a starch bandage, which is more quickly applied than a plaster-of-Paris dressing. As the swelling of the joint recedes the bandage has to be renewed.

Counterirritants have been highly praised; they do good probably by their effect upon the nervous system, but only those should be used that do no harm; no cantharides, because of the danger to the kidneys; no croton oil, because of its permanent effects upon the skin. Subjection to being stung by bees or the thrusting of the affected part into an ant hill may be noted as peculiar methods of counterirritation. If we use counterirritants at all it should be in an accurate way: the use of the galvanocautery or the Paquelin. *Local bleeding* is no longer resorted to. *External applications* are used in various ways. Warm applications are as a rule better than cold, although in some cases ice gives most relief. Cloths wrung out in water at room temperature may be used, covered by a layer of material completely or partially impermeable, or hot fomentations or dry heat. The remedies that have been added to the water are numerous: sodium bicarbonate, camphor, opium, lead and opium, ammonia, aconite, belladonna, and many others. Salves containing any one of these substances, to which ichthyol may be added, are also in use. In acute cases liniments should not be used, although all the official liniments of the United States Pharmacopœia with the exception of Linimentum calcis have been recommended. The various medicinal plasters are also in use; even if they have no medicinal effect, their proper use in this disease, applied on adhesive plaster, may do good by fixation of the affected part. In the acute stage of rheumatic fevers all these external measures are of very limited value; but if they benefit the patient, although there may be no scientific explanation for their *modus operandi*, they should be used.

Treatment of Symptoms.—The various internal remedies, excepting the alkaline treatment, have a distinct effect upon the **pain,** as also have some of the external measures. Notwithstanding this opium is sometimes required, not only for the relief of pain, but also for sleeplessness; it is best given in

the form of Dover's powder, but morphine may have to be given hypodermically. The other hypnotics are to be used with great care, owing to their effect upon the heart; therefore chloralamid, paraldehyde, sulphonal, or trional should be preferred. The latter two are very uncertain in this form of trouble.

The **sweats** may be controlled by atropine, 0.001 gm. (gr. $\frac{1}{6}\frac{1}{0}$); it would be impossible to stop them entirely, therefore no hesitation need be felt in using this drug when this symptom becomes too troublesome. When the sweats are profuse the skin must be protected, otherwise dermatitis may develop; as the acid reaction of the sweat is decidedly increased in rheumatic fever, alkaline washes have been recommended and found very valuable (one-per-cent solution of sodium bicarbonate). The skin, after it has been washed, should be covered with powder—talcum, zinc oxide, wheat starch powder, or bismuth. The folds of the skin should be especially looked after and be kept as dry as possible; if necessary, a five- to fifteen-per-cent aqueous solution of ichthyol may be applied here.

COMPLICATIONS

The treatment of the most common form will be found in the chapter on Heart Disease.

Hyperpyrexia.—This complication, which is fatal in eighty per cent of cases, should be treated by the cold bath; according to v. Jürgensen, the mortality is greatly reduced by the use of this method. Internal antipyretics are without value, for though the temperature may be temporarily reduced the mortality is not diminished. For the complications of the respiratory apparatus, such as pneumonia and pleurisy, and of the nervous system, such as psychoses, coma, delirium, meningitis, or chorea, the reader is referred to the appropriate chapters.

SEQUELÆ

Relapses are common and should be treated as the first attack. The most common sequelæ are found on the part of the joints, due to exudation, articular or periarticular thickening. For the exudation immobilization may be used, but great care must be taken that anchylosis is not produced, and that atrophy of muscle, already existing from disease, is not increased. The bandage or cast should not be allowed to remain too long. I have never found operation on the joint necessary. Most of the troubles about the joints that follow rheumatic fever can be relieved by local treatment, but they are very tedious, and require patience on the part of both patient and physician. Hydropathic measures, such as the applications before recommended and the hot douche, are used; the external use of iodine (iodovasogen or iodopetrogen is better than the tincture or the ointment), mercurials, ichthyol are all valuable. Rubbing the joint, when the acute process has ended, with hot soapsuds or any one of the many liniments does good. Massage when properly applied is of great value; both the joint and the muscle should be treated, first by effleurage until the other more active methods are used and then by Swedish movements. The hot-air apparatus frequently gives relief. Balneotherapeutics play a very important rôle in the treatment of these sequelæ. I have seen most striking results from

the use of sulphur waters: in this country, Mount Clemens, in Michigan, the Virginia Springs, the Hot, the Warm, the Sulphur, the Salt Sulphur Springs, at Martinsville, and many others; in Europe, Aix-la-Chapelle, Aix-les-Bains, Baden near Vienna, Ofen, Teplitz, are especially valuable. The exact dosage of hydrotherapeutic measures at Aix-la-Chapelle and Aix-les-Bains enormously increases their value by suggestion. For the neuralgias, the local use of electricity, the exhibition of the milder coal-tar products, aconite or aconitine (for the fifth pair of nerves), in addition to the measures just described when applicable to nerves, may be recommended.

For internal medication sodium, potassium, or iron iodide is valuable; the iodide may be given for weeks. Distinctly marked anæmia should be treated. Colchicum and cimicifuga have been recommended; I have obtained no results from their use.

CONVALESCENCE.

No special time limit can be put down for the individual case; it may be weeks or months, or the patient may be reduced to a state of invalidism. On an average, the patient should be kept in bed for two weeks after the attack; certainly he should not be allowed to leave his room before this time has elapsed. During this time the diet should be liberal, only limited by the patient's digestive capacity. The treatment, as we have seen, but especially the disease, may have left him anæmic, and he needs treatment for this (v. Anæmia). Various kinds of baths are serviceable, especially where local symptoms still remain; at home they may be given in the form of warm baths (98°–105° F.), to which may be added sodium bicarbonate, or they may be given in the form of the artificial Nauheim baths (v. Diseases of the Heart), as the indication demands. The Russian bath in some instances is very beneficial. Away from home any number of places are recommended; under all circumstances the patient should not be sent away too soon, usually not before four weeks from the time he gets up, as harm may be done by way of relapses. In selecting a place it is just as important to find a locality in which the patient may get all that is required in the way of good, healthy quarters, good food, good sanitary surroundings, as that the waters should be efficacious. The Hot Springs of Arkansas can be especially useful where there is a combination of rheumatic sequelæ with syphilis, and this is equally true of Aix-la-Chapelle. In Europe, the baths already mentioned, besides those at Bath, Baden-Baden, Ischl, Hall, Franzensbad, Pyrmont, Carlsbad, Nauheim may be mentioned. Except for some indication, such as anæmia, the heart trouble, or the joints, the patient will do well in any favorable place where warm baths can be had with good food, fresh air, and pleasant surroundings. The proper climate for permanent rheumatics has already been stated.

XX. CHOLERA ASIATICA

PROPHYLAXIS

Here especially has prophylaxis done wonders. One need only look to the Hamburg epidemic of 1892, which was not allowed to spread materially over

Germany, and during which the infected shiploads of passengers were so well managed by the health authorities of New York that, except a few cases in New York City, no cases occurred in this country; certainly there was no epidemic. Compare this with the results in 1873 and 1866 and we see a veritable triumph of modern medical science.

As cholera is contracted in the same way that typhoid fever is, except that we have no evidence that infection may take place in any other way than by the mouth, Koch's comma bacillus being unable to live for a sufficiently long time in the blood, the prophylactic measures as to food and water infection are similar to those in typhoid fever. But cholera, while not contagious, is more infective from man to man; therefore strict isolation of the patient, strict disinfection of his dejecta, his clothing, and his room are necessary. Cholera always follows the line of travel; before the days of railways and steamboats its spread was slow; now it is comparatively rapid. In order to prevent the introduction of cholera into a country the organization of an efficient health department is necessary. Land quarantine is impossible, because to establish it traffic and communication would have to be entirely cut off; if this is not done, perfectly healthy individuals may spread the disease, for it has been shown that such persons may harbor virulent comma bacilli in their intestines. Persons coming from infected regions should always remain under the observation of the proper authorities; this is done in some parts of Europe, and was done to a limited extent in this country in 1892–93. Ship quarantine has, by international consent, been reduced to the following: a ship is to be considered infected which has cholera patients, or has had such during the last seven days of its voyage; one that has had cholera on board during any time of the voyage is to be looked upon as suspicious; one that has not had any cholera on board, even if coming from an infected port, is to be looked upon as clean. Passengers, officers, and crew of an infected or suspicious ship should be, when possible, taken off and kept under observation for five days. The seven days in the first instance of detention represent later precaution in adding two days to the average duration of the period of incubation. The rules were laid down in 1893; but inasmuch as there is a large and steadily increasing number of ships which can carry passengers from Europe to America in less than seven days, this number of days should now be so changed that noninfected ships coming into a harbor shall not be allowed to land their passengers and crew before seven days have elapsed after their sailing from an infected port. The five days' detention for observation of occupants of ships is very well, but, as Rumpf points out, it is not absolutely reliable, in that the period of incubation may last longer; although rare for a period of six days, it has been known to last for two weeks (Reiche). Furthermore, it has been decided by this commission that all soiled clothes, washing, etc., in infected boats, as well as the ship itself, should be disinfected. Removal of the bilge and ballast water and substitution of fresh drinking-water for that which has been carried must be attended to. Foods, especially fruit and vegetables, are not mentioned. Clothes that have been worn and rags only are excluded as freight. A very important clause is the one in which every government the representatives of which have signed the convention, binds itself to notify the consuls or ministers of every other government of the existence of cholera foci within its domain. All land quarantine

is abolished. Only those that have cholera, or are suspected of having the disease, may be forbidden entrance into the country protecting itself against invasion. All travelers shall be examined, and if they come from an infected place they may be kept under supervision for five days at their place of destination. For the purposes of disinfection carbolic acid, lysol, creosote (all in three- to five-per-cent solutions kept in contact for some time with the infected object), or steam may be used. Ships as well as sick rooms should be thoroughly cleaned out with one or other of these agents. It is important always to take cognizance of the fact that the presence of the comma bacillus in the fæces (together with Pfeiffer's reaction) makes it certain that its host may carry infection. For the prevention of epidemics the principles are early recognition of the first cases and destruction of the bacilli as they leave the patient. To carry out the first the stools must be examined bacteriologically in all suspicious cases, whether coming from abroad or arising at home. To effect the second, the stools must be disinfected by means of the agents before mentioned, and personal prophylaxis must be carried out.

INDIVIDUAL PROPHYLAXIS.—When possible, the chance of infection is to be avoided; removal to a noninfected locality is not necessary, but can be recommended for countries in which cholera is epidemic during certain seasons of the year, such as India, where removal should take place before the dangerous season approaches, or at least as near the beginning of the epidemic as possible. Under ordinary circumstances removal is not necessary—for instance, if one is living in a civilized community. At home, all precautions as to food, drink, and cleanliness can be taken which are not possible in a strange place. Besides, by the moving of a large number of individuals the spread of an epidemic is promoted. Under all circumstances the physician should explain to individuals the risk they take in going away; but as a rule the elemental fear of diseases and death will outweigh reason. The strictest cleanliness should be observed, especially by those who come in contact with cholera patients: infection takes place by dirty hands; flies have also been accused; no food should be taken that has been in the room of a patient.

During an epidemic the gastrointestinal tract should be guarded against abnormal developments. Aside from those articles of food which may carry infection, such as unboiled milk, butter, cheese, raw fruits, all articles should be avoided which are difficult to digest. All food should be kept so that it cannot become contaminated; everything should be thoroughly cooked or boiled. Excess in eating or drinking should be avoided. Alcoholics are especially liable to cholera, as are all those in whom there is temporary or permanent derangement of the stomach. For drink, boiled water is perfectly safe; carbonated waters, coffee and tea, cocoa or chocolate, and small quantities of beer or claret in those countries in which they are commonly taken, may be used with impunity. All laxative foods in large quantities are to be avoided, as is also the drinking of very cold water; no excessive amount of fruit or fruit juices or of cream is to be taken. When constipation exists it should be relieved by rectal means. The individual should go on with his routine work in his routine way; let there be no overexertion, a minimum of strain, anxiety, worry. All diarrheas occurring in the presence of an epidemic should be immediately looked after by diet, rest in bed, and the use of bismuth and opium.

Because of peculiarities of the comma spirillum, artificial passive immunity is not possible. Haffkine has tried active artificial immunity in 42,000 cases for prophylactic purposes; he uses first a weak virus produced by cultures of the comma bacillus at 39° C. (102° F.), through which a current of air is allowed to circulate freely; then a strong virus which is produced by introducing bacilli into the peritoneal cavity of guinea pigs. The weak virus is used first, then, after five days the strong virus, then genuine Jennerization. The results, which have been accepted by the most critical, seem to show a reduction in morbidity and mortality; in other words, the production of active immunity. The method has been objected to, and Kolle's method, the injection of dead cholera vibrios, has been preferred; both methods prove that an immunity of practical value can be produced, but Kolle's method has not been extensively used; therefore the comparative value of the two methods cannot be established. Under all circumstances the prophylactic measures that have been recommended should be preferred; where these cannot be carried out, as may happen in armies and does always happen in India, vaccination should always be performed. Unfortunately, the same causes that are operative against prophylaxis—ignorance and superstition—may become operative against vaccination.

TREATMENT

In the treatment of this disease I follow principally Rumpf, whose extensive experience in the Hamburg epidemic entitles him to speak authoritatively.

The Initial Stage.—Opium should be given in small doses, but obstinate constipation should not be produced, as it favors the retention of the bacilli, and the mere reduction of intestinal irritability favors their expulsion. When there are evidences of fecal retention, opium should not be used immediately. Astringents have again found favor in the treatment of diarrhea since it has been shown that those that contain tannic acid destroy bacteria—the vegetable astringents, kino, catechu, rhatania, are to be preferred over pure tannic acid for internal administration. Bismuth in large doses, alone or combined with opium, is valuable. Intestinal antiseptics given by the mouth were without value (v. Typhoid, Intestinal Autointoxication). Calomel, which may act antiseptically, seems to be of benefit, given preferably in doses of 0.03–0.05 gm. (gr. ss.–j) every two hours, to be continued for from one to two days. Castor oil and the salines are also used. The danger lies in producing circulation changes by purgation, so that the pulse must be watched, and whenever it becomes rapid and small peristalsis must be checked by morphine. The enteroclysis of Cantani is highly spoken of. In this treatment from 1 to 2 liters (quarts) of a one-per-cent solution of tannic acid, at a temperature of 104° F., are introduced into the rectum by means of an irrigator once or twice daily. These have seemed so important that von Ziemssen thinks a physician in the presence of a cholera epidemic should always carry with him the necessary articles for using this method so as to avoid delay. Besides the effect upon bacteria, this method must be valuable on account of the heat, and especially because it adds more fluid, the absorption of which lessens the toxicity of the blood. This is best effected when it is possible to cause the fluid to flow into the colon.

The patient should always be put to bed. The *diet* should be the same as that recommended for diarrheal diseases: milk, cocoa, broths, toast, or wheat bread twenty-four hours old, the finer carbohydrates, arrow root, sago, eggs, diluted red wine. No great amount of alcohol should be used in this disease. When the appetite increases, chicken, broiled beef, mutton, or lamb may be added—boiled rice has always been a favorite addition to the diet list. Vomiting, which is produced by an elimination of the cholera toxine, should be controlled as in other infective diseases; fortunately it cannot be stopped entirely, but its frequency may be diminished so that the patient is not worn out by it. For the thirst all those fluids that have been recommended in febrile diseases may be given except those that are laxative; hydrochloric acid lemonade is frequently used in this disease.

The Algid Stage.—The prime object here must be to remove the toxine from the blood. Cantani's method has already been referred to, but successive observers have not been so successful in the algid stage as he has been. Lavage of the stomach in 1892 seemed ineffectual in Rumpf's hands, although with a much smaller number of cases it was more successful in 1893. A further trial of this method, thoroughly carried out, is desirable, as it seems to be directed to the increase of a natural method of elimination (Alt asserts that he has found cholera toxine in vomited matter of cholera patients). The skin has also been stimulated in order to remove toxine; the hot bath, so commonly used in Japan (temperature 110° F.), may be given, the patient to be allowed to remain in it as long as fifteen minutes. It should be used in those cases in which the patients are not already too far spent (syncope, complete collapse), and gives satisfactory results (v. Cholera Infantum). Hot-air and steam baths are not so satisfactory. Hypodermoclysis, or intravenous transfusion of a normal salt solution, has been extensively used. Transfusion produces more rapid results, hypodermoclysis is easier, both may be tried in the same case; transfusion of a small quantity first, in order to give relief for dangerous symptoms, the effect then being kept up by hypodermoclysis. Material reduction in mortality has not been effected, according to Rumpf, but the relief given to symptoms, improvement of the heart action, disappearance of coma, was very marked. Use of this method in an earlier stage might possibly be attended by better results, for evidently only one indication was fulfilled—the dilution of the toxine—as even the kidneys were not favorably affected on account of damage already done. When good results follow one or more transfusions, these should be followed up by attempts at increasing elimination of toxine, the giving of copious drinks, and the stimulating of the action of the skin in order to produce sweating.

The use of common salt solutions is followed by stimulation of the *heart*, and for this purpose it is the best remedy known. Morphine in small doses, camphor, ether, strychnine have also been used. Alcohol had better be avoided because it increases heat radiation in a patient who already has greatly reduced temperature. The administration of diuretics in this stage—digitalis, the caffeine compounds, or saline diuretics—is of no value.

The Stage of Reaction.—We here have two conditions that must be especially looked for—so-called cholera typhoid and relapses. For cholera typhoid or coma little can be done; it is ascribed to a uræmic condition, although the cause is not definitely known. The only methods that can be used

are those recommended in uræmia (q. v.). For the prevention of relapse great care must be taken as to diet and treatment of intestinal complications. When a relapse occurs, it should be treated in the same way as directed for the first attack.

COMPLICATIONS

Complications are found: pneumonia, suppurations in the skin and the parotid, and nephritis; the treatment of these will be found in their respective chapters. Persistent diarrhea may lead to death or invalidism. Here the cholera diet and rest in bed should be continued; bismuth, with or without opium, the former in large doses as used in gastric ulcer (q. v.), tannic acid preparations, silver nitrate, etc., may be used (v. Intestinal Diseases). Diseases of the lower section of the bowel should be treated locally (v. Dysentery).

CONVALESCENCE

The patient should not be allowed to get up too soon, and when there are any evidences of organic lesions of the bowel he should be kept in bed until all these have disappeared. A culture from the stool should be made when possible, in order to show whether the patient must still be looked upon as infectious; the comma bacillus may persist for as long as seven weeks. This may also be an index to the possibility of relapse. The diet should be gradually increased, beginning with the cholera diet as a basis, first using only those things which are not laxative; no fruits should be allowed, no great amount of sweets, no vegetables, nothing that may irritate the bowel. Strained apple sauce may first be tried, as also grated boiled potato, which, if no harm is done, can be followed by the use of other vegetables like spinach, stewed celery, green peas in the form of purée. Gradually the patient is allowed to come back to his normal diet, always under the observation and direction of the physician. Alcoholic stimulants may be used in moderation: claret, port wine or sherry, and diluted brandy. The constipation that may arise should be treated as the individual condition may require, either by mild laxatives or by rectal measures. When convalescence has been thoroughly established change of climate may be advised, but aside from the difficulties already referred to in the preceding chapter, the individual will not be looked upon as a *persona grata* in his new surroundings on account of the fear that he may be a possible source of infection.

XXI. YELLOW FEVER

PROPHYLAXIS

That yellow fever is carried by mosquitoes, the *Stegomyia fasciata*, as was first suggested by D. Carlos Finlay, of Havana, and afterwards conclusively proved by a board appointed for the investigation of this disease in Cuba, is accepted. This board consisted of Dr. Walter Reed, Dr. James Carroll, Dr. A. Agramonte, and Dr. José W. Lazear, the latter giving up his life as a result of mosquito inoculation in "the cause of science and humanity."

That this is the only way in which yellow fever may be transmitted must be considered an open question, only to be decided after the specific germ shall have been found and its whole natural history known. The practical results of the acceptance of the mosquito theory have been so far-reaching that in Cuba, where the disease was endemic, it has been practically exterminated, and we have lived to see the day when Cuba has quarantined against Florida. Much of this result is due to the indefatigable work of the board mentioned before, especially to its president, the late Dr. Reed, but also to intelligent coöperation on the part of the surgeon general of the United States army of that time, Dr. George M. Sternberg, well known on account of his research work in connection with yellow fever. The present condition in Cuba may be looked upon as an achievement in scientific prophylaxis the like of which has never been accomplished in any other disease. According to this view, the prophylaxis of yellow fever hinges on the prevention of mosquito bites (v. Malaria). For the extermination of the endemic form it has proved eminently satisfactory.

It is splitting hairs to discuss the question whether yellow fever is contagious or not, as it is immaterial for practical purposes whether fomites themselves or the mosquitoes contained within them propagate the disease, and under all circumstances a yellow-fever patient is necessary to produce the disease in others. That contagion by direct contact alone with patients is rarely, if ever, followed by the disease has been repeatedly shown. In the epidemic of 1878, when over thirty cases were imported from Memphis to Cincinnati, eight of which I saw, not a single case of infection occurred. On the other hand, Gallipolis, Ohio, which before has had local epidemics, again suffered because of three refugees; but with the acceptance of the mosquito theory this curious fact can be easily explained. The acceptance of the principle that yellow fever is noncontagious will do much good in the presence of an epidemic, because it strengthens individual resistance by allaying fear, does away with needless barbarity, such as shotgun quarantine, and does much good for the patient and the physicians, who are no longer looked upon with dread. Persons coming from an infected region should be kept under observation until five days have elapsed after the possibility of infection; their bedding, clothing, and baggage should be disinfected. It was the elation following the far-reaching discoveries that prompted the statement in Circular No. 5, from the headquarters department of Cuba (1901), that "they [the fomites] need not be subject to any special disinfection," qualified somewhat afterwards that they should not be removed from infected rooms until formaldehyde had been used in order to destroy the infected mosquitoes. We are not as yet entitled to such perfect confidence, and for prophylactic purposes no chances of any sort should be taken. Long experience has shown that in this disease fumigation with sulphurous acid is followed by the best results. Infected ships, dwelling houses, rooms, railway cars—in fact, all places where individuals have congregated—should be thus disinfected. Sulphurous acid, we now know, is very destructive to mosquitoes. Formaldehyde seems to have been very valuable in Cuba.

Prophylactically the patient should be dealt with as in malarial disease. The only definite thing we have is the mosquito theory, but the results of centuries of experience should not be neglected.

Sanarelli's serum, bactericidal, has been used for prophylactic purposes; it seems to be followed by better results in prophylaxis than therapeusis, as might have been expected if any results at all are to be looked for. Rego César recommended the use of small doses of arsenious acid—0.0005–0.0004 gm. (gr. $\frac{1}{30}$–$\frac{1}{15}$)—four times daily, continued for months, and Finlay has produced immunity in 177 out of 181 patients by having them bitten with infected mosquitoes, only one female mosquito being used.

TREATMENT

As there is no specific treatment for yellow fever, I follow the directions laid down by those who have most experience in this disease, especially as the application of the ordinary rules for the treatment of such fevers as occur in Northern climates is followed by anything but good results. The first thing for successful treatment is good nursing, the next is a physician who will not attempt to do too much. Every patient, even if only a suspect, should immediately receive an efficient cathartic—castor oil, 45–60 gm. (℥jss.–℥ij), or calomel, 0.5 gm. (gr. vijss.), twice—the action of which is to be hastened by injections. For intestinal antisepsis, benzonaphthol or corrosive sublimate has been recommended to follow the purgation. The patient is to be kept in bed, warmly covered, and no food of any sort should be given for the first four or five days. For the thirst, one-half-per-cent solution of sodium bicarbonate in Vichy water may be given; it can also be relieved by rectal injections of sterilized water, given every six to eight hours. This is the routine treatment that seems to have given the best results, as testified to by all those American physicians who saw a great number of cases in Cuba. Vaughan, when he had the disease, was treated by a native doctor and had a native nurse. It will be seen from the above how difficult the position of the nurse is, not only on account of what must be done, but also on account of what must not be done, the latter usually that which the patient wishes to be done.

Symptomatic Treatment.—For the symptoms the following have been found useful: For the fever, sponging with aromatic vinegar, or baths when necessary. No antipyretics; quinine should never be used unless there is a malarial complication. For anuria, poultices to the lumbar region, the caffeine preparations, enteroclysis. For sleeplessness, chloral hydrate by rectal injection; ice-bag to the head for headache or delirium. For hemorrhage, ergotin or local measures. For collapse, alcohol or other stimulants.

The severest cases, uræmia, cholæmia due to organic changes in the kidneys and the liver, resist all treatment; it is asserted that the routine method recommended prevents the development of these very severe forms.

CONVALESCENCE

The patient should not be allowed to get up too early; never until a week has elapsed from the termination of the secondary fever. When albuminuria is present the patient must also be kept in bed, as in nephritis. The diet should be carefully controlled; the opinion is common here, as in typhoid, that relapses are produced by carelessness; overfeeding and the introduction

of indigestible food should be avoided. If the patient is to be sent away from home, sufficient time must have elapsed for all evidences of the disease to disappear; his strength and resistance should be nearly normal, otherwise relapse or secondary infection may occur.

XXII. THE PLAGUE

PROPHYLAXIS

While prophylaxis is very difficult in this disease, the views of Sticker, of the German Pest Commission, that "where the plague has succeeded in establishing itself, the unceasing and self-sacrificing endeavors of sanitary officials are without results," have fortunately proved themselves too pessimistic.

Plague is propagated by direct and indirect contagion; indirect by anything that has come into contact with the patient, but also in devious ways by lower animals—rats and mice, cockroaches, fleas, bedbugs. Cantlie has found the bacillus in sheep, calves, pigs, ducks, and in food of all kinds. There is no evidence that plague is transmitted by drinking-water, as the bacillus does not live very long in this medium (Kitasato).

If there were *direct* contagion only, the prevention of the development of an epidemic would, in civilized countries, be easy. This has been demonstrated in Vienna, Berlin, and Ann Arbor, where laboratory infections have furnished a focus, and in Alexandria, Egypt, and San Francisco, where imported cases of the disease have found their way. For obvious reasons even this cannot be done where the teachings of modern medical science are not accepted by the physicians or the people.

Indirect contagion makes the problem very much more difficult; here the rats and mice must especially be looked after; at present the means for destroying rats are reduced to the paying of a price for each rat caught. In Sydney, according to Thompson, 108,500 rats were delivered at sixpence a head. In closed spaces, such as ships, they are easily killed by sulphur fumigation. Care must be taken that the rats of an infected ship do not leave it; this end has been attained by the application of adequate mechanical devices to all ropes or cables that connect the ship with the land.

Besides this, the strictest isolation of the patient must be enforced, and all those precautions be taken that have already been recommended in highly contagious diseases. In the plague chloride of lime seems, in addition to those substances mentioned in connection with similar infections, to be of great value as a disinfectant. The physicians and nurses should also be isolated, usually with the result that they contract the disease. No more pathetic picture can be conceived than P. Müller falling a martyr to duty and science as the result of attendance upon plague cases in the General Hospital in Vienna; shut up, with imperfect communication with the outer world, yet watching in himself the development and, as long as he could, the course of the disease. In no disease have so many physicians lost their lives as in the plague. Sticker, who himself contracted the disease, says: "During the plague it is shown how much we overvalue our lives." He advises, as the

best means for individuals that are able to do so, the avoidance of coming into contact with anything that may be suspicious and the usual means of keeping themselves in a normal condition of health. Yet it must be added that many physicians who have seen much of the plague refuse to admit the necessity of such strict measures as isolation of physician and nurses, so that they go about their work as if they had no plague cases. As the bacillus may enter by way of the skin, all, even the most superficial wounds, must be looked to.

SPECIFIC PROPHYLAXIS

On account of the difficulty in carrying out all these prophylactic measures, specific prophylactic measures have been received with great expectations. Here again the production of active and passive immunity has been attempted, the former affording a longer immunity than the latter, so that a combination of both should be used in this disease. Pfeiffer especially calls attention to the fact that in an epidemic patients may become infected in the time elapsing before the immunization shall have produced its effects; theoretically this objection is valid, practically it has been rejected by Haffkine and his followers.

Active immunization is brought about by vaccination (v. Cholera), with the result that morbidity and mortality are both much reduced; this has been verified by a great number of observers, and the contentions of Haffkine have been upheld. *Passive immunity* is produced by the serum of Lustig; but this immunity lasts only two or three weeks, and therefore it should be used only for prophylactic purposes in connection with Haffkine's method. Yersin's serum seems to be bactericidal and antitoxic.

But even with all these methods it is absolutely necessary to look after the individual and general hygiene. How much may be done by these means was shown in Alexandria, where these measures only were used and the epidemic was stamped out. For individual prophylaxis, then, Haffkine's method should be used.

TREATMENT

Specific Treatment.—Yersin's serum has been used with varying results, the mortality ranging from thirty-four to seventy-two per cent. This serum seems to be weak, as Marx points out, and for a curative effect in a man of 60 kgm. (132 lbs.), 9.5 liters would be required. Calmette and Salimbini used a serum, bactericidal and antitoxic, during the epidemic at Oporto, with a mortality of 14.7 per cent, as compared with 62.5 per cent in those not treated.

Lustig's serum, antitoxic, seems to give the best results, the Indian Plague Commission stating that the mortality was reduced to eleven per cent by its use. As for therapeutic use these various sera have been followed by good results, we may reasonably hope that in the future the same results may be achieved by their use as in diphtheria. Since both bactericidal and antitoxic sera have been found, both of the harmful agents—the bacteria and the toxine in the blood—can be neutralized. How much can be done with the serum, used in sufficient quantity and by intravenous injection, was shown by Vaughan, Dock, and Novy in a case of pneumonic plague in which recovery

took place. In this instance prophylactic injections prevented further extension of the disease.

J. C. Thompson has had good results from the use of carbolic acid, of which he has given as much as 144 grains in twenty-four hours.

Symptomatic Treatment.—This is of little value, no method or remedy lowering the mortality. Those best acquainted with the disease recommend rest in bed in all cases. The treatment should begin with a full dose of castor oil or calomel. The buboes may be treated with Unguentum hydrargyri or by incision. The fever should be met with the milder hydropathic methods, and those which are grateful to the patient are recommended; antipyretics are without value. The various stimulants should be used according to indications—alcohol, camphor, ether, digitalis, caffeine, and especially ammonia given with a liberal hand—as cardiac insufficiency is apt to occur. The diet should be the same as is recommended in other febrile diseases.

CONVALESCENCE

Convalescents should be kept isolated, according to Kitasato, for from three to four weeks, or at least until the bacillus is no longer found in the blood and the glands. In the blood, according to this author, they may be found by examining it when taken from the finger tips.

XXIII. DYSENTERY

PROPHYLAXIS

As all the causes for all forms of dysentery have not been discovered, we may be permitted to reason from the known to the unknown. Under all circumstances two things are necessary to produce the disease: bacteria or the *Amœba coli*, and some local predisposing cause; the necessity for the latter was shown by Flexner, by means of animal experiment, to exist in the case of bacillus, and for the *Amœba coli*, by the fact that it had repeatedly been found in the large intestine of persons who have never suffered from dysentery. The two elements for successful prophylaxis lie then in the proper precautions to insure the inactivity of these two causative factors. For the bacterial and amœbic cause all those measures recommended in connection with food in Typhoid and Cholera (q. v.) should be followed, the infection occurring by the mouth in the great majority of instances. In endemic or epidemic dysentery the patient should be looked upon as a possible source of infection, the fæces should be disinfected, and those precautions taken which prevent indirect contagion.

In the sporadic cases the organism producing the disease should be looked for, which is unfortunately too rarely done, for the purpose both of prophylaxis and of treatment. For the prophylaxis of the local predisposition, both constipation and diarrhea should be avoided, for it is common experience that those habitually constipated suffer much from dysentery. All foods that produce fæces mechanically irritating should be avoided; those containing too much cellulose, the early small fruits, unripe fruit; such foods as act mechan-

ically to produce normal peristalsis—e. g., oatmeal, grits, hominy; various drugs; cathartics acting especially upon the lower section of the bowels, and the injection of irritating substances should not be ordered.

TREATMENT

Specific Treatment.—Shiga has produced a serum for the dysentery caused by the bacillus discovered by him; it has not fulfilled the expectations that were excited by its discovery.

Hygienic Treatment.—In all forms of dysentery the *hygienic treatment* of the patient is the same. The patient should be put to bed and kept there until his bowels are absolutely normal; few diseases are so subject to relapse as dysentery, and rest prevents the development of organic lesions, or if they occur facilitates their healing by diminishing peristalsis and mechanical injury.

The Diet.—Contrary to the experience of most authors, I have not found milk the most favorable food; certainly in my experience the disease has run a shorter course without than with milk, and in many protracted cases, notably in children, I have been able to demonstrate, by the withdrawal of milk from the diet list, that this food acts injuriously. All articles of food should be given warm; cold stimulates, heat diminishes, peristalsis; for drink, cooled water, Vichy, Apollinaris, carbonated waters, the three latter not in large enough quantity to produce laxative effects. For food, eggs, soups, beef tea, Mellin's or Liebig's food, cocoa, or Racahout. The great value of Liebig's or Mellin's food in children must be tested before it can be realized. The finer carbohydrates—arrowroot, sago—may be used, also strained oatmeal or farina, alone in the form of paps, or as an addition to the liquid food. A moderate amount of alcoholics may be used, especially a good quality of claret (which, when diluted, relieves thirst), port or brandy.

Medicinal Treatment—*General.*—The earlier the patient comes under treatment the better the results. The first object is to keep the bowel clean; in the beginning of every attack a laxative should be given and should be repeated when the indications for its use arise. The best laxative, on account of its thoroughness and nondebilitating character, is castor oil, but when this cannot be taken salines should be used. The repetition of the dose depends upon the nature of the stools and the amount of retention of fecal matter in the intestine. If scybala are present in the stools in a case in which progress is unfavorable, it can be reasonably supposed that more are retained, to irritate the intestinal mucous membrane. When there is decided dullness on percussion along the course of the colon, especially to be noticed at the flexures where fecal matter is apt to collect, the laxative should be given until this disappears. I have never found it necessary to use the salines as a routine method of treatment, although most excellent results have been obtained by it. Calomel has also been recommended, and many good results are reported, especially from Japan; but care must be taken that too much mercury is not absorbed, and this, it seems, can be prevented by giving other laxatives. Bailey gives calomel—0.5–0.75 gm. (gr. vijss.–xij)—at two-hourly intervals, followed by a dose of castor oil, and asserts that in one half the cases the disease is aborted. In acute as well as in chronic cases the proper use of laxatives is of the greatest value. In the acute cases opium or mor-

phine should be given; the drug has fallen into disrepute in the treatment of intestinal diseases, principally because it does not fulfill any causal indication and because it is asserted that in this disease it does harm by producing constipation. But the latter is preventable by the judicious use of laxatives and local remedies, and it, as well as the former objection, is counterbalanced by the symptomatic advantages to be gained from its use. Opium gives rest to the patient and to the bowels; it relieves pain and diminishes the frequency of the stools; it tends to prevent organic lesions, and therefore favorably affects the course of the disease in every respect, so that when properly used it is invaluable. If used injudiciously and in narcotizing doses, it may undoubtedly do harm. To the opium may be added anything that agrees with the nosological concepts of the physician: salol, bismuth, β-naphthol, turpentine, corrosive sublimate, tannic acid compounds, quinine.

Ipecac, the radix antidysenterica, has been looked upon as a specific in this disease since the days of Helvetius. Its good effects are confirmed by physicians of all nations who have used it in the epidemic form of dysentery, but in the temperate zones its administration becomes necessary only under exceptional circumstances. The results are best when the medication is begun early. It may be used according to the Brazilian method or in powder. The former method consists in giving an infusion prepared and administered, according to Sodré, of Rio Janeiro, as follows: "Take 4 gm. (℥j) of ipecacuanha in powder and 200 gm. (℥vj) of boiling water, and let it steep for twelve hours; at the end of this time pour off the liquid, which is to be administered to the patient; then keep the powder, pouring 200 gm. more of boiling water on it and leaving it to steep for twelve hours, after which pour off the liquid as before, which is to be administered to the patient; from the same powder make a third infusion in the same manner, and use it in the same way. The liquid resulting from each infusion and maceration is administered in the course of a day, either all at once or in broken doses." This author prevents the emetic results of the drug by giving it in broken doses—a wineglassful every two hours, adding cinnamon and small doses of morphine. Sir Joseph Fayrer gives gr. xx to xxx (1.5 to 2 gm.) in water, which dose is generally repeated in from four to six hours. The beneficial effect of its use upon the local and general conditions is noted by all observers. Fayrer was able in India to reduce mortality from eleven per cent to five per cent. The disturbing feature in its administration is the vomiting, although it is stated that this is less likely to occur than by the exhibition of smaller doses. This objectionable feature has been removed by using ipecac from which the emetine has been removed, apparently with the same beneficial results (Pannwitz's communication to Schulz).

Local Medication.—Externally poultices are very grateful, giving relief for the tormina and reducing the number of stools. In the acute stage, direct treatment of the bowel should be confined to rectal injections, cold water, sometimes ice water, or warm water; injections with sweet oil that has been warmed give great relief to the tenesmus, also starch water with laudanum. Small quantities of fluid should be injected after each stool, and this method is especially valuable in children. In a large number of cases, however, in this stage the more efficient method of lavage of the colon can be used; as in all other cases, large quantities of fluid should be introduced, as much as the

patient can bear, tolerance being increased as the method is continued; in infants the weakness of the sphincter ani muscle prevents harm being done. In very acute cases a normal salt solution may be used; the large quantity of fluid distends the intestine and mechanically removes the cause of the disease. When the acute stage has declined, silver nitrate (0.4–0.6-per-cent solution), corrosive sublimate (from 1:5 to 10,000), tannic acid (five per cent), naphthol, ipecac, zinc sulphate, copper sulphate, potassium permanganate, iodine, have all been recommended by various authors, with varying results. In amœbic dysentery injections of quinine (1:1,000 to 10,000, the latter in young children) act as a specific. Failures recorded are due to improper use of the remedy or to its use in cases in which organic lesions are so developed that this form of local therapy of the bowels could not be expected to be of value. That harm may be done must be expected on account both of the large quantity of fluid and of the remedies used. As far as I can determine, however, in the hands of those who have used this method most extensively no harm has been done. In subacute and chronic cases it is of prime importance to examine the rectum and colon by means of properly constructed instruments; then the ulcers can be treated locally. It is a strange fact that this method has not been resorted to more frequently, especially as our instruments for throwing light into the lower section of the bowel have been so much improved. I have had very gratifying results in resorting to this method of treatment, which naturally has great limitations. Under all circumstances an examination should be made to determine what local conditions are present. The production of an artificial anus in the left iliac region has also been recommended in chronic cases; it is asserted that local therapy can thus be applied better both above and below, but further experience with this method is required to determine its value.

COMPLICATIONS

Peritonitis, perforation, abscess of the liver, arthritis, septicopyæmia, and complicating diseases are treated in the manner described in their respective chapters.

SEQUELÆ

These are many; irritability of the bowel, however, deserves special attention. This condition may last for months or even years. The neurasthenic condition that becomes established after its prolonged continuance makes it still more difficult of treatment. All those methods recommended for neurasthenia (q. v.) may become necessary. For the bowel a careful examination is first required; local treatment when necessary should be applied. Careful regulation of the bowels is necessary (v. Constipation). The continued use of belladonna gives good results in some instances; in others, nux vomica. The diet should be regulated especially to prevent flatulency and too great irritation of the rectum.

CONVALESCENCE

In acute cases, sufficient rest in bed is required. In chronic cases, removal from the source of infection; in the tropics, to temperate zones. Every at-

tempt should be made to cause the patient to gain weight, as the loss is very great in this disease—from thirty-five to forty pounds and more in many cases. The blood condition must be looked into and treated.

XXIV. MALARIAL FEVER

PROPHYLAXIS

All that we know of prophylaxis in this disease can be summed up under the following headings: A, The destruction of mosquitoes; B, the prevention of entrance of the parasite into the human body; C, increasing resistance of the human body to the parasite (Marchiafava and Bignami); D, prevention of infection of the mosquito. Even if the mosquito should not be found in the future to be the only way in which the parasite gains entrance into the human blood, this statement will include all that can be done as to prophylaxis.

A. The Destruction of Mosquitoes.—As we are engaged only with the Anopheles, the possibilities of destroying them depend upon our knowledge of the life-history of these insects and upon the practicability of their destruction. For this purpose there comes into consideration the destruction of the adult female and of the larvæ. In closed spaces they can be killed as individuals, but they are destroyed more effectually by fumigation, especially with sulphur. Pyrethrum is also used for this purpose; the dead and stunned mosquitoes must be removed from the room. Their destruction, and especially the destruction of their larvæ, depends principally upon the finding and removal of their breeding places. These are always small or large collections of water. Water barrels and privies should be covered with netting; all vessels containing water should be emptied at least once in twenty-four hours. Several methods have been used for larger collections, the best always being the establishment of good drainage, which by itself has been able to overcome malaria. The planting of trees which absorb much moisture, such as the eucalyptus, has not been followed by the good results that were expected. Indeed, in tropical countries, Fisch, medical missionary at Aburi, recommends that all trees near houses should be chopped down so that the Anopheles may not find resting places during the daytime. In order that the larvæ may be killed by suffocation—for in order to get air they *must* come to the surface of the water—oils have been sprinkled upon it—sweet oil, but principally petroleum; this should be used upon fresh-water collections, but it is also necessary where diluted salt water collects. This method has been largely used in this country for the purpose of exterminating all kinds of mosquitoes; so far, however, the reports of the efficacy of this method are contradictory. Anopheles hibernate in closed spaces, and in cold weather they can easily be killed by fumigation.

At present the most efficacious means are those that deal with good sanitation—complete drainage, pure water, good air; by using these Roman fever no longer occurs in Rome.

B. The Prevention of Entrance of the Parasite into the Human Body.—This at present means the prevention of being bitten by the mosquito,

for we can exclude the entrance of the parasite directly from one human being to another. All other means are covered by A except, for the individual, the possible infection by air, against which Henrot and Navarre have successfully used in India and Madagascar respirators containing animal charcoal. The individual should not go out of doors after sunset or before sunrise; this is a rule that was laid down in malarial regions long before the discovery of the plasmodium. But as the Anopheles sometimes bite during the daytime, especially in forests, the precautions of Celli should be adopted by those who have to be exposed—the wearing of caps to which wire gauze or mosquito netting is attached, of gloves and boots—measures that have also been adopted in Africa, indeed that are sometimes used in this country by very sensitive persons against the ordinary mosquito, the Culex. As a consequence of using this method in Italy, out of 207 railway employees only 10 contracted malarial disease. Every house should be screened by wire netting, of which the Germans state that the meshes should be 2.5 mm. wide. The efficacy of the method, when properly carried out, doors being furnished with strong springs and windows completely covered, can be attested by common experience with the species Culex. The sleeping rooms should be kept dark, for, like most insects, the mosquito follows rays of light.

The objections to this method of protection are the cost and the effects upon ventilation and temperature. In this country, even with its summers almost tropical at times, we prefer the expense and the slight increase of temperature to the annoyances of the mosquito, disregarding entirely the question of malarial infection. Mosquito netting for doors and windows has been shown to be comparatively inefficient, and has been largely discarded. As it is known that the Anopheles do not fly high as a rule, only from ten to fifteen feet, the sleeping rooms or tents have been placed in trees or on poles in the Pontine marshes, in Greece, and in South America. Mosquitoes can also, as in yellow fever, be carried by fruits, hay, or fomites, and, as is well known, they have been shipped from Italy to London for experimental purposes, and malaria has then been produced by them in the human body.

C. Increase of Resistance in the Human Body.—Serum immunity has been sought for by Celli and Santori, but ineffectually. As in all infectious diseases, hygienic measures are of enormous value: good, normal food, pure drinking-water, and healthy surroundings. Overexertion of all sorts, physical and psychical, should be avoided; in the tropics all work should be done in the coolest parts of the day; exposure to the sun should under all circumstances be avoided. Alcohol does harm, and in the tropics should not be used at all (Laveran). The principal prophylactic measure is the use of quinine. Laveran recommends 0.2–0.3 gm. (gr. iij–v) every day, or 0.5–0.6 gm. (gr. vijss.–x) every other day; in tropical countries, where malaria is not confined to special seasons, large doses are required, and the German physicians in the Cameroons and East Africa recommend 0.5 gm. (gr. vijss.) every five days. The objections to this method are many, especially the production of blackwater fever, but it has served excellently well in reducing morbidity. Experience has shown that arsenious acid is valuable as a prophylactic; while it has no effect upon the parasite, the investigations of Tomassi-Crudelli seem to show that it is of value. Given with quinine it certainly does good.

D. Prevention of Infection of the Mosquito.—The presence of Anopheles alone is not sufficient to produce malaria; they must become infected by sucking blood from a malarial patient. Grawitz states that Anopheles have not disappeared in Germany, but that malarial disease practically has. In certain parts of this country where Anopheles exist and malarial disease had practically disappeared, the latter again became endemic upon the return home from the Spanish war of soldiers who had malaria. The prophylactic measures of R. Koch depend entirely upon the consideration of these facts, and he uses quinine as a prophylactic, having laid stress on the observations that gametes are especially found in children, and that a large number of individuals harbor the parasite without having subjective symptoms. In order to carry out this method, either the examination of the blood of every individual where malaria is endemic, or the administration of quinine to every individual during malarial epidemics or, in some places, all the year round, would be required, measures that are not practical and are sometimes futile. He attributes the decrease of malaria in the German army since 1890 entirely to the fact that the price of quinine has been very much lowered, and that therefore it has been used more generally, so that the Anopheles cannot be infected so frequently. Grawitz answers this by stating that the price of quinine had been reduced ten years before the reduction of malaria was noted, and that the quinine treatment had been used for at least fifty years.

When large hospitals can be erected, special wards should be used; if this is not possible, the bed containing the patient—and this is especially important, as in yellow fever—should be surrounded by wire gauze. I have more than once seen cases of malarial disease develop in one ward of a hospital.

If we sum up these four measures of prophylaxis, it will be seen that all are important, but that no one should be used to the exclusion of the rest, otherwise the results cannot be satisfactory.

FORMS OF MALARIAL FEVER

Intermittent Fever.—A certain number of cases of malarial disease, such as are seen by every physician who has had much experience with malarial conditions, gets well by removal to a nonmalarial climate, possibly by absence of reinfection or from increased individual resistance brought about by improved hygiene and sufficient and nourishing food. This may occur in mild acute cases, or even in chronic cases, and is not due to the production of immunity, which in this disease is doubtful. But as we possess in quinine a specific which should be used in all forms of malaria—intermittent, remittent, or larvated—all cases should be treated. The best results are obtained by giving quinine in one large dose at the proper time, though I do not say that good results have not been obtained by giving it in small doses frequently repeated. Stated briefly, the action of the drug is manifested upon the young forms of the parasite; but the adult form, the male gametes, are very little affected, the large gametes probably not at all. As the young forms are set free into the blood as the result of sporulation, which occurs at the time of the chill, we have fixed for us a definite time when the quinine should be given. Because quinine produces its maximum effect four hours after it has been given, it should be administered four hours before the chill; if there is no

chill, six hours before the maximum temperature occurs. In the majority of cases the time of administration is at six o'clock in the morning, but this time must be changed according to the individual case (and in the individual case this time will be different even for successive attacks, as the attack is of the anticipating or postponing type). Upon the whole, the maximum temperature best indicates the time when quinine should be given, as there may be no chill, especially in the larvated forms, or the patient may not be able to state exactly when the chill occurred. The remedy should be given every day when the attack is expected until the disease is "broken," as the disease may be due to double infection by the tertian and quartan parasites or to treble infection by the quartan. With the exception of reinfections, relapses can usually be prevented. The rule here is to give the quinine on the seventh day from the occurrence of the last chill—i. e., after six days, as expressed by the Italian observers, with whom this rule also seems to have found favor—and for four weeks at intervals of six days, always at the same time of the day. If the last attack has occurred on Monday, it should be given the next time on Sunday, the next time on Saturday, the next time on Friday, and the last time on Thursday. If for any reason—e. g., diminutive attacks or general symptoms coming on at the regular time—or if there is any doubt about the time of giving, the remedy should be administered on two successive days, counting the last well-marked attack as the first day and the undeveloped attack as the second. I have used this method with but few failures throughout my whole experience. The quinine should be given in doses not smaller than 1 gm. (gr. xv)—to children in proportion to age—and ordinarily by the mouth. Care must be taken that it is given in such a form that it shall be absorbed; even the best coated pills pass through the gastrointestinal tract when they are too old. Unless perfectly certain of the quality of the coating, whether it be pill or capsule is immaterial, the physician should prescribe the quinine in the form of powder, solution, or extemporaneous pill. Quinine in wafer paper is the best way to exhibit it to those who can swallow a wafer. The sulphate or hydrochlorate is usually prescribed, as the dose required is the smallest of all the salts of quinine, and it is said that the hydrochlorate irritates the stomach least. Insoluble salts are to be used only exceptionally (v. Whooping Cough). The only valuable substitute for quinine is euquinine, but it is doubtful whether it should be used in very severe cases, as further experience is necessary in its use. All other tasteless preparations of quinine should be looked upon with suspicion. With children, for whom the dose should be smaller, the taste can be covered by the addition of the Syrup. liquiritiæ comp. of the German Pharmacopœia, but one teaspoonful will only neutralize the bitter taste of one grain of quinine. Inunctions of quinine are used by practitioners in malarial districts. Quinine can also be given by the rectum by injection, suspended in gum-arabic solution or sweet cream, or by suppositories made from cacao butter with the addition of gum arabic, in which way the quinine does not irritate the bowel. Hypodermic use of quinine is rarely necessary in the intermittent form of this disease, but with the æstivoautumnal parasite it is frequently necessary. The objections to the use of quinine are that it cannot be taken by the patient, that the administration does harm, and that it does no good. For the first objection it may be said that in one way or another it may be

overcome, for the methods of giving the remedy are many. For the second objection, the possible harm must be weighed against the good, a decision that can be left to the attending physician (v. Blackwater Fever). For the last, it is unfortunately true that there are some cases of malarial fever that cannot be controlled by quinine—cases that occur to everyone who has had long experience in this disease. As for the substitutes for quinine—methylene blue, chinoidine, cinchonine—all are followed by results, though they are not so positive or so reliable; but the first named certainly should be tried in cases in which quinine does not act.

What can we expect from the proper administration of quinine? The first attack cannot be prevented, the second can be, as can also relapses; in other words, the disease can be cured—a thing we can say, unfortunately, of only very few diseases.

The treatment during the *paroxysm* should be confined to purely symptomatic measures, which readily suggest themselves. During the period of the chill the patient naturally tries to keep himself warm—hot drinks may be given here; the practice of giving quinine at this time should be discouraged, except in æstivoautumnal intermittent seen for the first time during this period. The vomiting should be controlled by measures already mentioned (v. Scarlatina). During the period of fever cold is used—cold drinks; if there is much headache, cold applications to the head, or, if necessary, one of the milder antipyretics, or even a hypodermic injection of morphine. The period of sweating should not be interfered with beyond keeping the patient comfortable. Efforts to shorten this period should not be made. As a rule they are ineffectual; when they are not so they may do harm by causing toxines to be retained.

Remittent Form.—This form of disease is the common manifestation of the æstivoautumnal infection in temperate zones; it represents the milder type of æstivoautumnal infection in the tropics. Here again quinine is the remedy, and it should be given as recommended for the previous form—i. e., in the same dose and at the same times. In some cases there is difficulty in knowing when to give the one large dose of quinine, and this can be determined only by a careful study of the temperature chart. Furthermore, owing to the presence of several generations of the parasite and their differing life cycles, it is impossible to determine exactly when to give the remedy; but under all circumstances, until this can be determined, smaller doses of quinine—0.3 gm. (gr. v)—should be given every four hours. The results in this form are by no means so positive or so quick as they are in the intermittent form, and the quinine must be given for a longer time, even if there are no immediate effects produced. Even then we sometimes see cases that are not affected by quinine, a fact thoroughly recognized by all practitioners. The hypodermic or intravenous introduction of quinine may have to be taken into consideration in these cases. For the intravenous injection Baccelli has made the calculation that 1 gm. (gr. xv) of quinine, used in this way, fulfills the indication, demanded by Binz on theoretical grounds (v. *infra*), of destroying all the parasites. With this specific medication there must be symptomatic treatment as in all continued fevers (v. Typhoid Fever). The cold bath, however, has not given identical results; here, as in many other diseases accompanied by fever, hydropathic measures should be used only for their

temporary effects, and then in their milder forms, as they do not shorten the disease. In addition, the measures to be applied are in the direction of preventing reinfection and of increasing resistance, so that the parasites already present may finally disappear. As in this form there is a tendency to relapse, it is well to give small prophylactic doses of quinine during the convalescence.

Pernicious Malarial Fever.—In this form quinine must be used subcutaneously or intravenously as soon as the patient is seen. Hypodermically the quinine may be given; the hydrochlorate dissolved in distilled water 1:2, 1:3, or 1:4, of which sufficient should be used for the patient to receive 0.5 gm. (gr. vijss.) at a dose; the bisulphate, the quinine hydrobromate, the quinine and urea hydrochlorate, are all used in about the same dose—from 0.5 to 0.6 gm. (gr. vijss.–x). The proportion of quinine to water just mentioned lends itself especially well to hypodermic use, but with all aseptic precautions troubles in the skin may arise as the result of subcutaneous medication.

For intravenous use Baccelli recommends the following formula: Quinine hydrochlorate, 1 gm. (gr. xv); sodium chloride, 0.75 gm. (gr. xij); distilled water, 9.5 gm., to make 10 c.c. (℥ijss.), the whole to be given till the production of maximum effects. Excellent results are reported by Italian observers from its use in the grave pernicious cases.

In these pernicious fevers symptomatic treatment is very important. The measures recommended under Septicopyæmia (q. v.) for intoxication should be tried. When the nervous symptoms are excessive sedatives should be used—morphine, or rectal injections of chloral. The cardiac symptoms should be treated as in all infectious diseases. The use of stimulants is especially indicated in the algid form—camphor, caffeine, ether, musk, hypodermically; externally, friction, the mustard bath, mustard plasters, the application of warmth, wrapping up in heated blankets, hot bottles applied to the surface of the body. For the gastrointestinal forms, besides the specific treatment, the treatment of cholera or dysentery, as indications may suggest, can be used.

Malarial Cachexia.—Removal from the malarial climate is the best remedy that can be recommended. Where there is fever the quinine should be given daily for a long time; in these cases arsenic is valuable, given singly or with the quinine, with iron, with extract of eucalyptus globulus: ℞ Sodii arseniat., 0.065 gm. (gr. j); extract. eucalypt. globul., 4 gm. (℥j); ft. pil. No. xxx; S.: One pill three times daily. It is necessary to continue medication for some time. If the patient is not removed from home, the best possible sanitary conditions are to be looked for and the best possible food obtainable should be given. The spleen in this condition has been the place of therapeutic attack, because this organ is very much enlarged in cachexia and is supposed continuously to harbor the malarial parasite. Attempts have been made, but with doubtful results, to reduce its size by parenchymatous injections of various substances such as arsenic, ergotin, quinine, and this mode of medication should not be used, subjecting the patient as it does to too great risk. External methods—the cold douche, massage, and electricity—are also recommended; I have failed to obtain results from their use. Operative intervention, especially splenectomy, has been recommended. The high mortality from the operation must for the present limit its general applicability. The results as far as the cachexia is concerned are good, although malarial infection occurs again in those patients in whom the

spleen has been removed. For the present this operation should be performed only after everything else has failed.

Malarial Hemoglobinuria.—PROPHYLAXIS.—The toxic effects of quinine have been intimately connected with this disease so that we find some authors stating that quinine is the only cause of the disease; others that quinine is not at all the cause; and still others that quinine is only a contributing cause. That quinine has hemocytolitic properties can be admitted without hesitation. Many observers in temperate zones who have given quinine in large doses for a long time (v. Graves's Disease) have never seen the disease, and it has been rarely reported. That it is due to something more than quinine alone, then, must be admitted, and this additional cause is found in climate and the malarial condition produced by the æstivoautumnal parasite. That malarial disease must always be present seems to be disproved by the observations of various authors (F. and A. Plehn, R. Koch, and others). The view that it is due to an idiosyncrasy must be rejected, as idiosyncrasies are permanent things and last at least for the greater part of the individual's life; the quinine idiosyncrasy is well known, thoroughly well understood by the patient himself, but never presents itself in the form hemoglobinuria in temperate zones when the drug is administered in medicinal doses. For prophylaxis, then, we have a very anomalous condition because we do not know the cause of the disease. It is admitted that quinine is the proximate cause, that it occurs principally in regions in which æstivoautumnal malaria exists, but in an inexplicable way, this parasite producing equally severe symptoms of malarial disease without hemoglobinuria in the Roman Campagna, but with it in Sicily. The importance of the subject lies in the prophylactic use of quinine in the regions in which blackwater fever occurs frequently. This question must be decided for each individual case. If the administration of even the smallest dose produces hemoglobinuria, then the individual must do without this drug. While a great many cases of this nature have been reported by many observers in the tropics, they are exceptional, and the prophylactic use of quinine should be continued until it shall have been proved that the individual has the direct cause within himself.

TREATMENT.—When hemoglobinuria occurs in a patient with malarial parasites without quinine having been administered, quinine frequently cures both the malaria and the hemoglobinuria. When the hemoglobinuria occurs after an attack of malaria, the parasite being absent, quinine should not be used, for it does no good and usually even does harm. If in a malarial attack the administration of quinine is followed by hemoglobinuria—i. e., during the time of its maximal physiologic effect—the quinine should be withheld, as it seems to be shown that the drug is acting directly as proximal cause. In these cases it may be that a reduction in dose will prevent hemoglobinuria, and this should be tried. The question of giving quinine is much more complicated when one sees cases in which, in successive attacks of malaria, even the smallest dose of quinine is followed by hemoglobinuria; here the patient must choose between two serious conditions and decide which of the two is the more important to endure. As a rule the whole question will be decided by the laity, for in blackwater-fever regions there exists great prejudice against the use of quinine, a prejudice which, it has been seen, is founded on facts. In these cases such measures should be recommended as have already

been given to increase resistance and prevent reinfection; the best of these is a removal from the malarial region, and in tropical countries consists principally in removal to the hills or mountains if the patient cannot leave the country entirely. The treatment of the attack consists in medication against heart failure; furthermore, in the treatment of the toxæmia (v. Septicopyæmia). Inhalation of oxygen has been advised; its use is based on scientific principles when respiratory symptoms are present, as it has been shown (Zuntz) that the plasma of the blood carries the oxygen so that adequate respiratory changes may be kept up. Ergot should only be used symptomatically (v. Neurasthenia); it can have no effect upon the cause of the condition. The temperature should be controlled by hydropathic measures—not too cold. The anuria, due to kidney lesions, is usually fatal, but an attempt should be made to give relief (v. Nephritis). Dilution of the blood, used against toxæmia, acts prophylactically. To judge from the experience of physicians who have treated blackwater fever there is in this disease, as in so many others, a tendency to spontaneous recovery. It is to be hoped, then, that in the future some specific mode of treatment may be evolved. For the present and for individual cases both prophylaxis and treatment can be considered only imperfectly developed.

COMPLICATIONS

For the treatment of the complications of malarial fever which are found in the skin, the nervous system, the respiratory apparatus, the gastrointestinal tract, and the heart the reader is referred to the appropriate chapters.

SEQUELÆ

Many complications and sequelæ have been described and abandoned as the diagnosis has been rendered more positive. The sequelæ that are recognized will be found in their respective chapters (q. v.). Of all diseases malaria must be the one that causes the greatest destruction of red corpuscles, and therefore produces anæmia. It is well to give every subject of malarial disease, during the convalescence, any one of those remedies that are recommended in anæmia, but arsenic especially has proved very valuable.

In the convalescence our object is to treat the sequelæ, to prevent relapses, and to restore the patient to his normal condition of health as early as possible. The measures recommended for prophylaxis—good food and good hygiene and, if possible, the removal to a nonmalarial climate—should be advised.

XXV. MALTA FEVER

PROPHYLAXIS

A disease rarely seen in this country, and I therefore make free use of the experience of other authors, especially that of Bruce, the discoverer of the cause of the disease, the *Micrococcus melitensis*. The method of propagation of the disease is unknown; according to all the authors who have written upon the subject, it is not contagious; Hughes considers the disease as air

borne, Bruce as water borne. All the recommendations for general and personal hygiene should be carried out—good general and private sanitation and a normal mode of living, as in the presence of any other epidemic.

TREATMENT

A serum has been used, but as yet its value has not been determined. There is no other specific treatment. Bruce says "that the majority of the cases are best treated by leaving out drugs as much as possible. Quinine, salicylic acid, antipyrine are without value. High temperature is to be met as in typhoid fever. *Diet:* The same as in typhoid fever; stimulants are required, and to prevent scorbutic symptoms, after a few weeks the addition of lemonade made from lemons or limes. Gradually semisolids and solids may be added. Ordinary diet should not be given until the temperature has fairly come down to the normal and remained there for a fortnight."

Symptomatic Treatment.—Sleeplessness is to be met with antipyrine or chloral hydrate combined with potassium bromide. The pains are controlled by one or the other of the antipyretics. In the joints they are to be met by local treatment. Orchitis is to be treated as in any other disease. Constipation should be met by enemata or milder aperients.

CONVALESCENCE

Bruce does not advise change of climate. Notter says convalescence "can rarely be completed" without it. All advise not to send the patient away too soon and to wait until the fever has entirely disappeared.

XXVI. BERI BERI

PROPHYLAXIS

The morbific agent has not been discovered in this disease, and we are therefore confined to adopting such means as clinical experience has shown to be effective. Whatever the cause may be, it seems to be tenacious, as is shown by its remaining undisturbed by the ordinary means of disinfection. It does not act by direct contagion, as the cause of the acute exanthemata does, but resembles in this respect yellow fever; in Brazil a large number of physicians and nurses have been attacked by it. Indirectly it is infectious through fomites. There is no origin *de novo*, and it seems to have its source in the human being, an epidemic always being traced back to some individual. In this disease, even more than in typhus, hygienic surroundings are of paramount importance. The individual resistance also is of the greatest importance; so much so is this the case that in Japan Takagi has asserted that the disease is due to bad food, reduction in nitrogen, spoiled rice, and foul fish. While the adoption of measures based on this view has been followed by enormous reduction in morbidity, there is no further evidence that the view of Takagi is correct. Sodré states that in Brazil, when an epidemic appears, it shows a predilection for the higher classes. In order that the disease may become endemic or epidemic it is necessary that the climate be hot and moist.

Under all circumstances, when the cause of a disease has the properties just described, the only thorough way to carry out prophylaxis is by isolation of the patient. Until the cause is found this should be done in the strictest way possible. In a hospital, the room from which the patient is taken should be thoroughly disinfected by corrosive sublimate, and all his belongings also. This is now done in South America. After the cause has been discovered it may be found that this measure is extreme. Under all circumstances it can only do good to the community. Combined with this, all general and individual hygienic measures that diminish morbidity should be carried out. Here, as in so many infectious diseases, drinkers fare badly, but in this disease the puerperal state seems to act as a predisposing factor. Outside of these there seem to be no other predisposing factors; to what extent immunity is produced by an attack is not definitely settled. In the war between Japan and Russia, not only was the spread of beri beri prevented by the Japanese, but all their cases were practically cured.

TREATMENT

The principal indication is the removal of a patient to a place in which the disease is not endemic—best to hills or mountains; if this is not possible, anywhere, provided the place is free from beri beri. Sir Patrick Manson states that in the "cases that are brought to the Seamen's Hospital, Greenwich, from ships in the London docks, it is found that if they survive the first few days on shore they steadily recover. It may be laid down as an axiom, that in all cases of beri beri the chances of recovery are very much prejudiced if the patient remains in the tainted spot." Let the patient then be moved, if not to another climate, to another place in the same climate; if this is not possible, to another house; even removal from the room seems to be of value.

Symptomatic Treatment.—There is no specific; all the drugs that have been recommended have been proved to be without value; we must therefore meet symptoms; but the fact that any case may at any moment develop into a serious one on account of the involvement of the cardiac nerves and the myocardium, as in diphtheria, must not be lost sight of. For the *rudimentary forms* very little treatment is required; the patient can remain out of doors; the *diet* should in all cases be nutritious and easily digested. In the *atrophic form* the treatment should be that of peripheral neuritis (q. v.). Indeed, treatment more or less like this is required at some time or other in every form of the disease. For the *wet, or dropsical*, form, the natural history of the disease showing that the fluid leaves the tissues by the kidneys, diuretics, especially the caffeine compounds, have been used. But the authors who have had the most experience prefer saline or hydragogue cathartics—the latter especially when there are present symptoms of anæmia—such as compound jalap powder, elaterium, croton oil. Hydropericardium or hydrothorax (q. v.) must be treated locally as well, if there is any evidence of damage to the heart, by evacuation of the fluid. The greatest danger to the patient is acute right heart failure. Simon recommends for this 5 to 10 minims of a one-per-cent nitroglycerin solution every quarter or half hour as the symptoms require. At the same time elaterium or croton oil is given. If this is not sufficient,

phlebotomy should be performed (v. also Acute Myocardial Insufficiency, where the indications for the use of digitalis in this condition are given). Local and general bleeding is also valuable in œdema of the lungs. After the acute symptoms have subsided, the patient must be treated according as the general or local condition is the more prominent; sometimes both require attention.

XXVII. ANTHRAX

PROPHYLAXIS

The difficulties of prophylaxis in this disease are exceedingly great on account of the biological properties of the *Bacillus anthracis*. In the herbivora, especially sheep and cows, the bacillus can be transmitted by their secretions and excretions, therefore by their hair, their hides, and their blood; by means of the sting of insects or by entrance into wounds; by their meat, especially when eaten raw or rare; and lastly, of great importance, the soil upon which they feed is infected for an indefinite length of time. The spores, which are very resistant, as well as the bacilli can be transmitted in the form of dust. When an animal dies of this disease it should be cremated, no part of it being removed to be used for any purpose. Unfortunately this is not always practicable; then the animal should be buried in a deep hole, and covered over with lime or petroleum and three feet of earth. Frank S. Billings states that of 200 people who ate cooked meat from an animal dead of anthrax, not one was affected; five who handled the fresh meat became diseased, and three died. The greatest care must be taken in the removal of the carcass so that neither blood, secretions, nor excretions are lost. The stables must be thoroughly disinfected, manure being especially looked after. The places where diseased cattle have grazed should be fenced off, drained, and allowed to stand unused. Much good has been done by Pasteur and his pupils by vaccination of cattle with attenuated cultures of the anthrax bacillus. Chamberland states that from 1882 to 1893, 1,788,677 sheep and 200,962 cows were treated by this method in France, with the result of reducing the morbidity in sheep from 10 to 0.94 per cent and in cows from 5 to 0.34 per cent. Wherever this method has been tried good results have followed.

Individual Prophylaxis.—In order to prevent infection in man it is necessary that those who are exposed to possible infection—veterinarians, grooms, shepherds, drivers, butchers, tanners—see that they have no wounds upon their hands or arms; they must be warned not to scratch themselves when at work, for the location of the local lesion frequently shows that infection must have taken place in this way. For the transmission by dust to wool sorters or rag pickers special precautions are recommended. The German Government has ordered that all imported hair and rags must be treated either by exposure to steam under pressure of 1.5 atmosphere, according to Eppinger, for one half hour, or by being cooked for fifteen minutes in a two-per-cent solution of potassium permanganate, and that this treatment should be followed either by bleaching with a two- to three-per-cent solution of sulphurous acid or by boiling for ten hours in water. In addition, it has

been recommended that the dust be removed from other articles in a closed space by machinery, and that it be collected and burned. But here again the value of life has to be reckoned as opposed to the value of money, with the result that prophylaxis is frequently not carried out. Fortunately for us, in this country the disease is comparatively rare.

FORMS OF ANTHRAX

The Local Form.—As soon as a patient who has an open wound has come into contact with anthrax material, the wound should be cauterized and disinfected by the application of pure carbolic acid or by the actual cautery, after which potassium permanganate or corrosive sublimate in substance may be used. When the malignant pustule has been developed, much good can be done by incising it and introducing caustic potash, carbolic acid, sublimate, or fuming nitric acid. The actual cautery has also been recommended. The risk of failure with these methods depends upon the fact that it is impossible to determine how much virus has been destroyed and the possibility of spreading infection into the normal tissue. The application of ice has been recommended, as it is known that a temperature below 50° C. (122° F.) destroys the bacillus; but the conditions are not so simple in the human body as in a test tube, and, except for giving relief, not much can be expected from the application of heat or cold externally. The best surgical method is the excision of the carbuncle; this is possible only when the local lesion is not too large, or when its location is favorable on the body or extremities. Care must be taken to excise into healthy tissue, and the wound should be thoroughly treated with the actual cautery. Schnitzler has recommended that if, twenty-four hours after the operation, the fever has not disappeared, the affected lymph glands should also be removed.

Because of the limitations of this method, injections of fluids containing antiseptics into the diseased tissue have been employed. For this purpose two- to five-per-cent solutions of carbolic acid and tincture of iodine (1 : 2 in water, Davaine) have been employed. The injections are to be made not only into the carbuncle, but also into the œdematous tissue and the surrounding skin, twice or three times daily.

Kurt Müller has obtained excellent results in the surgical clinic at Halle by making use of the natural protective agents in the body. He recommends the application of mercurial ointment, the giving of large doses of alcohol, nourishing diet, and absolute rest of the part affected. He has seen thirteen cases in which this treatment resulted in recovery.

The question of absolute rest of the parts affected is emphasized by the authors who recommend local treatment.

The Intestinal Form.—Intestinal antiseptics have been recommended: calomel, 0.1–0.2 gm. (gr. jss.–iv), several times daily; corrosive sublimate, 0.01 gm. (gr. $\frac{1}{6}$), twice or three times daily. Leube has used carbolic acid with success—0.1 gm. (gr. jss.), as often as ten times daily. The French have used iodine, 0.3 gm. (gr. v) dissolved in potassium iodide, 0.6 gm. (gr. x), in a litre (a quart of which mixture should be taken in the course of twenty-four hours). Carbolic acid and iodine have also been used hypodermically, the latter even intravenously.

The Pulmonary Form.—Quinine has been recommended by Koranyi in this as well as the preceding forms. The hypodermic use of carbolic acid or iodine, as recommended in the intestinal form, may also be tried. This form is attended by great mortality, but in some cases recovery occurs spontaneously, and it is difficult therefore to form any judgment in regard to the value of medication.

XXVIII. HYDROPHOBIA

PROPHYLAXIS

In man hydrophobia is always the result of the bite either of some domestic animal, such as the dog, cattle, horse, sheep, swine, cat, or of wild animals, such as the wolf, the hyena, the skunk, the jackal, the ferret, the fox. The prime object of prophylaxis, then, is to prevent man from being bitten by one of these animals, and in civilized countries precautions are especially taken against dogs. Police regulations have been introduced in various countries, such as the licensing of dogs and the wearing of muzzles, both of which have done good by diminishing the number of dogs in a given place, and in muzzling, because bites thus become rarer. Unfortunately, in most cities in this country where muzzling is obligatory, a time limit, extending over the summer months only, has been introduced. Statistics have shown that rabies may occur at any time of the year, but that it occurs less frequently during the "dog months." If muzzling is prescribed, it should be kept up for the whole year round.

In this country potent opposition comes to any restrictive measures on dogs from the societies for the prevention of cruelty to animals. In Cincinnati the arrangement was made by the city government that the Society for the Prevention of Cruelty to Animals should get the dog-license fees, in return for which it was to catch all dogs without a license (which, by the way, was most inhumanely done) and kill them humanely. When the license fees were withdrawn, the society also withdrew.

It is important also for prophylaxis that the laity should understand how rabies shows itself in dogs. The typical form comprises three stages. "In the first, the dog is dull, depraved, fidgety, nervous, restless. In the second, it is delirious, maniacal, furious. In the third stage it is imbecile, helpless, paralyzed" (Keirle). The second stage of the disease is the one which by the laity is considered characteristic of the "mad dog." But in most respects people have an erroneous conception of this stage, in that the dog never foams at the mouth, has no fear of water, and, as a rule, does not bark when biting. In this stage the dog is rarely well nourished, but looks thin, and his coat is dry and rough. A dog suspected of having hydrophobia should not be killed unless it is impossible to restrain him or keep him from infecting others. This mistake is constantly made, even by veterinarians, as I know from personal experience. If the disease is hydrophobia, the dog dies within two weeks, and it is of the utmost importance that, by post mortem and inoculation experiment, the diagnosis should be confirmed; for upon this depends the treatment of those that have been bitten. Without this the diagnosis of

hydrophobia cannot be made with any degree of certainty. Inoculations into the subdural space of a rabbit, with material obtained from the medulla of the suspected animal, can be easily made, and are always decisive. All animals that have been bitten by a mad dog should be killed; this is difficult, because the dog in the second stage covers much territory. For this reason the German Government has decreed that all dogs within a radius of four kilometers (about two miles) shall be chained and kept under observation.

PREVENTIVE TREATMENT.—*Local.*—All wounds should be cauterized, as it has been shown that the mortality is very much reduced by it—eighty-three per cent in the uncauterized, thirty-three per cent in the cauterized. Bruises need not be cauterized, but the smallest abrasion should be treated in this way. The sooner after the bite cauterization is resorted to, the better the results; for one hour after the bite it decidedly mitigates the course of the disease, or may even prevent it; even after this time it produces beneficial effects. But cauterization should be effectual; silver nitrate does no good; the chemicals that may profitably be used are strong acids—sulphuric, nitric, carbolic, and glacial acetic; the best and as a rule the most convenient remedy is the actual cautery with hot iron; when possible, the galvanocautery or thermocautery. When the wounds are too extensive to be cauterized, long-continued douching with some mild antiseptic may be tried. Sucking the wound, ligature of the limb, may prove useful; even amputation has been resorted to, but this should be done only when necessary as a surgical indication; resection of the nerves should be made if the laceration is very extensive, as it has been conclusively shown that the virus travels along these on its way from the periphery to the nerve centers. Where possible, all bites should be kept open and treated locally with mild antiseptics.

General.—Stress has been laid on these prophylactic measures, important in this disease as in all others. In this country, however, hydrophobia is exceedingly rare. Yet the prophylactic treatment of all dog bites should be carried out on account of the possibility of mental relief given both to the patient and to his friends and relatives. We must not forget that ultra-skeptical people still think hydrophobia a sort of hysterical affection; a symptom complex of this nature undoubtedly does exist, and if we can prevent this, much will be done. The thoroughness of explanations of ætiology, natural history, and symptoms, which some physicians allow themselves with their patients, should be refrained from. It does no good and may do harm.

We owe it to the labors of Pasteur that we have a method that may prevent the outbreak of hydrophobia. It consists of a true immunization by the introduction into the human being of attenuated virus obtained from the medulla of infected rabbits. As the lower form of life which produces rabies has not been discovered, we are not in a position to determine whether we are producing active or passive immunity. In this connection it may be stated that Babes and Tizzoni have discovered a serum, which, however, has not as yet been used clinically. Pasteur's method is one that can be compared with vaccination, and as the period of incubation of hydrophobia is rarely under six weeks, sometimes extending to nine months or longer, it necessarily fol-

lows that our chance of preventing hydrophobia is great, provided the method is used early enough. The method can be carried out by any physician who has under his control all those conditions found in a well-regulated bacteriological or physiological laboratory; as a rule, it is carried out in institutions, in this country called Pasteur institutes, which are found in many of the larger cities all over the world, to which the patients are sent. It is not necessary to describe the details of the method; they differ somewhat (e. g., those of Pasteur, Bujwid, Marx, Högyes, and others), but the practice is the same, beginning with attenuated virus and going up to a very strong one, more or less rapidly, dependent upon the nature and location of the dog bites. The virus is used by subcutaneous injection. The nearer the brain and the greater the number of wounds, the more quickly must the intoxication be antagonized, so that in these cases medulla that has been dried only three days is used as early as the third day of treatment. It is necessary that the patient should be treated as early as possible after the bite; but, in a majority of cases, a sufficient time can be allowed for making a preliminary diagnosis of the condition of the dog. The injections are not followed by any untoward results when properly used, as is the case in these Pasteur institutes, and the patient need not go to bed unless the nature of the wounds makes it imperative. As for the results of using this method, their beneficial effects are now accepted in all places where the method has been tried. The results are about the same everywhere: in Barcelona, Farran has treated 1,792 cases, with a mortality of 0.5 per cent; Zoëros Pacha, at Constantinople, has a mortality of 0.8 per cent; in the Paris Pasteur Institute, 16,985 cases have been treated, with a mortality of 0.7 per cent. According to Högyes, up to 1895, 54,620 individuals have been treated in twenty-four institutions, with a mortality of only 0.47 per cent. If the fact is taken into consideration, that of those bitten by dogs with rabies at least ten per cent get hydrophobia, and that the mortality from hydrophobia in man is practically one hundred per cent, it will be seen how great the reduction in both morbidity and mortality has become since the introduction of Pasteur's method. But the greater the number of bites and the more extensive they are, especially upon the face and head, the sooner the treatment should be begun. In a certain number of cases it will always fail, as immunity cannot be produced inside of two weeks.

TREATMENT

The treatment of hydrophobia must be, for the present at least, purely symptomatic. The room of the patient should be kept dark and quiet; everything that tends to excite the patient in any way should be kept from him. All authors agree that feeding should be done by nutrient enemata. To relieve the paroxysms, morphine subcutaneously or chloral by the rectum should be given. In the maniacal attacks, chloroform or ethyl bromide may be used; unfortunately, the effect is usually only transitory. Curare has also been used, as in other diseases associated with convulsions. It is a drug of very uncertain constitution. Its effects, even in large doses, are sometimes very slight, yet one case (Offenbung) has been reported as cured by its use. No preparation of this drug should ever be used in the human being until it has been tested on some warm-blooded animal.

XXIX. TETANUS

In this disease we are dealing with a difficult prophylactic problem, although we know the cause of tetanus and possess a prophylactic measure of great value. We furthermore know the location where the tetanus bacillus or its spores are found—i. e., in garden earth and manure; and yet it is almost impossible to introduce prophylactic measures, because, logically, we should regard every wound that has been brought into contact with earth mixed with manure as suspicious. But we know that in the largest percentage of such cases tetanus does not follow, and for the individual, then, we can only approximate the chance of infection. On this chance is based prophylaxis. Every wound, however trivial, should be thoroughly cleansed, and some application should be made to prevent renewed infection—hydrochloric acid, silver nitrate, collodium, or simple court plaster. When there is suspicion of tetanus infection, as in gardeners, hostlers, or stablemen, the wound should be carefully cauterized, and if necessary be thoroughly opened up and treated. If infection is at all apparent, then what seems to be the prophylactic measure should be used; this is the injection of the antitetanus serum (v. Remarks on Antidiphtheria Antitoxine). Where do we find these indications? Where the occupation of the subject is one that is favorable to infection, where there are contused wounds that have been in contact with garden earth, manure, soil, street dirt or dust. If the disease is endemic, do as the surgeons of the German army did, treating all their wounded with prophylactic injections of serum, not one case of tetanus developing. If the disease is epidemic, do as was done in the Lying-in Asylum at Prague, where the epidemic of puerperal tetanus was checked by these injections. In this country all wounds produced by the Fourth of July celebrations in cities, where the children have contaminated themselves with dirt, must be looked upon as suspicious. It is a fact that in one year, as a result of Fourth of July wounds, at least one half as many die as succumbed to this fearful disease during the whole of the War of the Rebellion. It is not necessary to determine, for our purpose, whether the bacillus is introduced by the various noise-making apparatus used, or otherwise; the fact stares us in the face that a great number of lives might be saved. Obviously, the best preventive measure would be to do away with the present method of celebrating, but this is impossible, for, after all, the number of wounded celebrants that escape further trouble is too great to make a sufficient impression upon the people as a whole. This militates against general prophylaxis, small wounds everywhere being so common that, even with great chance of infection, no attention is given to them. However, the experience of St. Louis with prophylactic injections on two successive Fourths shows no single case of development of tetanus out of thirty-seven and eighty-four cases respectively of Fourth of July injuries, although the preceding year, 1903, showed sixteen deaths therefrom out of fifty-six similar cases (Scherck).

TREATMENT

Specific Treatment.—Unfortunately, the use of tetanus serum as a curative agent has not been followed by the same good results as has its use for prophylactic purposes. Notwithstanding the theoretical opinion expressed

by one of its discoverers, von Behring, the great mortality (eighty per cent in traumatic cases, P. S. Conner) has not been reduced. The tetanus toxine is anchored to the cells in the central nervous system, and it requires enormous doses of antitoxine, if it is at all possible, to cause these cells to relax their hold upon it. Dönitz has shown that in the rabbit, in four minutes after the appearance of the tetanic symptoms, only a small excess of serum was necessary to effect a cure; after one hour, however, twenty-four times the quantity was required. The serum, then, acts as an antitoxine and curatively, but changes in the nerve cells take place so rapidly that recovery is impossible. In order to get perfect results, which in the human being seems theoretically possible, the serum should be used before or immediately after the tetanic symptoms begin, and in large quantity. It is impossible to fulfill the former indication, the disease cannot be recognized before the symptoms develop, and the patient is not apt to present himself as soon as the symptoms develop; and yet, notwithstanding all that has been said, the serum should be used in every case of tetanus, because of its antitoxic effects, in repeated and large doses, in order, if possible, to limit the effects of the toxine still developing. The methods of using the serum are four: the subcutaneous, probably the least reliable, but the safest; the intraspinal injection, by lumbar puncture; the intracerebral method (Roux and Borel), by means of drilling a hole into the school, possibly injecting into the lateral ventricle; and, finally, the intravenous injection, probably the best, but the most hazardous, because toxic substances, as von Behring states, are sometimes contained in the serum, which may destroy life. The latter result might be prevented by testing the serum upon mice, which are very susceptible to the tetanus toxine. For prophylactic purposes twenty units should be used, for curative purposes not less than fifty units. The effects of the injection when it acts curatively are slow, the symptoms disappear gradually, and if improvement does occur, it may not be noticed for twenty-four to forty-eight hours; the results do not warrant the preference of one method over the other, but the subdural one seems to be the favorite. The after-effects of tetanus serum are the same as are found after using any form of horse serum.

Finally, the injection of brain emulsion must be taken into consideration. Wasserman and Takaki have shown that the central nerve tissues contain antitoxic material that does not protect against general infection, but when introduced into the general circulation has the property of binding the toxine of tetanus. Brain substance is rubbed up (the brain of pigs or rabbits has been used), with normal saline solution and injected subcutaneously; 10 gm. (gr. clx) of pig's brain rubbed up in 30 gm. (℥j) of saline solution, has been used. Results are not more promising than from the use of serum.

Local Treatment.—In a certain percentage of cases there can be no local treatment, because the point of infection cannot be found, as in the so-called rheumatic, idiopathic, or cryptogenetic form. As the tetanus bacillus can also develop upon the mucous membranes, the nose, tonsils, and pharynx should be examined in all these cases and treated. Because the tetanus bacillus acts upon the nervous tissue not by its presence, but by the remote effects of its toxine, the local treatment may at times be of importance. The same trouble is found here as in the use of the serum for its curative effects, for the tetanus bacillus may have disappeared locally, and

yet its toxic effects upon the nervous system may remain, and the patient succumb. Thus, unless an operation—amputation—is indicated for other reasons, it offers very little chance of doing good, so far as the tetanus is concerned. But as no general rule can be laid down, patients apparently having been saved by amputations, the nature of the lesion and the character of the case must decide the question. Of far greater importance is the treatment of any wound, as referred to under prophylaxis. The tetanus bacillus is an anaërobic form, and it is always necessary to open up the wound thoroughly so that air may act upon it. It is, furthermore, very resistant to chemicals. Kitasato has shown that a solution of five per cent of carbolic acid and one half per cent hydrochloric acid is most effective against the bacterium, as well as against its toxine; this, when possible, should be also used prophylactically. Iodoform, applied to the cord and umbilicus, has been found valuable in preventing and treating tetanus neonatorum.

General Treatment.—As in rabies, the patient must be kept absolutely quiet, and everything that tends to increase reflex excitability should be kept away from him. All manipulations, such as the taking of temperature, catheterization, enemata, feeding, must be done in the gentlest manner possible. When feasible, food should be given *per os*; when this produces great reflex reaction, the stomach tube may be tried, being introduced through the nose. Unfortunately, this method is apt to be followed by convulsive seizures, which may become dangerous; it is better not to use this method unless the physician can make up his mind to anæsthetize his patient when it seems to be the best way of keeping up the patient's nutrition. Upon the whole, it will be found that rectal feeding, although incomplete, is the most satisfactory; care must always be used to give the patient plenty of fluid by the rectum. We are dealing with a febrile affection, and not infrequently the patient loses much fluid by profuse sweats. The measures used to diminish toxæmia (v. Septicopyæmia) have also been tried; but aside from the fact that they offer very little hope of doing good, their use is connected with so much disturbance of the patient that this alone renders their application unsuitable. Eliminative measures have also been recommended; hot baths have been advised; I have tried the hot pack, keeping the patient in it for several hours at a time, but without any good results.

Baccelli has recommended the subcutaneous injection of carbolic acid, because this drug reduces fever, reflex irritability, and pain. This method is largely used in Italy and is looked upon almost as a specific measure.

Babes states that this method gives better results than the serum treatment. The method is this: A two-per-cent solution of carbolic acid is injected subcutaneously every two or three hours, so that at first the patient receives from 0.2 to 0.4 gm. (gr. iij to vj) daily; this is increased to 0.6 to 0.8 gm. (gr. x to xij) daily, according to the severity of the case. To this solution there is usually added a small quantity of morphine, in the proportion of one part of morphine to ten of carbolic acid. The oftener the tetanic convulsive movements occur, the oftener must the injection be repeated. Due care must be taken not to give too much morphine. The improvement is said to be very rapid, although complete recovery may require from two to six weeks. No bad effects follow the use of carbolic acid in this disease, which fact, as well as the good effects, is to be explained by Kitasato's obser-

vation referred to before. Wiedemann, who obtained his information direct from Baccelli, states that in the Italian cases treated by this method three subjects have died out of sixty-four; this is supposed to be an exaggerated estimate, but, as the method is also serviceable in horses, and all kinds of cases are included in Baccelli's statistics, it should be tried, especially as it can be used together with the serum treatment.

Symptomatic Treatment.—Here the attempt is made to reduce the irritability of the motor and sensory centers. Curare does not fulfill this indication; it acts only on the peripheral end apparatus of the motor nerves; but it may do good by its action on muscles, which it paralyzes. On account of the difficulties of its administration (v. Hydrophobia) curare is practically no longer used, although good results were obtained by Demme and others. Physostigmine has been given up as ineffectual, although Monti recommends it in tetanus neonatorum, and I have seen it followed by one good result, in a case with a long period of incubation. Morphine and chloral hydrate are the remedies that produce the best effects. Morphine should be given in large doses, so that physiological effects are produced; as a rule it is administered hypodermically, but it may be used by rectal suppositories. In some cases the addition of hyoscine hydrobromate is of value. Chloral should be given in maximum doses in the adult—1.5–2 gm. (gr. xx–xxx)—every four hours, and the doses may be increased so that the patient receives 15 gm. (℥ss.), or even more, in twenty-four hours. In children the dose must be correspondingly large—in the newly born, 1.5 to 3 gm. (gr. xxij to xxx) in the course of twenty-four hours; in older children double this quantity. If the chloral cannot be given by the mouth, its action is just as efficient when given by rectal injections. It is not worth while to lose time with the use of the bromides or the newer soporifics, such as trional, sulphonal, or amyl hydrate. If morphine or chloral does no good, ether or chloroform should be used to give temporary relief.

It is difficult to form an accurate opinion of the results of the modern treatment of tetanus. It has been proved beyond a doubt that the prophylactic use of the serum is of the greatest value; not so its therapeutic employment. Indeed, it is difficult to determine the therapeutic value of any agent in this disease, because the prognosis differs so much in individual cases. At present the best results have been obtained by Baccelli's method, but its use does not preclude the administration of antitoxine, which may at least neutralize the toxine in course of formation before it reaches the nerve cells themselves. If we look back upon the many remedies and methods used in preantitoxine days, it will be found that a number of patients have recovered by the use of any one of these. I have just noted a case of tetanus neonatorum in which recovery occurred under treatment with physostigmine; it was the only one in which I ever saw recovery with any treatment, and undoubtedly this patient would have recovered if I had used any one of the other remedies then in vogue. I have seen one patient recover after having a nerve stretched; in all the other patients in whom this was done death followed. I may add that these cases all had long periods of incubation. Our previous experience certainly teaches us that the specific, the general, and the symptomatic treatments should all be used, and that the two latter should not be esteemed too lightly.

XXX. GLANDERS (Farcy)

PROPHYLAXIS

The prophylaxis of this disease is similar to that of anthrax (q. v.), although there is relatively more immunity, and glanders is not so contagious as anthrax. In the horse we are better able to use prophylactic measures, because we have in mallein a substance by means of which the diagnosis can be readily made in the majority of cases (ninety-five to ninety-nine per cent of all cases, Nicolaier).

TREATMENT

In the acute cases the treatment should be that of septicopyæmia (q. v.). The chronic cases should receive local and general treatment. All abscesses should be opened, treated with strong carbolic acid or corrosive sublimate solutions, and then packed with iodoform gauze. If there is a pyogenic membrane, or wherever there is a nodule (button farcy), the curette should be used. Ulcers, wherever found, should be treated locally—in the nose, by the application of caustics, trichloracetic acid, zinc chloride, or the actual cautery. In addition, the ordinary mild antiseptics should be used for the purposes of cleanliness.

The patient should be isolated and all his secretions disinfected. His food should be such as is adapted to chronic wasting diseases, and stimulants are required. Many remedies have been recommended—mercury, the iodine preparations, arsenic, strychnine, and internal antiseptics; good results have followed the use of every one of these drugs, but it is still questionable whether any of them has any effect upon the general process.

Mallein has been used for curative purposes. It is still on trial, and the future must decide its utility, which at present seems doubtful.

XXXI. ACTINOMYCOSIS

PROPHYLAXIS

Direct transmission of the *Streptothrix actinomyces* from cattle to man is a rare occurrence; it is even more doubtful whether the plant may be transmitted by means of the meat or the milk of diseased cattle. Cattle must, then, be looked upon as indirect carriers of infection, because the streptothrix may infect the ground or the plants with which they come into contact, and they should therefore be killed. Liebmann has shown experimentally that in infected ground the ray fungus may be found upon plants grown upon it, such as barley, rye, and beans. It is, therefore, more than probable that the mode of infection in man is the same as in cattle, especially as in men with this disease plant tissues have been found in a great number of lesions. The ray fungus has been transmitted, as the history of the cases shows, by the various forms of grain—barley, wheat, rye, oats—and by various vegetables. The most common place of invasion, in man as in cattle, is the gastrointes-

tinal tract; for this there is necessary the presence of the fungus and some lesion of the mucous membrane. The mode in which this infection takes place is usually through the chewing of some infected plant or the picking of teeth, especially carious teeth. The prophylactic indications here are very simple; when the introduction of plants that may carry the fungus into the mouth is stopped, no infection can take place. For infection of the respiratory tract, in a large number of cases, this also holds good, because the mouth is the primary seat of infection. In some cases it is supposed that the fungus is inhaled; here general prophylaxis alone can be of value. Practically there can be no prophylaxis unless there is a known source of infection; in many cases this source is never detected. The rarest mode of infection is by the skin, from wounds made by infected woody parts of plants. Until it is settled positively that neither meat nor milk can transmit the disease, animals having actinomycosis should not be used for food.

TREATMENT

The treatment is largely surgical. All local manifestations of actinomycosis should be removed when possible. The operations must be performed in the most thorough manner, to prevent relapses; on the surface the lesions should be softened by hot applications, incised, then curetted, and the cavities either treated by the actual cautery or packed with sublimate or iodoform. In the mouth, after removal of the lesion, all carious teeth should be removed and the sockets treated. Upon the skin good results have been obtained by many observers by the injection of a solution of potassium iodide into the affected part, which is then acted upon by electrolysis (Gautier). This method may also be used in carious teeth. Resorcin, ichthyol, and chrysarobin have also been used to advantage.

The sovereign remedy in actinomycosis is potassium iodide, given internally in large doses—4–5 gm. (gr. lx–lxxv)—daily; this should be given in every case (v. Syphilis). Its use in cattle and man has been followed by most excellent results, although it has failed to do good in some instances, probably because, as Prutz has demonstrated, the iodide does not affect the fungus itself, but only the lesions. However this may be, the iodide offers an excellent chance of success in actinomycosis of internal organs which cannot be reached by surgical means.

XXXII. SYPHILIS

PROPHYLAXIS

Absolute prevention of syphilis is theoretically easy; practically, it is impossible. At best we can only hope for diminution of venereal disease, as the whole question is bound up in conditions that we as physicians can control only to a very limited extent. Our whole civilization militates against the solution of the question, because in women the sexual instinct is diminished, so that nowadays prostitutes are looked upon as degenerates, and in man this instinct must be suppressed for a variable length of time, in that its normal gratification, matrimony, is put off for a long time after the generative organs

have developed. In Anglo-Saxon countries, at least, such matters are looked upon as belonging to the domain of æsthetics, ethics, or religion, and the physical aspect is largely ignored. We physicians see the results; in the female there is a natural inhibitory force, the possibility of pregnancy; but in the male no such force exists, and for him, therefore, instruction—a knowledge of the results of illicit intercourse—should be made easily accessible. Unfortunately, the whole subject is usually tabooed in the mutual confidences that should exist between fathers and sons, and is particularly ignored in private or public life, so that many young men suffer because they do not know why they should restrain their natural appetites. On the other hand, public discussions, such as we see them in the various European congresses for the prevention of venereal diseases, where a large percentage of the audience consists of women, cannot do much good, and the layman's action in the matter can be helpful only in carrying out measures recommended by those who have studied the question. The work of instruction must be done from individual to individual, and in this great tact is required; here the family physician can do an infinite amount of good.

Until comparatively recently the woman only has been taken into consideration in the prophylaxis of venereal diseases. At present the male is considered, and justly so; the question of male continence, formerly considered impossible, is engaging attention, especially in those countries in which sexual relations have been lax from the Anglo-Saxon point of view. Here it would seem that the attitude of the physician should be uncompromising, as the prevention of disease is after all his greatest mission, and he is at his best when he confines himself to the rôle of a physical director of his clients. But he is confronted by an individual, and not by a condition, an individual in whom the sexual desire may be so great that it is uncontrollable and in whom the efforts at control may do harm. It is barely possible that the number of these individuals has been overestimated, but those who have occupied themselves with this question for many years would not be inclined to assent to this proposition. Indeed, the assumption of an uncompromising attitude as a matter of course by the physician may do more harm than good, as experience shows; for when infection does occur, the individual is apt to seek advice from disreputable practitioners because the reputable practitioner has shown no sympathy with him. That sexual continence may do harm is incontestable; that it does do harm frequently in men remains to be seen. Our attitude should always be to advise sexual continence; we cannot insist upon it, but we should not place ourselves in the position of advising anything that may be followed by permanent harm, not only to the patient himself, but also to his associates and to succeeding generations. On the other hand, we are bound to give all possible assistance to those who are willing to practice continence, or even a limited gratification of their desires, as, with the latter, chance of infection is diminished. Nothing acts so well for the purpose of abstinence as work—physical and mental. Athletics, although carried to extremes in our country, has done more good, as the testimony of all educators attests, in this direction than anything else. Application to study, to a serious pursuit of one or more branches of knowledge, is invaluable, but a combination of physical and mental training is the best. Clean surroundings are of importance, but complete absence of temptation is not

desirable, because inhibition is strengthened by exercise. But in the nature of things, and however much we may try to achieve it, male continence will not be general.

For prophylactic purposes the woman is of more importance than the man, for since illicit intercourse cannot be prevented, and since with her the sexual act is more or less passive, she has the opportunity of spreading infection more than the male, as is the case with prostitutes. Now comes in the question of the social evil, a question that has never been solved, and, in the nature of things, never can be solved. All that has been done is to try to limit the amount of harm done physically; it is perfectly clear that, although this is important, nothing more can be accomplished. The various measures that have been introduced—segregation of prostitutes, their regular medical examinations, hospital treatment until cured—are of value, but as yet there is no method that can be applied everywhere. It is not surprising to find so much difference of opinion upon this subject among those who have given special attention to it, as this difference is due not only to the inherent difficulties of the problem, but also largely to ethical concepts. With us, where the existence of the social evil is not recognized by the State, and therefore not recognized as a condition by the majority of the people, the problem is more complex than is necessary. Attempts offering some amelioration have been made, and are making, by the police authorities to enforce medical examination of prostitutes and their prolonged detention in public hospitals; this presupposes that the prostitute is a criminal by virtue of her occupation, and that she is deprived of her legal rights. For these reasons, disregarding all possibilities of corruption of officials, this method must be looked upon as a temporary one, which will eventually result in something better.

A syphilitic patient, except in the tertiary period, must be looked upon as dangerous to his environment, and must be instructed as to the methods by which syphilis is transmissible, so as to enable him to avoid them. Great care must therefore be taken in the use of towels, dishes, and other inanimate objects; kissing should be guarded against, and cohabitation should not be indulged in. But the instructions to the patient should be definite as to the danger, according to the site of the lesion, because syphilitics are prone to become hypochondriacs, frequently with results dangerous to themselves, or, if not this, at least to their usefulness as members of society. Physicians should be very careful in examining these patients; in acquired syphilis of innocents, in my experience, physicians present a large percentage of all cases. They should also be very careful, in using the hypodermic method of treatment, to guard against pricking themselves with the needle of the syringe, which, as we all know, unless special care is taken, occurs very frequently in the use of hypodermic syringes. After all, with the great number of syphilitic cases that come under observation, acquired syphilis insontium is comparatively rare, as a consequence of the nature of the syphilitic virus; yet it does occur in the most unexpected way, and should be guarded against. I have seen the initial lesion over the sacrum in a man who had infected himself by using a bath towel used by his son, who had a primary lesion.

The question of matrimony in a syphilitic is thoroughly answered by Fournier. It is the duty of a syphilitic to get married. But sufficient time must have elapsed so that the other party to the contract may not become

infected and that nonsyphilitic children may be born. The rule that the patient must wait at least two years from the time the last specific manifestation has disappeared is a good one. This means that the patient must be under treatment and observation, and that all signs of syphilis, especially on the part of the lymphatics, shall have disappeared for two years. It is carried out with great difficulty, for manifest reasons, like all restrictions to matrimony; yet after the physician has pointed out to the patient the risks incurred by disregard of his advice, he has done his whole duty. Under no circumstances is he allowed to disclose confidences, least of all in cases of syphilis, where so much unhappiness may be produced.

The relation of syphilis to wet nurses is a very important one. Children with congenital syphilis do badly on artificial food, and they must therefore, that they may thrive, be brought up on natural food. When possible it is, as always, the duty of the mother to nurse her own child; in the great majority of cases she is exempt from infection, according to Colles's law. If circumstances prevent this, and there are many that may arise, the question comes up whether a wet nurse should be taken or whether the child should take its chances upon artificial food. Here the responsibility rests with the guilty party, and the physician can act only as an adviser; if he believes that a healthy wet nurse should not be given to a syphilitic child, he should make this statement, but should also present the other side of the question fairly. He must, when a wet nurse has been chosen, insist that she be made fully aware of the risk she is undertaking, and then arrangements can be made by which she as well as her employers may be protected by law in the matter of financial compensation.

The prevention of syphilitic infection by wet nurses may be a difficult matter. If the rule is followed that the wet nurse's child be at least six weeks old, and that this child have no evidences of syphilis, after the wet nurse has been carefully examined and found without lesions she may be considered reasonably safe. Care must always be taken that the child presented for examination really is the child of the wet nurse (for women who have wet nursed before resort to all sorts of tricks), that it is of the age asserted, and that the examination of the nurse herself is of the most thorough nature.

TREATMENT

Abortive Treatment.—The cause of syphilis has not been found, the *Spirochæta pallida* of Schaudinn is not as yet accepted by all, but we are justified in the conclusion that it belongs in the same class as is found in the other chronic infectious diseases—i. e., some lower form of life. As in these, then, removal of the local infection may prevent general infection, and this, although only in a small number of cases, has proved true for syphilis. I have never had this occur in my experience, but so many good results that are beyond criticism have been recorded that the attempt should be made in every suitable case. Even if the disease is not aborted, it is likely that every local intervention may mitigate the general infection. After suspicious sexual intercourse, every wound upon the genitalia, however small, should be treated, either with carbolic acid in crystals or with the actual cautery. If this is done early, and if the scab falls off, leaving healthy cica-

tricial tissue, our purpose may be considered accomplished; but if an ulcer is left, a second application must be made, and this should be the last cauterization that should be used for the primary sore. If there is infiltration at the base of the sore when the patient first presents himself, without involvement of the lymphatics, the chancre should be excised, and after excision the tissue should be carefully cauterized. This operation cannot be done when the lesion is upon the glans penis or when there are many lesions, and sometimes it is impossible in the female. Even the remote possibility of abortive action is done away with when the lymphatics are involved; the removal of these can do little additional good because by this time there is generally widespread infection. It is impossible in individual cases to state when this operation still offers chances of success, but lymphatic involvement certainly should not be present.

Local.—**The Primary Sore.**—Where there is little secretion the best method is application of Emplastrum hydrargyri (Emplastrum hydrargyri and lanolin, equal parts, spread upon chamois, which usually adheres without bandage in the male). In the female, strict antisepsis, douches with weak corrosive sublimate solutions, then application of calomel in powder form or frequent penciling with corrosive-sublimate solution (one per cent). When there is much secretion, especially if it is thick, frequent douching with plenty of warm water, to which an antiseptic like boric acid or small quantities of carbolic acid, creolin, or lysol may be added. When the ulcer has been thoroughly cleansed, calomel or iodoform, the latter especially when inflammatory symptoms are present, should be applied. If the ulcer becomes phagedenic, all conditions producing pressure should be removed, phimosis should be relieved, and the penis be placed in position to favor the circulation. The Paquelin cautery has been advised, and good results are also obtained by careful antisepsis, the application of hydrogen peroxide, and other stronger antiseptics. The swelling of the lymph nodes, when treatment is required, is best met with inunctions of blue ointment; when inflammatory, by pressure, ice, and finally incision.

General.—Whether syphilis can be cured has been variously answered. It is affirmed that it is a self-limited disease (Sir William Ferguson, Keyes); this is undoubtedly true, but in the treatment of this disease this fact should not be taken into consideration. The reason for this, as well as for the divergence of opinion in regard to the possibility of permanent cure, is to be found in the fact that we never know which patient is going to have relapses or sequelæ in the form of tertiary lesions. All that we do know is, that when properly treated about ninety per cent of all the cases remain well. We can never tell, however, who belongs to these ninety per cent or to the remaining ten per cent. Zeissl's statement, "once syphilitic, always syphilitic," may be true, but the properly treated ninety per cent do not live long enough to prove it. Serum therapy has been tried, but, as could be expected (for we are not positive that the disease is ever found in lower animals, although recent inoculation experiments on apes have been successful), has not been successful. Blood serum taken from convalescents has also been ineffectual, Baumgarten's view that the syphilis producer is a tissue parasite being probably correct.

Hygienic Treatment.—As in all infectious diseases, this is of great importance, as we not only increase resistance, but also prevent complications

and sequelæ. Excesses of all sorts, both physical and mental, should be avoided. All extraordinary exertions should be avoided, especially nerve strain, the extraordinary increase in postsyphilitic nerve lesions that has been noted in the last twenty years being due to the exaggerated wear and tear of the nervous system. The conjunction of Bacchus and Venus is a bad combination; alcoholic syphilitics are bad cases. It is advisable, therefore, to advise abstinence unless withdrawal of alcohol does more harm than good. The use of tobacco should be limited, not only on account of its effect upon the nervous system but also on account of its tendency to keep up local irritation in the mouth. The diet should be normal; healthy, nutritious, it should always be directed toward increase in weight; all depleting measures should be avoided. Much of the good that is done in the various places given up to the treatment of syphilis is due to the carrying out of these measures: the regulation of the patient's mode of life, the change of scene and air, and the systematic use of medication. All this can be done at home, but not so easily, as the syphilitic must of necessity not disclose the nature of his ailment. Attention must be given to the condition of the skin. Hydrotherapy can in no way be looked upon as a substitute for specific medication, but it does good as a hygienic and suggestive measure. All syphilitics should be taught to keep their mouths clean; the teeth should be brushed after each meal at least, carious teeth should be filled or extracted, and the throat gargled. For the cleansing of the teeth, either listerine or some innocuous tooth powder containing a mild antiseptic should be used; when the gums are puffy a mild astringent, tannic acid, rhatania, or alum should be added. Gargling with plenty of cold water is sufficient, but the addition of remedies makes the patient more careful in carrying out instructions. Indeed, it should be the aim of the physician to reduce all his procedures to a systematic measure; in this way the patient will become more exact and conscientious. No class of patients wants to get well sooner than the syphilitic, and as in the nature of the disease a long time is required for treatment, the more he can do for himself the better he will be satisfied.

Medicinal Treatment.—Three things are necessary: time, patience, and the proper remedies. When a syphilitic presents himself for treatment, the physician should always explain to him the nature of his ailment and tell him approximately the time that is required to eradicate it. At the same time the patient must be told of the possibilities, in regard to relapses and sequelæ, resulting from neglect of thoroughly carrying out the treatment. All this must be done in the most optimistic way, for syphilis produces a most depressing effect, so that suicidal tendencies are not uncommon, and many a useful life has been saved by judicious physicians in this disease. If the physician thinks it his duty to look upon a syphilitic as a physical and moral leper he will do an incalculable amount of damage. He should in every case practice the virtue of patience and cheerfulness that he preaches to his patient; the treatment of few diseases is so monotonous and so devoid of interest as that of syphilis. If the physician does not do this his patient will suffer. The medicines that are used—they may almost be looked upon as specifics—are mercury and iodine; the former for the secondary manifestations especially, but valuable during the whole course of the disease, the latter principally for the tertiary symptoms. The value of a method in syphilis is measured by the

time required in removing symptoms, the effect upon relapses, and the prevention of sequelæ. We are not in a position to determine which one gives the best results as to final cure, for the possibility of infecting others, especially the offspring, is a variable quantity which can be temporarily removed by proper treatment.

Mercury is administered by the gastrointestinal tract, by the respiratory tract, by the epidermic, the endermic, and hypodermic methods. In the use of mercury two views have been expressed: the first that there should be intermittent administration, without regard to relapses, for approximately two years; the other that the drug is to be given only when relapses occur. The former method, most conclusively urged by Fournier, is the one that should be adopted; I have seen much damage done by accepting the latter, for even the most careful and conscientious patient may overlook the slight manifestations of a relapse in a mild infection. In one instance in my experience, where this method was not adopted, a patient, without seeking the advice of his physician, married three years after the disappearance of his last symptom. He infected his wife, a syphilitic child was born which died, and he himself finally succumbed to paresis.

When should the administration of mercury be begun? The best rule is to begin medication as soon as the diagnosis is positively made, irrespective of the moot question whether secondary manifestations can be prevented in this way or not, because the subsequent treatment must be the same in all cases. The choice of method depends entirely upon the nature of the individual case; the more intense the manifestations the more is it necessary to use that method which gives quickest symptomatic relief. Under all circumstances, any method that is used should be repeated according to the individual case—intensity, relapses, and possibility of marriage—during the first year; less frequently repeated during the second year; still less during the third year, and if necessary during the fourth year, always at this time if the patient wishes to get married.

(*a*) *Administration of Mercury by the Mouth.*—The objections to giving mercury by the mouth are that it produces gastrointestinal disturbances, salivation, diarrhea, and that the results, while reasonably quick, are not so permanent as with some other methods. It can be given in the form of the Hydrargyrum cum creta—0.065 gm. (gr. j)—four to six times daily; combined, according to Hutchinson, with Dover's powder. The beneficial effects of this method, confirmed by Osler, have been verified by myself, although I use this form of mercury only in the milder cases. When possible the opium should be omitted, since when it is given for a long time the patient accustoms himself to its stimulating effect, and bad results may follow. The tannate of mercury (Hydrargyrum tannicum oxydulatum—0.25–0.30 gm. [gr. iv–v]—three times daily in pill form), which was introduced by Lustgarten, is just as efficient, and does away with gastrointestinal symptoms to a marked degree. The two iodides of mercury are used, the protoiodide—0.04–0.065 gm. (gr. ¾–1), three times a day, the quantity being increased provided that gastrointestinal effects are not produced—is used very frequently because it is well borne, not because it contains iodine. The bromide does not offer any advantages over any other of the salts except that it makes a colorless preparation when given together with potassium iodide. The use of mercury

by the mouth is convenient, not taking up the time of the patient or exciting notice. While this method is probably the one in most common use, it is not looked upon with particular favor by most of those who have given the subject of syphilis special study, yet it is admirably adapted to long-continued use.

(*b*) *Administration of Mercury by the Respiratory Tract.*—This can be effected by fumigation, the patient taking a mercurial vapor bath either in an apparatus especially constructed for the purpose or by sitting upon a chair covered with a blanket, the body remaining exposed to the mercurial vapor derived from the fumigation of calomel for twenty minutes. This method is applicable, in private practice at least, in only a limited number of cases, and then with very unequal results; the mode of absorption, however, comes into play in the other external methods of administration.

(*c*) *Administration of Mercury by Epidermic Methods.*—For this purpose baths containing corrosive sublimate are used; they are especially indicated when well-marked syphilitic skin lesions are present. It is doubtful whether enough mercury is absorbed in the adult to produce a marked constitutional effect. The use of mercury by long-continued contact with the skin has again been revived by Unna. Strips of Emplastrum hydrargyri are applied to one extremity, allowed to remain for several days, and then new ones are applied to another extremity. This method might be used with advantage in children, although I have no experience in its use. The smearing of Unguentum hydrargyri upon the skin, the application of mercurial soap and other mercurials, is to be looked upon as an incomplete substitute for the endermic method, to be used with advantage under peculiar conditions.

(*d*) *Administration of Mercury by the Endermic Method.*—Upon the whole this can be looked upon as the best method for the treatment of constitutional syphilis because, with one exception, it fulfills all the indications before laid down for a complete method. Its effects follow slowly; in this respect it is inferior to the administration of mercury by the mouth, and cannot be compared with the hypodermic method. The form in which mercury is given is the Unguentum hydrargyri, and although various substitutes, such as mercurial soaps, mercurial vasogen, etc., have been recommended, a reliable preparation of the unguentum is still the best. This method is one of the oldest that has been used to combat syphilis, but it has many objections: it is uncleanly; it soils the patient's clothing and bed clothing; it consumes time, and is therefore carried out with some difficulty in private practice when the patient seeks to conceal the nature of his ailment. This is probably the principal reason why the administration of mercury by the mouth has found so much favor. Mercury given by the rectum in the form of suppositories—Unguent. hydrarg. (1–2 gm.—gr. xv–ʒss.)—once or twice daily, gives excellent results, and may be tried as a substitute for the endermic use of mercury. When the patient can be removed from his environment the inunction cure is the one that is commonly used.

The ointment is rubbed in according to a well-recognized system; parts of the body should be chosen where the skin is thin, where there is little hair, and where there is no eruption that denudes the epithelial layer. Eczema, scabies, and other skin diseases therefore form a contraindication for its application; 2–4 gm. (gr. ʒss.–ʒi) are rubbed into the skin for from fifteen

to twenty minutes by the watch. The rubbing is to be done gently by smearing the ointment upon the palm of the hand or, when this is hardened, upon the ball of the thumb of the operator, who may be the patient himself or some one trained for this purpose, until the mercury has entered the skin. It must always be done in the direction of the hairs so as not to produce irritation or folliculitis; this rubbing should be in the form of an ellipse, and it is best done just before the patient goes to bed, as the mercury then will remain longer undisturbed upon the skin. It is rubbed in once a day, beginning upon the inner surface of one thigh, the next day on the other thigh, the third day on the inner surface of the forearm, the fourth day on the other arm. If there is little or no hair upon the chest and abdomen, as is frequently the case in females, these places may be added, and then the cycle is repeated. After seven rubbings the patient takes a cleansing bath, and on this day the inunction may be omitted unless the bath can be taken in the morning. When the patient is accustomed to a daily bath this should always be permitted; it makes the method less objectionable, and some authors even advise it, asserting that the mercury is better absorbed by a clean surface than by one covered with a salve. The gums should be carefully watched, for, as in all cases when mercury is administered, the first evidences of mercurial stomatitis appear in the gums; should they become affected, the drug must be withdrawn until they again become normal. Salivation must be avoided, for it is unnecessary, adds to the filthiness of the condition, and does the patient harm.

These inunctions should be continued until all manifestations of secondary syphilis have disappeared; from twenty to forty, or even more, are required. Under no circumstances should the rubbings be continued after mercurialism has appeared; in children without teeth this is difficult of detection; here the disappearance of secondary symptoms is a sufficient guide for discontinuance of the treatment. The contraindications for the use of this method, besides those mentioned, and the general contraindications for the use of this drug, are to be found in individual characteristics, for sometimes the patient's skin will not bear any inunction, however skillfully applied, a dermatitis always following; at other times there will follow a sort of toxic erythema, or even more.

(*e*) *Administration of Mercury by the Hypodermic Method.*—Hebra and Berkeley were the first to use this method, but to Lewin belongs the credit of having established it. *A priori* it would seem that accuracy of dosage and rapidity of action would be gained by this method. It will be shown to what extent this is true and how permanent is the result. Mercury is used subcutaneously in the following ways: as insoluble salts, as soluble salts, and as metallic mercury. The injections should be made with all aseptic precautions, the substances to be injected should be introduced into the subcutaneous cellular tissue, or according to some others into the muscular tissue. The greatest care must be taken not to inject into a blood vessel, for thrombosis and embolism may result, in a number of instances leading to fatal termination.

1. *Insoluble Preparations.*—The object of using these, as well as mercury itself, is to establish depôts of mercury in the tissues from which a gradual but constant absorption of mercury takes place. For this purpose are used calomel, the yellow oxide of mercury, the borate, the carbonate, the benzoate,

the salicylate of mercury, the various combinations with thymol, resorcin, and acetic acid. Any one of these may be used, for there does not seem to be much reason for a choice among them except that some irritate more than others. They are suspended either in oil or liquid paraffin, according to Lang, who has had great experience in their use, but a more stable suspension is secured by a mixture of lanolin and oil. The "normal" strength is a ten-per-cent suspension, of which 0.25 to 1 c.c.—0.025–0.1 gm. (gr. $\frac{3}{8}$–$1\frac{1}{2}$) of the drug—is injected every three to eight days.

2. *Soluble Preparations.*—These preparations are used on account of their great rapidity of action and their production of the least amount of local reaction. Corrosive sublimate, the formamidate, the carbamidate, the amido-succinidate, and the peptonate of mercury, Hydrargyrum bichloridum carbamidatum, Hydrargyrum carbolicum, and other preparations are used. I do not understand the preference that is shown for the cyanide of mercury in some quarters, as both the action of hydrocyanic acid and that of an irritating mercuric salt must be reckoned with. Corrosive sublimate in a ten-per-cent solution of common salt is the preparation commonly used. Usually all these preparations are administered as one-per-cent solutions, of which 0.5 to 1 c.c. of the solution (gr. $\frac{1}{12}$–$\frac{1}{6}$ of the drug) is injected. In using stronger solutions —two to five per cent—the injections should be made at longer intervals than is usually done.

3. *Metallic Mercury.*—This is best used according to the method of Lang, from whom the following is taken: He first prepares an Unguentum cinereum lanolinatum forte as follows: Lanolin, 15 gm. (℥iv); chloroform, 50 gm. (℥iss.), to be evaporated in a large mortar under constant stirring until reduced to 30 gm. (℥i); then 30 gm. (℥i) of pure mercury are added, and the whole is slowly stirred until the chloroform is evaporated and the metallic mercury is no longer distinguishable. From this the "gray oil" is made in the following way: ℞ Unguent. ciner. lanolat. fort., 9 gm. (gr. cxxxv); ol. vaselini (pure liquid paraffin), 3 gm. (gr. xlv). The oil is to be added very gradually to the ointment, with constant stirring, until a smooth mixture is obtained. Of this, "0.05 c.c., containing 0.04 gm. (gr. $\frac{2}{3}$) metallic mercury," is injected "deeply under the skin of the back every three to five days, and when the symptoms have markedly improved every five to eight days, and the same amount as an extra dose is given once in seven, fourteen, or twenty-one days—in all eight to twelve times, rarely more. In early relapses one half the quantity is frequently sufficient." Lang never injects into the gluteal region because of the danger of embolism. Neisser prepares the mercury as follows: ℞ Hydrargyri, 20 gm. (gr. ccc); ether. benzoic., 5 gm. (gr. lxxv); tere, etc., deinde adde paraffin. liquid puriss., 40 gm. (℥x), of which 0.1 to 0.25 c.c. is used for each injection. Both these directions produce an oil which solidifies at ordinary temperatures, but can be liquefied at temperatures not detrimental when the preparation is used subcutaneously.

Of the three methods, the soluble preparations act most rapidly, but with the least permanent effect; the insoluble less rapidly, but with greater permanency of result; the mercury itself produces the best result as to permanency, but is the least active of all as far as time is concerned. The danger in their use holds the same relative position, being least with the soluble, greatest with the mercury itself. This is also the case as far as local lesions are con-

cerned, yet with proper precautions suppuration can be avoided; in nearly every case the patient complains of the pain produced by the injection, and in some instances this is so great that the hypodermic method must be given up.

In reviewing the various methods of giving mercury we come to the following conclusions: the hypodermic use offers the quickest results; even the use of mercury itself is followed by quicker results than the endermic method, but for permanent results this latter method with inunction is the best. For accuracy of dosage the hypodermic method should be chosen. The administration of mercury by the mouth, by the respiratory apparatus, and by baths are the least reliable methods in both respects. The hypodermic method is the most dangerous. Under these circumstances one of the methods must be chosen that is best adapted to the individual case, according to its character, its localization, and the nature of the patient and his surroundings. Here, as elsewhere, much good is accomplished by individualizing, and the fact must not be lost sight of that one method may succeed with one patient and fail utterly with another.

(*f*) *Contraindications.*—The dictum, "syphilis, therefore administration of mercury," is no longer accepted, for it is a fact that mercury will always do harm when given in large enough dose or for a sufficient length of time. It is imperative that during the course of a mercurial treatment the patient should be carefully observed by his physician. The blood in syphilitics seems to react differently to mercury from the reaction in healthy beings; it should be watched, because mercury sometimes increases the cachexia or even produces it. When syphilis occurs in combination with certain other diseases, mercury should not be used until the latter are eradicated or ameliorated by the treatment especially indicated for them. In gastrointestinal diseases great caution is required, as the metal is eliminated from the mouth downward, in the mouth especially and in the rectum. In acute nephritis, which may be due to syphilis, the administration of mercury, if begun, must be withheld. In alcoholics the drug must be cautiously used at first. All chronic wasting diseases—tuberculosis, malarial conditions, grave anæmias, and degenerative processes in vital organs—form contraindications until improvement takes place. In the same way all serious disturbances of nutrition, such as so-called scrofula, diabetes, continued suppurative processes, convalescence from long-continued fevers, should be looked to. For the same reason mercury should not be given in the malignant forms of syphilis; it does no good for the intoxication and does great damage to the general condition. In the hemorrhagic diathesis mercury has been known to produce fatal results. Pregnancy is no contraindication except that undue zeal in its use may produce abortion by irritation of the large intestine; on the other hand, a proper use of the drug in many instances prevents abortion.

(*g*) *Bad Effects of Mercurial Treatment.*—Bad effects, besides those already mentioned, undoubtedly do occur from the proper use of mercury, but the laity reason from the exceptions, not from the rule, with the result that all the world over irregular practitioners thrive who carry on their flouting banner the device, "No mercury, no poisons," though their nostrums do contain either mercury or iodide. Mercury produces, sometimes in an unaccountable way, hydrargyrism, which may even become fatal. The drug has a dele-

terious action upon the general metabolism, the blood, the gastrointestinal tract, the kidneys, the skin, and nerves when given in medicinal doses, all which can be prevented by judicious care, so that usually they need hardly be taken into consideration. The changes produced by chronic mercurialism do not interest us here. The most common form of trouble found is in connection with the gastrointestinal tract—in the mouth and in the large intestine—and this may follow any method of administering the remedy. The reader is referred to the chapter on Dysentery and Stomatitis Ulcerosa for its treatment. Occasionally there is found a patient who has an "idiosyncrasy"—to him mercury cannot be given at all, or at least not by the method already mentioned. The skin affections—erythema or bullæ—should be treated, and as these are usually due to so-called "idiosyncrasy," they may make it necessary to choose some other method of treatment.

(*h*) *Substitutes for Mercurial Treatment.*—In a number of cases mercury cannot be given, or it does no good—refractory cases. In these cases it is necessary to institute tonic treatment, and for this purpose iron, arsenic, or the bitter tonics have been recommended. For sarsaparilla specific effects have been claimed, though probably incorrectly, but in some instances this drug is valuable when combined with good hygiene. Certain it is that the decoctum Zittmanni is very efficient in a limited number of cases of inveterate syphilis in which no good seems to be derived from the various methods of using either mercury or iodine. Because of the good effects that follow its use when everything else has failed, a lesson I was taught by Hebra, I give his formula for the decoctum; it is especially useful in very debilitated syphilitics, in those that cannot take mercury in any other form, and in very anæmic patients. Its *modus operandi* is not explained, although long experience has taught us its efficiency.

The decoction is given in two forms, the stronger and the milder. The formula of the stronger is: Take sarsaparilla root, 420 gm.; digest for twenty-four hours in 30,240 c.c. of water, then add, inclosed in a linen bag, the following: Sugar and alum, of each 25 gm.; calomel, 15 gm.; and cinnabar, 4 gm.; heat until the quantity of fluid is reduced to 9,600 c.c., then add anise and fennel while the fluid is hot, cut senna leaves and licorice root, of each 50 gm. Express, strain, and set aside for some time. The milder decoction is made as follows: 200 gm. of sarsaparilla, to which is added the residue of the stronger decoction; heat in 30,240 c.c. of water to 10,080 c.c.; at the end of heating add lemon peel, cardamoms, Chinese cinnamon, and licorice root, of each 10 gm.; express as before. The whole quantity obtained by the first process is divided into eight parts; the same is done for the second. One part of the stronger decoction is given in the morning, one part of the weaker in the afternoon. When the patient can be kept in bed the results are best.

(*i*) *Iodine.*—The various preparations of iodine are used against the toxic symptoms of the secondary stage—headaches, anomalous conditions in the bones, the joints, and the nervous system; iodine may also be tried in malignant syphilis, but cautiously. As a rule we use it in the tertiary forms, and here it is capable of producing medical miracles. When it does not act alone it should be combined with a mercurial treatment, but this as a rule is not necessary. Whichever preparation is used, unless otherwise indicated by the severity of the diseased process, begin with small doses, increasing them grad-

ually until the limit is reached. The preparation that is most commonly prescribed is the potassium iodide; although the sodium iodide contains more iodine, it is not so frequently used in this disease; indeed, some authors have denied its utility in syphilis. The advantage of sodium iodide consists in its little irritation of the stomach; the disadvantage, according to my experience, in its easy production of symptoms of iodism. In the administration of the iodides one of our objects is to prevent the symptoms of iodism, and for this purpose many things have been recommended; the iodide should always be well diluted with carbonated water or milk; it should be given after meals. Ehrlich has suggested sulphanilic acid—3 gm. (gr. xlv) dissolved in water containing sodium bicarbonate; atropine is valuable in removing hypersecretion from the mucous membranes. I always give potassium iodide dissolved in an equal part of water, so that each minim equals about one grain of the drug; the dose to be used is dropped into a glass of milk; before and after taking this, artificial gastric juice (essence of pepsin is the most palatable and elegant preparation) is given. In this way the iodide may be given to great advantage, even to most of those patients who cannot stand minute doses without iodism. The dose that may be used at the beginning is 0.6 gm. (gr. x) three times daily, which in proper cases can be increased so that the patient takes as much as 30 gm. (℥i) daily. When combined with the use of baths, as is done in the places given up to the treatment of syphilis, fabulously high dosage is used and is thoroughly well borne by the patients. On account of the fact that with all precautions there will now and then be found an individual who cannot take even the minutest dose of the iodides, the following substitutes may become necessary: Iodipin, introduced by H. Winternitz, is produced by dissolving iodine in sesame oil that has been acted upon by iodine monochloride; it can be given internally in ten-per-cent strength, subcutaneously in twenty-five-per-cent solution. It certainly fulfills all the indications of iodine in the most advantageous manner; whether it meets all the requirements for the treatment of syphilis remains to be seen. Other substitutes—tinct. iodi., iodol, subcutaneous injections of iodoform, or iron iodide—may be useful in individual cases; they all produce symptoms of iodism, but in some who have an "idiosyncrasy" one or another may be given when the iodides cannot be taken.

The best of all the substitutes for the iodides is iodonucleoid, a preparation containing nine per cent of iodine. This preparation can be given in more human beings without producing iodism than any other that I am acquainted with. It is even more slowly absorbed than iodipin, and this may account for its wide range of usefulness. Iodonucleoid may be given in doses of from 0.3 to 1 gm. (gr. v to xv), or even more, three or four times daily. That it can be given to anyone without producing iodism is erroneous; I have seen several patients who could take only minimal doses of it.

The objections to the use of iodine are summed up in the word iodism. This even in the form of acne, which is harmless and needs least to be considered, is very unpleasant to the patient. Severe symptoms like œdema glottidis or œdema of the lungs are rare, but do occur, even after few and small doses. In the beginning of iodine treatment it is always wise to determine whether the patient has an idiosyncrasy; after that if the symptoms of iodism, especially as regards the mucous membrane, are well marked the rem-

edy must be withdrawn. To patients who already have laryngeal or bronchial trouble (v. Diseases of the Respiratory Tract) iodine should be cautiously administered. It is well to advise a patient who has had syphilitic symptoms that have succumbed to the use of iodine to take a thorough course of iodides once a year for three or four years.

Local Treatment.—For the *alopecia* various "hair tonics" have been recommended containing chloral hydrate, cantharides, resorcin in alcohol or oil. Lang speaks very highly of inunction with blue ointment.

Macules and papules as a rule require no treatment; when, however, the latter become painful or secrete much they should be treated. *Dry papules* are best treated by the application of Emplastrum hydrargyri, white precipitate ointment, or calomel ointment. For the palmar and plantar psoriasis the same may be used, the patches may be painted with tincture of iodine or covered with collodium containing corrosive sublimate (0.05–0.3-per-cent solution). *Moist papules* should be kept clean by douches and baths, and carbolic acid or corrosive sublimate should be applied; at times they must be cauterized with chromic acid or silver nitrate. When there are fissures, lint containing sublimate solutions or iodoform may be used; if the lint cannot be kept in place they should be cauterized. Some lesions will have to be removed by the curette when they are too much in evidence or too painful, or when the chances of infection are too great.

Syphilitic exostoses are most frequently removed by the use of iodine—℞ Iodini, 1–2 gm. (gr. xv–xxx); potassii iodidi, 2 gm. (gr. xxx); glycerini, 4 gm. (℥j)—applied over the exostosis, covered with oil silk, and the application renewed twice daily for three days when possible, is a remarkably sure but very painful method. Superficial gummata are best treated with Emplastrum or Unguentum hydrargyri; poultices with subsequent incisions may be required.

Ptyalism.—Every patient who is treated with mercury should be taught how to keep his mouth in the best possible condition in order to prevent ptyalism. With all care this is sometimes impossible, but strict attention to cleanliness of the mouth does much to reduce the risk of salivation. The patient should be instructed to clean his teeth with a soft tooth brush and some antiseptic lotion or tooth powder after each meal. All carious teeth should be attended to by the dentist, all rough or sharp teeth should be filed or otherwise changed into nonirritating bodies. For the further details and the treatment see Stomatitis Ulcerosa.

FORMS OF SYPHILIS

Congenital Syphilis.—Macular forms do well under the inunction cure. Hydrargyrum cum creta is very valuable, because no suspicion of the character of the disease is attached to its use. In papular forms these methods may also be used, but severe forms should be treated with very small doses of calomel, used with great care, or with the tannate of mercury, although it also at times produces gastrointestinal disturbances. For the *pustular* forms, which are usually fatal, corrosive sublimate baths (Baginsky) may be used (1:20,000), or the subcutaneous method may be tried. Wherever there are evidences of visceral lesions iodine should be added to the mercury. The

newly born child is very tolerant of mercury, but all such preparations as interfere least with the digestive functions should be tried first, as at best the question of nutrition is a difficult one. The attempt has been made to give mercury to the child by administering it to the mother or wet nurse; but while it is highly probable that mercury is eliminated by the milk in human beings, it is impossible to tell when and how much mercury is given to the child in this way. The prevention of relapses and the after-treatment of these patients taxes the skill of the ablest physician. At one time these patients may be doing very well, shortly after this a relapse or the development of cachexia makes the condition almost hopeless. They have very little resistance, so that an ordinary gastroenteritis may prove fatal. Feeding these children is always a difficult problem. In the interim of mercurial treatment they must be given iron, the iodide when possible, iodine for special indications, creosote for glandular troubles, oils when nutrition is very much reduced; whether this last be in the shape of cream or some other form of fat must depend upon the condition of the digestive apparatus. Local treatment should be carried out as in adults. The early use of iodine has seemed to me to prevent nervous and osseous lesions to some extent, but whatever is done must be done thoroughly, and in the bad forms quickly. The prophylaxis of congenital syphilis offers more chances of doing good than its treatment.

COMPLICATIONS AND SEQUELÆ

For the treatment of the various complications and sequelæ of syphilis the reader is referred to the appropriate chapters.

XXXIII. GONORRHEA

PROPHYLAXIS

Prophylaxis should be attended to in general on the lines laid out in the preceding chapter. In gonorrhea we have prophylactic advantages because the cause of the disease is known. It is the duty of the physician to discover its existence, and then to prevent its spreading infection. The first may be difficult under peculiar conditions, but is of the greatest importance in preventing ophthalmia, vulvovaginitis in children, the production of sterility, and many diseased conditions more or less dangerous to life. This can be done only when the physician familiarizes himself with the bacteriological diagnosis of the disease, for very frequently a clinical diagnosis is impossible. It is necessary only to consider the common occurrence of the gonococcus in vulvovaginitis in children to prove this statement. To a certain extent it is just as important to examine for the gonococcus as for the tubercle or diphtheria bacillus; it would be best to examine every discharge from the genitals, but for practical reasons this is inconvenient, and frequently not feasible. Under all circumstances, a patient with gonorrhea should always be instructed as to the extreme infectiousness of the gonococcus. Of equal importance nowadays is the obtaining by the patient who has a discharge from the ure-

thra of his doctor's permission should marriage be contemplated. It is a matter of common knowledge among physicians that a large percentage of uterine and adnexal diseases in the female are produced by gonorrheal infection; we no longer look upon gonorrhea as equivalent to a "bad cold." As there are gleety discharges which are not infective, the only way in which we can tell whether such a patient should be allowed to marry or not is by the absence or presence of the gonococcus. In such cases the examinations should be frequently repeated, and with all the precautions that have been recommended, to cause the reappearance of the gonococcus in the secretion; but even with all these, in rare cases, a negative result does not always prove that infection cannot take place, for we know that the gonococcus may remain hidden, and appear on the surface only at times. Theoretically examination for gonococci should always be able to settle the question; practically it does so in the vast majority of cases; certainly when it has been made in the proper way the physician cannot be accused of having neglected anything necessary to enable him conscientiously to answer the question.

In families great care must be taken as regards the use in common of the articles of the toilet, the bath, and of various instruments such as syringes, thermometers, etc. Family epidemics of gonorrheal infection, as well as widespread epidemics in institutions, can usually be traced to this mode of spread.

Individual Prophylaxis.—In the female repeated irrigations of the vagina have been recommended; for the male, injections of silver nitrate or the silver preparations into the anterior part of the urethra shortly after any possible chance of infection may have arisen.

TREATMENT

As this is nowadays largely surgical, the reader is referred to the proper authorities. For us there are certain complications that require consideration here.

COMPLICATIONS

Gonorrheal Arthritis.—The principal object here, as far as the joints are concerned, is to prevent deformity. The joint, therefore, should be put into some form of immobilizing bandage, but not for too long a time; certainly not after the inflammatory symptoms have disappeared. In very severe cases operative intervention should be resorted to—incision into the joint and proper antisepsis. The chronic condition is treated by judicious exercise, massage, friction, the use of counterirritants, and best of all the actual cautery. Internal treatment is of doubtful value; the usual remedies given in acute inflammatory rheumatism—salicylic acid or antipyrine—may be tried; the latter may give relief to pain, both may seem to have some effect upon the process itself, but the fact must not be lost sight of that here, as in other places, mild gonorrheal infection runs a self-limited course. In the subacute and chronic cases potassium iodide has been recommended (J. C. Wilson); I have never been able to accomplish much with it. In severe cases this complication produces much debility; a causal as well as a symptomatic indication, therefore, is the proper attention to the general condition. Tonics, food, and

drugs are required; the syrup of the iodide of iron, the organic preparations of iron, and the bitter tonics are all used to advantage.

For the other medical complications the reader is referred to the appropriate chapters (Septicopyæmia, Diseases of the Heart, the Kidneys, the Alimentary Tract).

XXXIV. TUBERCULOSIS

PROPHYLAXIS

Wherever prophylaxis has been carried out in a scientific way mortality from tuberculosis has been diminished. In many places a reduction of about fifty per cent has taken place; in England, from 2,410 in a million in 1870 to 1,307 in 1896; in Germany and Austria (Weichselbaum), from 1883 to 1892 the reduction is represented, for Bremen, by a fall from 110 to 60 in 10,000; for Leipzig and Berlin, from 36 to 28; in this country the best results have been obtained in Massachusetts (nearly fifty per cent) and in New York. While this is partly due to treatment, it is principally the result of prophylaxis. In order that prophylaxis shall be carried out most effectively, two things must be especially considered: the cause (the tubercle bacillus) and the individual. The first is most conveniently considered under the heading of

General Prophylaxis.—In order to have the coöperation of people at large it is necessary that they receive instructions as to the nature of tuberculosis, its fatality, and its prevention. This is done in many countries, and in this country there is a large number of State and local societies for the prevention of tuberculosis; but an even larger number is necessary, for in our struggle against this disease we are opposed by all those factors which are antagonistic to the prevention of infectious disease—ignorance, cupidity, poverty, and neglect. Of necessity, then, the intervention of the State must be called to our assistance, and this in our country is beset with many difficulties, though notwithstanding this R. Koch has publicly commented favorably on the good work that has been done by Hermann Biggs in New York. While all popular teaching must be clear and forcible, much harm may be done to the tuberculous individual if the chances of prevention of the disease are not also always stated clearly and forcibly. Fear is best controlled by knowledge, and our knowledge of tuberculosis is positive as to its prevention. The danger in the popular conception is exaggeration, which in this case makes a leper of the patient, destroys his utility, and frequently deprives a whole family of its natural supporter. Great stress must always be laid upon the bacillus as the carrier of the disease as opposed to contagiousness—something definite as offered to something indefinite, and consequently regarded by the laity as something fearful. Bacteriophobia, which exists among physicians as well as among the laity, can only be controlled by definite knowledge. Every physician can contribute his mite to the general prevention of tuberculosis, but we must always remind ourselves of the fact that to become great popular scientific teachers there is required a special gift, otherwise we fail in our purpose. In this connection the difference between Huxley and Darwin need only be mentioned, the former possessing the great gift of popularizing any subject to which he gave attention, a gift entirely absent in the latter.

Wherever any tubercle bacillus is found it should be rendered innocuous, and this must remain our principal object until it is positively proved that certain kinds of tubercle bacillus are harmless to man. For our purpose it does not matter whether a human being dies of the disease produced by a bovine or by a human bacillus. Our first object is to destroy the bacillus as it occurs in the outer world. We know that tuberculosis occurs in lower animals—cattle and swine most commonly, more rarely in goats and sheep, horses, dogs, and cats, in monkeys in captivity, and in birds, especially parrots. While in these animals there may be present a special form of tubercle bacillus, R. Koch's statement that bovine tuberculosis cannot be transmitted to man cannot be accepted; clinical observation shows that this does occur, and Theobald Smith has conclusively demonstrated the fact in describing a case in which a human being died of tuberculosis produced by the bovine tubercle bacillus. All animals having tuberculosis should be killed and their carcasses destroyed. In order that the loss should not fall upon the proprietor of the cattle, the State should pay for the animals to be destroyed; for it will be asking too much of individual human nature that it should sacrifice itself for the public good. Meat or milk from diseased animals should never be used; dairy hygiene should be established, and especially to children, to whom the danger is greatest, no raw milk should be given unless the cows have been tested with tuberculin for tuberculosis. This test also destroys the possibility of transmitting tuberculosis by cream and butter. It would be wise if all cattle were tested by tuberculin, by which a sufficiently accurate test for tuberculosis in cattle is easily made. But the expense connected with its use, small as it may be, the fear of losing the cattle, and the fact, repeatedly observed, that the drinking of milk or the eating of the meat of cattle that have reacted to tuberculin frequently does not produce human tuberculosis, all act against its general adoption.

In the case of the human bacillus it has been shown that infection takes place especially by the dried bacillus, although Flügge has demonstrated the fact that tubercle bacilli may be suspended in the smallest drops of expectoration that are expelled when the patient coughs, sneezes, speaks, or laughs. B. Fränkel has therefore proposed that all phthisical patients should wear masks—a very efficient method, but absolutely without practical value. To prevent the spread of the human bacillus, the individual carrier must be instructed as to the danger of transmitting infection. The crusade against promiscuous spitting, now happily started in this country, should be carried on with the greatest vigor not only against tuberculosis, but for the prevention of many other diseases. If spitting must be, it is better to provide cuspidors, better to offend æsthetics than sanitation. It is a delectable vista to imagine cuspidors distributed at regular intervals along the streets, in public places of amusement, in the street cars and elsewhere; but these cuspidors might act in a deterrent way. However, as according to all eye witnesses, both foreign and native, the American spitter can be looked upon as a skillful marksman, the number of cuspidors need not be too great, it being necessary only that they be in evidence. All cuspidors, private and public, should contain water, to which corrosive sublimate (1:1,000) or lysol (ten per cent) may be added; the principal object of the fluid, however, is to prevent the expectoration from drying up. The individual must be taught to dispose of his expectoration in

the proper way. A great number of spitting cups has been invented for hospital, veranda, or constant use, many of them very valuable. In private practice, except when the patient remains at home, their use is restricted because no patient is willing to expose the nature of his ailment by the public use of a spitting cup; here it is better to have the patient expectorate into rags or Japanese napkins—when handkerchiefs are used they should be put into the wash every day, or very cheap ones can be bought which should be destroyed after being in service one day. The expectoration is best destroyed by burning; of all methods for destroying sputum this is the best. Next to this comes disinfection, which can be accomplished by long boiling in an alkaline medium, five-per-cent carbolic-acid or ten-per-cent lysol solution, 1:1,000 corrosive sublimate, or formalin, the first and the last being probably the most effective. Knopf recommends wood vinegar (Acidum pyrolignosum), which he says kills the bacillus in six hours and "takes away the unpleasant aspects of the expectorated matter"; all chemicals take from six to twelve hours or longer to kill the bacilli.

As light and cleanliness are antagonistic to the development of the tubercle bacillus, the hygiene of closed spaces should be carefully looked to. This is especially the case with workshops, where insufficient ventilation, overcrowding, and lack of individual cleanliness exist; we find this notably in so-called "sweat shops," but it is not confined to these, for it occurs in all industrial establishments where the quantity and low price of the output are paramount. Dust and smoke do harm in tuberculosis in the same way as in other respiratory diseases (q. v.). Street and railroad cars, especially the sleepers, should be disinfected daily by formaldehyde; they should have proper means for ventilation, and steps should be taken to prevent overcrowding. We know that the bacillus clings to walls, ceilings, and floors (Cornet has found them in convent rooms that have been inhabited by tuberculous patients). In various cities of this country (New York, Biggs; Philadelphia, Flick) it has been shown that there is almost an endemic distribution, the inhabitants of certain localities and houses being most frequently affected. It is curious to note that all these things were known to our forefathers in medicine: Morgagni and his immediate successors in pathological work refused to make autopsies on phthisical patients because of the possibility of contagion to themselves. In some Italian cities all those were punished who did not notify the authorities of deaths from phthisis pulmonum, or who did not destroy all articles of clothing and bedding that had been in contact with the patient. In many Spanish cities a house in which a patient had died of tuberculosis was destroyed and allowed to remain vacant for a long time. In many regions of Germany the contagiousness of phthisis was so thoroughly accepted by the laity that nothing could shake this belief which the medical profession had given up for so long a time (Liebermeister).

All infected houses and rooms should be carefully cleaned (v. Scarlatina), and disinfected with formaldehyde. But the fact that tuberculosis is by no means so contagious as scarlatina or a great many of the other acute infections must not be lost sight of. The disinfection of articles commonly used by tuberculous patients is not usually necessary, provided the products of diseased conditions are destroyed. The books of public libraries should be disinfected; whether we shall ever be able to get clean paper money is a

question; that infection is carried in these ways must be accepted, but how often it occurs it is difficult to establish. Hebra was in the habit of relating how he received a fee in bank notes from a patient with confluent smallpox which the patient kept for security in the form of a roll next to his skin, and the story always ended with the question, "Do you think I refused to take these bills?" The method employed by the Bank of England is one that should be accepted by every country using paper money: to destroy every bill as it comes back to the bank and to issue a new bill in its place.

In order to make general prophylaxis most effective, it is necessary that everywhere tuberculosis should be reported to the health official, for in view of this tenaciousness of life by the tubercle bacillus much good can be done when the health officer applies the proper methods; care must be taken, however, that harm does not come to the patient. Alcoholism, which forms a decided predisposition to tuberculosis, must be combated. The question of isolating all tuberculous patients, especially the pulmonary cases, in especially constructed hospitals or sanatoria answers itself; there are too many patients, there could not be enough sanatoria. But these methods of limiting the transmission of tuberculosis are very efficient, and should be adopted to the fullest extent possible. A *résumé* of all that needs to be done to exterminate tuberculosis will show the correctness of v. Jürgensen's statement, "general prophylaxis includes the prevision of the well-being of man in every respect—its never attainable end would be paradise before the fall of man."

Individual Prophylaxis.—*Children.*—When the mother has active tuberculosis she should never nurse her child; latent or passive tuberculosis need not be taken into consideration. In hereditarily predisposed children all possible hygienic precautions should be taken. The prophylaxis of respiratory diseases (q. v.) should be carried out. All enlarged glands should be looked after and the causes removed; skin diseases; troubles of the respiratory tract, in the nose, the pharynx, especially adenoids, and the bronchi; diseases of the mouth and teeth, and of the intestinal tract (mesenteric glands)—all should be regarded. Rickets and hereditary syphilis must be treated. The food should be free from tubercle bacilli; in infancy, raw milk from tested cows, sterile milk, or pasteurized food should be used; in older children, fats and carbohydrates should be given in abundance; the tendency in older children of this kind is to prefer albumens and indigestible food; their appetite is very capricious, so that great care must be taken in the maintenance of weight. In these cases an approach to normal appetite is frequently obtained by the administration of syrup of iodide of iron or creosote. They are anæmic, either on account of glandular enlargement or from gastrointestinal causes. The lack of appetite and the anæmia are usually secondary, and not primary, causes of the malnutrition. In children of this class every attention must be given to their mode of life: they should not be sent to school too young; they must be kept in the open air as much as possible; strengthening of the muscular apparatus by judicious play and exercise must be looked to; their clothing must be adapted to the season and the changes in weather. In my judgment it is wrong to say that a child of tuberculous patients should always be clothed in one material or in another; most of these children have sensitive, badly nourished skins. When the clothing is too heavy they sweat too much, which is debilitating; when it is too light they easily become chilled.

So-called hardening of the skin is of value in these little patients; they should be sponged daily with cold water or take a cold tub bath when their general condition permits, always to be followed by friction of the skin with a rough towel. Liberal ventilation of their sleeping rooms should be looked after; they must not be coddled in this respect. The best that can be done for them is to remove them to a climate where they can live out of doors all the year round; in this country, southern California especially, but good results are also obtained in colder climates. Special diseases which tend to the development of active tuberculosis, such as measles, whooping cough, pneumonia, and pleurisy, must be given special consideration; spinal curvatures, produced by or following the sinking in at the apices, require special attention; exercise, massage, Swedish movements should be used; traumatism, especially around the joints, should be carefully attended to. As these children have a tendency to nervousness, most of them require judicious psychical handling, otherwise they will become neurasthenic, hysterical, or hypochondriacal; overconscientious or anxious parents may do great harm here as elsewhere. Special precautions should be taken, but otherwise all predisposed children should be treated as if they were normal. During the period of sexual development all the conditions that are commonly found should be treated. Much to our gratification, we commonly see children with a tuberculous history grow up to become healthy men and women, even though they have had some lesion in childhood; this need not surprise us, as Naegeli has shown that upon post-mortem examination few human beings are found without some manifestation of tuberculosis.

The Adult.—All those with local or general predispositions should be especially careful. That occupation should be chosen which necessitates their being in the open air as much as possible; but as this, like the whole prophylaxis of tuberculosis, is largely a social question, only a limited amount of good can be done. All the precautionary general prophylactic measures should be carried out as to sanitation; infection is the paramount danger. As in all infectious diseases, everything that lowers resistance should be avoided; no excesses in any way should be indulged in, nothing that tends to reduce strength. Alcohol should be taken sparingly—best in the form of malt liquors. Tobacco may be used in moderation, but any form in which the smoke enters deeply should be avoided, therefore the inhalation of cigar or cigarette and smoking in confined spaces is to be prohibited (v. Respiratory Diseases). Exposure to contagious diseases should be guarded against, especially as regards influenza. When the local predisposition is found in the lungs, all deformities of the thorax should be corrected to the extent that is possible; respiratory exercises of various kinds can be recommended. They consist in attempts at increasing the expansion and contraction of the thorax, and may be applied in the form of active or passive movements, with or without apparatus. To be of service they should be done daily, judiciously, and when possible in the open air; they are of great value, both physically and psychically.

A patient with active tuberculosis should not be allowed to marry because of the danger of producing infection and also the danger to himself. Phthisical subjects are usually of such a temperament that this restriction is likely to be met by great opposition. When recovery has taken place and the patient has been well for two years, medical consent to marry may be given.

The patient should be instructed so that he may carry out all measures intelligently; here again the physician must exercise great tact, for the manner in which these instructions are given must *be adapted to the individual* who receives them. In order that the organism may protect itself against tuberculosis three things are necessary: the neutralization of the tubercle poison, the prevention of increase of the bacillus, and its destruction.

FORMS OF TUBERCULOSIS

Pulmonary Tuberculosis.—SPECIFIC TREATMENT.—Since the discovery of the tubercle bacillus various methods have been used; Koch himself has recommended three specifics—the original tuberculin and its modifications, TR and TO; Klebs has a tuberculocidin, allied to tuberculin; serum therapy has been attempted by many, Richet and Héricourt being the first to try it, but Maragliano seems to be the most successful. Tuberculin is made up from the filtrate from cultures of living bacteria diluted with glycerine. In his first communication (1890), Koch, after making many statements in regard to the efficacy of his remedy, even went so far as to suggest that climatic treatment would no longer be necessary. Elation in the profession was followed by depression when the harm done by this remedy was discovered, not a little due to the remarkable pathological demonstrations of Virchow; and the most enthusiastic physicians, having returned to objective consideration of their cases, finally decided that the tuberculin was without value, or at least of only limited value. That tuberculin may be of value in an individual case of phthisis cannot be doubted; I have shown that the pumping of air into the rectum may do good, but this good may be due to the giving of the remedy and not to the remedy itself. At the present time its routine use is recommended principally by the followers and adherents of the discoverer; a careful review of their selection of cases will show that these are more efficiently treated by other means, certainly with less danger. But the fact must be noted that judicious use of tuberculin—i. e., in small doses beginning with 0.001—in addition to other methods, is gaining ground again. The TR of Koch is produced by centrifuging a mixture of mechanically subdivided tubercle bacilli and salt solution; the lower layer containing the subdivided bacteria is TR, the upper, clear layer is TO. TR is supposed to act by producing immunity, but is without value in the human being because, as the followers of Koch say, it does not allow of the addition of preservatives, and therefore cannot be efficiently used in general practice. TO produces increased agglutination in animals; it can be used in all phthisical patients except in those manifestly incurable on account of great lung destruction or great debility. As this preparation is a commercial product, it is even more difficult to arrive at any conclusion regarding its efficacy. Furthermore, after the signal backset that the use of the original tuberculin has suffered, TO has not been received with great favor, either by physicians or laity. At present the remedies that are advised by R. Koch will require much evidence as to their utility before they will be universally accepted. In the use of TO, however, there is one advantage: it is affirmed that it does no harm.

SERUM TREATMENT.—That immunity can be produced in animals has been conclusively shown, and it has also been demonstrated in the human being,

for agglutinins and antitoxines are produced. The introduction of antitoxines has been used by Koch in TR, and by Maragliano in his serum. Both claim good results in the treatment of tuberculosis. The production of greater or less immunity as a prophylactic measure has been made possible by vaccination in calves by Behring, and is used by Maragliano in human beings. As yet all these specific methods are to be looked upon as phases of development of this method of treatment; with continued investigation and more complete knowledge of the defensive apparatus of the human being a specific treatment of tuberculosis may be found. Even without this, the present results in treatment are good, provided the diagnosis be made early, the patient be tractable, and the form of tuberculosis not necessarily fatal.

General Treatment.—The attitude of the physician in tuberculosis is of enormous importance as to the result of treatment in this disease. It is said that tuberculous patients are sanguine, they are cheerful and hopeful; daily experience shows that this is the exception, except possibly in advanced cases. Certainly in making the diagnosis, especially in the early stages, the physician must communicate his conclusion to the patient in such a way as to produce the least depression, and the term "consumption" should be avoided altogether. It need not be added that great judgment must be exercised in making the diagnosis; the presence of a lesion is not in itself sufficient evidence, for with exactness enough in the autopsies Ribbert has found evidences of tuberculosis in practically one hundred per cent of subjects. When we look back for twenty-five years and see how physical examination of the chest alone has led us to errors in prognosis, the necessity of distinguishing between lesions and active processes becomes apparent. In this disease the telling of the whole truth should be used with similar limitations as any other therapeutic measure: the dose should be large or small according to the individual. Much harm has been done by physicians who consider it their duty to tell all they know. In tuberculosis many patients have been sacrificed by our forgetting that all knowledge is imperfect, and that our medical convictions on a given subject may be changed by a small discovery. We frequently see patients who have not enough stamina to fight against the disease; the proper sort of physician tries to overcome this difficulty by encouragement, and by presenting the bright side of the results of therapy; he should use all those means which come under the head of suggestion, which indeed cannot be reduced to a method, but with which, as physicians, we should be thoroughly familiar. With the skeptics in therapy these methods are paramount, with the blind believers they are used unconsciously. It is necessary that the patient should become acquainted with his true condition sooner or later, for upon this depends his good will in carrying out instructions. How and when this is done can be answered only by taking into consideration everything that is connected with the individual case, and then we are apt to make mistakes. But under all circumstances the psychic element must receive full consideration, and this with the physical and financial condition determines the nature of the treatment to be advised. All instructions to phthisical patients must be given in the clearest and most concise manner; in accordance with the intellectual development of the patient they should be accompanied with explanation as to the reason for giving them and the results that have been obtained by care in carrying them out. The physician

should be not only the adviser, but also the educator, of these patients in teaching them how to take care of themselves. As a teacher the physician not only does good to the individual patient, but also helps to disseminate knowledge about tuberculosis, the patient becoming a disciple. The great amount of good that can be accomplished by the spread of knowledge among the laity has already been referred to. We can point with pride to the improved results obtained by our present methods of treatment, imperfect as they are. In order to achieve these we rely upon general treatment intended to increase the individual resistance, upon symptomatic measures, and upon local treatment for certain localizations of the process.

As pulmonary tuberculosis is by far the most common form, we now pass to the special consideration of this subject. That the results of the treatment may be thoroughly watched, the chest should be examined thoroughly at least once in two weeks; the expectoration should be examined; the temperature should be taken twice or three times daily—when there is doubt, every three hours—and the patient weighed once a week; in this way we get an approximately correct idea of both the local and general condition. While increase in weight alone does not of necessity mean local improvement, stationary weight in thin, or diminishing weight in other, tuberculous patients must always be looked upon with suspicion, for as a rule the toxines of tuberculosis produce loss in weight. The methods by which improvement in all directions and final cure can be obtained are principally hygienic and dietetic.

Diet.—The phthisical patient must be properly fed, both as to quantity and quality. The quantity should be excessive for the patient's weight, at least 45 calories for a kilogramme of weight should be striven for; the quality should be especially adapted to the disease, carbohydrates and fats should form an important factor in the dietary list. Alcohol may be given in small quantities, not to exceed 45 gm. (℥jss.) a day; not only on account of its being a food, but because, as Maragliano and his school have shown, alcohol in these doses increases the resistance to tuberculosis; in special forms of the disease it acts against certain symptoms, and finally it is a stimulant, necessary especially in patients with weak hearts. As a matter of fact, Brehmer, who is the father of our modern method, and Dettweiler, his distinguished assistant, both recommend alcohol in the routine treatment of active pulmonary tuberculosis. The diet, outside of the general indications mentioned, should be adapted to the individual case; meats of all sorts may be given; the taking of fats should be encouraged—fat meats, oil, butter, cream; carbohydrates in the form of cereals should be given in large quantities, when possible, with some form of sugar. Milk and eggs are invaluable adjuncts (v. Appendix for food tables). In some cases, as will be seen, the diet must be made up exclusively of alcohol, milk, and eggs. Meals should be given frequently—five to six daily—and when possible the patient should rest for a half hour after his meals. As the appetite of phthisical patients is more or less impaired, special care must be taken in the preparation of food; frequently food must be given in the form of medicine. The list of articles used for this purpose is very long, and includes the hemoglobin preparations, beef juice; the substitutes for milk—kumyss, kéfir, matzoon; buttermilk, bonnyclabber, and the artificial milk foods; the predigested albumens, peptones, somatose, tropon, etc.; cod-liver oil, olive oil in the form of lipanin, sesame oil; the cocoa preparations, and, in the class of

carbohydrates, the malt preparations, the great number of cereals and foods made from them; honey and the grape cures. All these can be given in combination or singly, with or without the addition of alcohol.

Fresh Air.—The effect of fresh air upon phthisis pulmonalis has been long recognized. The best of our methods includes the fresh-air treatment, which means that the patient shall live in the fresh air day and night, at all seasons of the year and irrespective of the weather. By fresh air is meant air free from dust or smoke, and comparatively sterile. It has been shown by direct observation that the higher the altitude the freer the air from bacteria. City air contains more smoke, dust, and bacteria than country air. The most favorable results are obtained in places where the patient can be altogether out of doors—i. e., outside of the house—for the greater number of hours in the twenty-four. Climate then is a most important factor, but it must not be forgotten that the fresh-air method originally was carried out in Silesia; that most excellent results have been obtained in England and New England, where the climate is everything but equable; and that, when imperative, good results can be obtained in cities. But in order to get the best results, this part of the treatment must be reduced to a method, and is most advantageously employed in sanatoria; while these are not absolutely necessary to success, the individual patient should always be under the observation and direction of a competent physician. The simplest way to carry out the method is to have the patient live in a tent; this can also be done in cities. The tent should rest upon a platform, and the sides should be so arranged as to provide for free ingress of air; chilling should be avoided, but patients can sleep in tents, even in the depth of winter, with advantage. If in the individual case it should become necessary for the patient to sleep in a house, or if he have to remain in a house, the room in which he sleeps should be most freely ventilated, the breathing in of fresh air should be attended to by the patient's sitting by open windows or upon porches or galleries; he may be protected from the wind by portable screens, and in this way his fear of "catching cold" is controlled. In the use of the fresh-air treatment it has been especially shown that actual "catching cold" is of very rare occurrence. Care, however, must be taken to prevent actual chilling of the body; for this purpose the clothing should be proper (v. Prophylaxis), and when the patient is at rest, sufficient covering should be used.

Rest and Exercise.—Some authors assert that patients should rest all the time, others that they should exercise as much as possible. While there are some patients who must rest all the time, experience has shown us that under certain conditions all patients must rest. Patients should rest by lying down, in the open air, always after a meal, and when the body temperature goes to 100° F., for by rest we increase the digestive functions, and in the case of fever lessen tissue waste and prevent reduction of general resistance. For exercise the same is true. Normal exercise is followed by normal metabolism; normal exercise in faulty metabolism does harm in most infectious diseases. Walking is the exercise adapted to the greater number of phthisical patients; next comes driving in the open air. Robust patients and patients in the first stage of the disease may ride, shoot, or hunt, and play games out of doors; golf, croquet, or even cricket practice, as I have often seen at the establishment at Ventnor, may be indulged in. Special respiratory gymnastics can be

used in every case. They, as well as exercise of the mildest sort, are contraindicated when the patient has any fresh lesion or symptom, pleurisy or hemoptysis, when there is too much cough, or where there are very large cavities which may be affected by violence. These exercises consist essentially in having the patient increase the excursions of the thorax by prolonged inspiration and expiration, and should be done out of doors. The patient is told to breathe through the nose, to take a full breath, to hold it a little while, then to breathe out; this is done at first for a short time, repeating the procedure from three to ten times with intermissions for from one quarter of an hour to an hour or even longer. By changing the position of the arm, trunk, and head special exercises can be devised, so that the apex or lower segment of the thorax is expanded. In special cases passive movements of the thorax are of importance, combined with massage or electricity, in order to save the patient fatigue and to strengthen muscles.

Hydrotherapy.—This adjuvant is of importance by conducing to cleanliness, increasing resistance, and stimulating the respiratory function. Its general tonic effect upon the patient is of special importance. It can be applied as a routine method in the form of sponging, in bed when necessary, the usual daily cold sponge followed by rubbing and exercise afterwards; or by the cold douche, a measure to be used with care, but of great value to respiration. The latter method is contraindicated in older persons and by all those conditions that prevent the taking of exercise. All the hydropathic measures should be taken before breakfast, and after their completion, when necessary, a glass of milk may be drunk, to be followed by the exercise. Hydropathic measures are also used for inflammatory conditions of the larynx, the bronchi, and the pleura, in the form of cold compresses—the Priessnitz applications. Brehmer said that the recovery of a tuberculous patient depended upon the strength of his heart; the contraindications on the part of the heart will be found in the appropriate section.

Sanatoria.—As has been stated, the best results seem to be obtained by the sanatorium method. A sanatorium, in order to give the best results, must have a favorable location; it should be so conducted that the patient has all the external necessities and comforts commensurate with his means; it should be so arranged that the private life of the individual is not interfered with; its furnishings should be of the simplest nature, but should include everything for the amusement and diversion of the patients. As in all institutions, much depends upon the chief physician; Trudeaus and Dettweilers, with their combination of executive ability and scientific attainments, are not found every day. When all these factors are combined we have ideal conditions for the treatment of pulmonary tuberculosis, and they are found in many places, both in this country and abroad. This treatment need not be reserved for the wealthy; on the contrary, sanatoria exist in various parts of this country and elsewhere conducted at the public expense, and the cost of their maintenance has been fully met by lives saved and usefulness to the state restored. There is a limitation to this method of treatment on account of the great number of tuberculous patients, and there are other objections, it must be admitted, though of minor importance. The uncongeniality of surroundings, the reduction to the status of a hospital patient, the close supervision and limitation of personal liberty, all sometimes have bad effects, so that here,

as elsewhere, the physician must individualize. The presence under one roof of so many people ill, expectorating, measuring their temperature, and naturally always talking about themselves, does not make the environment cheerful. It is possible to limit the aggregation of patients by large grounds and proper buildings, but this measurably adds to the expense. Wherever necessary and possible, a phthisical patient should be sent to a sanatorium, whether he be poor or rich; the poor need it absolutely, and the rich are in a position to do away with those features that may be especially objectionable to them.

SYMPTOMATIC TREATMENT.—The use of the methods just described frequently makes all medication unnecessary, but manifestly the physician is not doing his whole duty if he tries to cure without giving relief while this cure is going on. But even beyond this there are certain symptoms which must be met because they retard the cure or endanger life.

Cough.—Careful examination of the nose, the pharynx, and the larynx will sometimes result in finding a contributory cause for the cough, and removal of this cause will diminish the number of attacks. In the great majority of cases of phthisis pulmonalis the cough is due to bronchitis, frequently to the emptying of cavities, or irritation of the pleura, for the treatment of which the reader is referred to the chapters dealing with these diseases. When profuse secretion exists, belladonna or atropine may be given to great advantage. The codeine preparations should be used when other measures fail; they are of advantage because a drug habit is rarely acquired from their use, the respiratory center is very little affected by them, and they impair general metabolism to only a limited extent. Constipation may follow their use, especially in those who have a tendency in this direction, but this is easily avoided by simple measures. Morphine or opium should never be given unless codeine fails signally; the "drug habit" is easily acquired by tuberculous patients, and the drug affects the respiratory center and the general condition of the patient in a markedly unfavorable manner. In incurable cases morphine is a necessity, but it is apt to make curable cases incurable when given indiscriminately. The synthetic substitutes for morphine—heroine and dionine—can be used with greater safety, their action being less intense; a drug habit, therefore, is not so easily established, although it does occur, and the general effects are not so bad. But preference should be given to codeine, which in phthisical patients should always be given a fair trial; when it becomes necessary to increase the dose too much, heroine should be administered, this in turn to be discontinued if the same reason recurs, when it will be found that codeine in smaller dose may again be given with advantage.

Hemoptysis.—Here the treatment consists in attempts to stop the hemorrhage and to counteract the bad effects produced by the loss of blood. It goes without saying that the first indication frequently cannot be carried out at all; when extensive ulceration into a large blood vessel takes place, the patient may die before anything can be done. A patient with hemoptysis should always be put to bed and kept absolutely quiet; he must make no effort of any sort, talk as little as possible, must lie in a horizontal position, and must be examined by the physician in the gentlest way, and it is better not to percuss at all. When the cough is annoying, a subcutaneous injection of morphine should be given; it also slows respiration, lowers the pulse, and

is of enormous value in acting favorably upon the psychical condition of the patient, which after even the smallest hemoptysis is disturbed. The patient's diet should be limited to cold liquid food, given in small quantities; small pieces of ice may be taken, but stimulants should not be used unless there is a special indication. An ice bag should be put upon the part affected. Because pulmonary hemorrhage in phthisis frequently stops without further medication, as the rupture of a blood vessel in and of itself brings into action all the natural antagonistic processes for stopping hemorrhage, it is exceedingly difficult to put a proper valuation upon the various remedies that have been recommended in hemoptysis.

Statistics are not available, and theoretic conceptions derived from experiments on healthy lower animals are fallacious. We can therefore be guided only by the teachings of experience. The use of ergot in hemoptysis has been quite commonly accepted by physicians in this country, and I have seen good results follow its use; on the other hand, we find so excellent a therapeutist as H. A. Hare stating that ergot should never be used, mainly because the pulmonary blood vessels have no vasomotor nerves. That it may do harm if it raises the general blood pressure is incontestable, that it does so to a marked degree in therapeutic doses is disputed; that, on the other hand, it acts directly on the muscular coat of blood vessels is accepted; if this is the case, the absence of vasomotor nerves, a point as yet not verified, may be looked upon as of secondary importance. Ergot should especially be used in continued, smaller hemorrhages; it may be given by the mouth, or, when quick effects are desired, hypodermically. The preparations that can be used are a trustworthy fluid extract which, when used subcutaneously, may produce abscess unless great care is taken, the dose by the mouth being 2–4 gm. (ʒss.–ʒj); hypodermically, one half of this. For subcutaneous use other preparations are better because more concentrated. Ergotin is unreliable, often being only an extract more or less imperfect; the Injectio ergotini hypodermica of the British Pharmacopœia is an excellent form for its use—ergotin, one part; camphor water, two fluid parts—of which from three to ten minims are given subcutaneously, representing 0.065 to 0.2 gm. (gr. j to iijss. of ergotin). The best permanent preparation for subcutaneous use is ergotol.

The administration of a tablespoonful of salt with very little water is also sanctioned by experience in acute cases; it may act by reducing blood pressure, by increasing the coagulability of the blood, or by establishing by a hypertonic solution in the gastrointestinal tract concentration of the blood. Anyhow, a combination of two or more effects may explain the result; sufficient to say that, especially in large hemorrhages, sodium chloride, when administered in this way, does good. Iron preparations and the astringents are no longer much used; according to Nothnagel, they do good only by direct application to the bleeding surface, and in hemoptysis this cannot be accomplished in sufficient quantity by internal medication; the case is otherwise in organs in which the circulation goes on under different conditions. Digitalis should never be used for hemoptysis *per se*; it may be required for a heart complication. Adrenalin is successfully used, and in my opinion it is the most valuable of all the remedies recommended. It may have to be injected more than once, as its effects are very transitory. The injection of gelatine has unfortunately so frequently been followed by the production of tetanus that

unless all satisfactory measures can be taken to render this impossible it should never be used.

In addition to this, when the hemorrhage is great, we must see to it that coagula are removed; this is best accomplished by postural treatment by elevating the foot of the bed, a measure invaluable also for the prevention of cerebral anæmia. Large coagula in the mouth should be removed. Much good can also be done by applying ligatures to the lower extremities, the pressure being gradually applied, best by means of the Esmarch bandage, and in this way the general blood pressure can be diminished. When the bandages are taken off, the pressure must also be reduced gradually or the opposite result, a renewal of the hemorrhage, may ensue. When there is danger of collapse, stimulants must be used—e. g., alcohol, camphor, ether; the physician is here called upon to decide which of the two conditions, the hemorrhage or the collapse, is the more important *quoad vitam*.

The means to be applied to keep the patient alive until plugging up of the blood vessels may take place are the same as those recommended for internal hemorrhage in typhoid fever (q. v.). Care must be taken to use only so much fluid as is necessary to keep up sufficient blood pressure; too much is inadvisable.

Night Sweats.—As night sweats are a natural consequence of the toxic condition and help to eliminate the toxine, it is a question to what extent they should be interfered with; this question is happily answered by our therapeutic limitations. That attempts at interference should be made is reasonable in those cases in which this symptom does harm. The best treatment consists in the open-air method. External applications can be made when the patient has gone to bed for the night—sponging, alcohol and water, vinegar; the addition of formalin has been recommended on account of its good effects in hyperhidrosis generally; powders are applied; salicylic acid (one per cent with wheat starch), tannoform in compound stearate of zinc, or the astringents, alum in talcum, bismuth subgallate. Internally atropine (0.0005 gm.—gr. $\frac{1}{130}$) is most beneficial, although not infrequently it fails altogether, when given in this way, to produce mild physiological effects.

Agaricin, 0.01 gm. (gr. $\frac{1}{6}$), hydrastis canadensis, hyoscine, camphoric acid, picrotoxine, and many other remedies have been recommended, and used with more or less beneficial results.

Fever.—The best treatment for the fever is rest and open air. When it is due to pus producers the cause must be removed if possible. Where this is impossible, I have seen, in a number of cases, decided improvement follow the daily use of unguentum Credé; the results, however, were not permanent, for the fever returned when the medication was stopped. In one case the patient used the ointment for six months without harm, and finally was cured of her phthisis with the use of the routine method. The ætiology of fever in pulmonary tuberculosis is a complex one, so that purely symptomatic treatment must frequently be adopted. Winternitz recommends the moist pack, followed by friction with a sheet that has been wrung out of water at about 70° F. External use of guaiacol, judiciously employed, is of great service. Quinine may be useful in doses of 0.3 to 0.5 gm. (gr. v to vijss.), given in one dose so that its maximum effect comes at the time of the highest temperature; it has at least the advantage of not being depress-

ing. The coal-tar products should be used with great care, and only in small doses.

Gastrointestinal Symptoms.—These are best met by diet. The medicinal treatment is that recommended in diseases of the gastrointestinal tract (q. v.). Constipation is easily relieved, and diarrhea should be avoided.

Special Remedies.—From time immemorial specific medication has been sought after and apparently found, but experience has shown that all the remedies, when they do act, act only by giving relief for one or more symptoms. For this reason we find that a great many of them are valuable, for symptomatic therapy is of great importance in pulmonary tuberculosis and should not be neglected. The creosote preparations are very serviceable; they improve the appetite, the digestion, reduce expectoration, diminish the number of bacilli, act beneficially upon the lymph nodes. How they act is not decided, possibly from a combination of their local action with an effect upon the toxine. They are given in the form either of pure "white" creosote from beechwood (Sommerbrod), or of its derivatives. Creosote is best given as pure creosote in the majority of cases, and must be administered in such form as to fulfill all the local indications. Germain Sée uses it by inhalation, Revillot by rectal injections; it has also been given subcutaneously by French authors. The method of giving creosote should be adapted to the individual case; if decided gastrointestinal symptoms are present it should always be given by the mouth. Creosote is given in fluid form with milk, wine, some bitter tonic, or oil; in capsules, those of Sommerbrod, each containing 0.05 gm. (℥j), with oil, or in the form of intestinal pills (v. Chronic Intestinal Autointoxication). The derivatives of creosote are many, and all bear more or less fantastic names, such as eosol (valerianate of creosote), creosotal (the carbonate), sulfosote (creosote sulphate of potassium); they may be used as substitutes for creosote, on account of absence of odor and because they set up less local irritation, but their action is not the same in all particulars as that of creosote itself.

Guaiacol, one of the constituents of creosote, is frequently used as a substitute, but its action *a priori* is that of a part and not of the whole. With this substance as a basis, the inventive faculty of synthetic chemists has evolved a great number of compounds, some of them especially valuable in their local action. As with all products that are pushed by commercialism, extravagant hopes have been raised as to their value, the latest always being the best, and the wealthier the manufacturer the better the results. The number of products is constantly increasing and the end is not yet. We have the carbonate (duotal), the benzoate (benzosol), the camphorate (guaiacamphol), the valerianic ester (geosote), thiocoll, and many more. Whichever of the creosote preparations is given the dose must be small at first, to test the action of the drug in the individual patient, and it should be gradually increased. The statement made by Sommerbrod, that the greater the dose in pulmonary tuberculosis the more positive the cure, has not been verified by experience. Moderately large doses—0.3–0.6 gm. (℥v–x), given three times daily for a long time—are better than the maximum doses which have to be withdrawn from time to time. The objections to the use of creosote are that it cannot be taken at all by some individuals, and that at times it does harm. The former objection can usually be overcome by administering a form of the drug

that is odorless, is not decomposed in the stomach, and therefore produces no local irritation. The latter objection is valid; not only do the odor and the local symptoms do harm, but the drug itself does harm in individual cases in a way entirely inexplicable, from individual predisposition, so-called idiosyncrasy. In a certain number of cases it entirely fails to do good. Thus for all these reasons the use of creosote in pulmonary tuberculosis cannot be carried out.

A number of remedies has been recommended to influence the local condition in the lungs, increasing cicatricial reaction, local hyperemia. Liebreich has recommended the subcutaneous use of potassium cantharidate; Landerer, of sodium cinnamate (hetol), by intravenous injection. Alexander and Robert have recommended subcutaneous injections of camphor, which stimulate both the lung and heart. Of all these methods, it may be said that they have not succeeded in establishing themselves as permanently accepted procedures.

Inhalations of various sorts and kinds have been used (v. Bronchitis). Permanent apparatus has been invented; the pneumatic cabinet, in which the patient was locked up, breathing medicated, moist, compressed or attenuated air. There is no doubt that at times good is done; but the apparatus is expensive, and it takes up much time, so that the patient who can indulge himself in its use can do better by resorting to other means. At present the pneumatic cabinet is a piece of office furniture which acts by indirect moral effect upon the patient.

In the future good results may be attained by the use of the Röntgen rays, d'Arsonval's current, or by radium; it is too early to judge of their value in this disease.

Zomotherapy.—This depends for its supposed value, according to Héricourt and Richet, upon the fact that the administration of large quantities of meat in dogs produces and increases the antitoxines in the blood. The giving of meat and beef juice in large quantities is of value in some tuberculous cases; it may even increase the antitoxic factor in the blood, just as small quantities of alcohol do, but *a priori* the general use of zomotherapy has been disappointing. Experience has established this conclusion.

The treatment of the various complications of tuberculosis, as far as they are within the limits of this work, will be found in their respective chapters.

General Scheme of Treatment.—Whenever it is possible, a patient with active tuberculosis should be sent to a proper climate. No patient should be sent away from home in whom the immediate prognosis is bad or who has no reasonable chance of recovery. This is a very difficult problem and depends for its solution somewhat upon the temperament of the physician. It is not going too far to say that the utmost objectivity of reasoning is required, but the patient is to be given the benefit of the doubt. We are only exceptionally in a position to say that a given patient cannot recover, as is proved by common experience, even by physicians who have made tuberculosis their lifelong study. No patient should be sent away from home who cannot give up sufficient time to obtain results. The climatic treatment of tuberculosis takes a long time, and the physician must make it clear that the patient is not going away as if he were going to the baths for "liver trouble," rheumatism, or what not. It is said that the chances of recovery

are in direct ratio to the size of the purse; this is true to a limited extent, notably so in advanced cases, but many without a long purse have been cured by climate, having found occupation and become permanent inhabitants of their new abode. Unless the patient can be sent to an institution, it is absolutely wrong to send away from home those that are entirely unprovided for. The social aspect of this question is, however, gradually being solved, and if we continue as we have begun the future will see adequate arrangements for the treatment of the indigent tuberculous.

The choice of the proper climate for treatment of patients is a very difficult matter, and only the most general rules can be given, for we frequently see that bad results ensue even in following these. The only way to determine the possibility of the beneficial action of a given climate is by giving it a trial. It is imperative that in the place to which a patient is sent he shall obtain all the creature comforts that are necessary to his well-being, and these vary much with the individual, many being satisfied with very little. Everything should be favorable to the leading of an out-of-door life—the temperature, the amount of sunshine, and the amount of rain. In many places suitable as to climate, there exists an utter disregard of sanitation, so that the native inhabitants become infected and the patients reinfected, or acquire other diseases. It is necessary for the patient to have occupation, both physical and mental, when he is well enough. It is always best to select a place in which the patient can give himself up entirely to treatment, not being tied down by social conventionalities, least of all by those of club life, which are not unfrequently accompanied by the excessive use of alcohol. The patient should be within reach of a competent physician, for his physical and psychical treatment. The classification of climates is naturally an imperfect one, but for our purpose climates may be divided into those of great, medium, or low altitude, moist and dry, hot and cold. Some patients bear cold much better than heat, and so far as this characteristic of climate is concerned individual preference must as a rule be decisive. Older people, however, bear heat better than cold. We consider anything above 5,000 feet a great altitude; the contraindications are here to be found in people over fifty years of age, in all patients with marked evidences of arteriosclerosis or with kidney trouble; well compensated heart lesions form no contraindication unless the cause of the trouble is of a degenerative nature. It has been satisfactorily shown that hemoptysis does not occur more frequently at great than at low altitudes. Patients do best there in the first stages of phthisis, but those with large cavities should not be sent to these places. In Europe, the Alps, Davos, and St. Moritz; in this country, the Rocky Mountains, Denver, Colorado Springs, Montana, and New Mexico; and in South America, the Andes, Quito, Santa Fé de Bogotà, belong to this class. Places of medium altitude are most frequently indicated; any patient who can be sent away from home at all can be tentatively sent to one of these places; this is shown by the fact that the great majority of resorts for phthisical patients are located in this way, both abroad and in this country. The list is too long to be given here, and the reader must consult the special works on this subject. In Europe these resorts are found in the lower hills of the Alps, the Tyrol, both on the Italian and the Austrian side; in the Black Forest and the eastern mountain ranges of Germany, Göbersdorf and Falkenstein being especially notable because of

their sanatoria; and also in the Pyrenees. In this country, the Adirondacks, especially Trudeau's sanatorium at Saranac, a model institution; in the Catskills, in North Carolina (Asheville), in Texas, and in New Mexico. A low altitude, below 1,500 feet, is found in Egypt, at Cairo, in the southwestern part of France, in Italy, the Riviera, and the Italian lakes. In this country, at Aiken, Thomasville, and in southern California; in the Northwest, in Minnesota, Nebraska, and Dakota. Moisture and dryness find their indications in the amount of secretion that exists; when it is excessive, a dry climate should be preferred; a moderately moist climate is of great service in laryngeal phthisis; a dry one in profuse bronchial secretion, bronchiectasis, or cavities. Evans arranges climates in this country, as to moisture, in the following order: Moderately moist, the Adirondacks, Catskills, Asheville, Aiken, and Thomasville; moist, Florida, southern California on the seacoast; moderately dry, Texas, southern California inland, Dakota, Nebraska, Minnesota; dry, Montana, Wyoming, Colorado, northern New Mexico, western Kansas, southern New Mexico, and southern Arizona. Long sea voyages may be recommended, being especially valuable where the tuberculosis has become active owing to overwork or influenza; the general strength of the patient must be sufficient to warrant the trial of this method, and all grave complications—laryngeal, intestinal, or rapid breaking down of lung tissue—form contraindications.

Attempts have been made to stimulate phosphorus-containing tissues and to increase calcification by the internal administration of salts containing phosphorus. Among these the hypophosphites are especially popular. I have never been able to satisfy myself that they produce much effect of any kind, least of all a specific effect. Combined as they are in the various compound syrups with iron, manganese, and strychnine, the effect seems ascribable to the remedies added. These compound syrups possess the advantage of being palatable, and on account of there being public exploiting they have suggestive possibilities; but in phthisis they should be given cautiously, for they disarrange the stomach and then do positive harm.

The time required to cure tuberculosis may vary from months to years, depending upon the various forms, the condition of the patient, and the method of treatment. Relapses are common, so that the question has been raised for how long a time the patient must remain away from home—i. e., in the climate best suited to him—until he can consider himself safe in returning home. It has been variously answered, "as soon as he is perfectly well"; "for from two to eight years after he is well"; "never." In order to achieve perfect results, the last answer is the correct one, but two years are usually sufficient to warrant the attempt to return home during a favorable season of the year. Immediate return after complete subsidence of all manifestations and the regaining of normal weight and blood composition is most frequently followed by relapse. Relapses are least likely to occur in mild forms and in those in which the original predisposing cause can be avoided. In all cases a stay at home will decide the question, and all permanent plans for the future must be so laid that the patient may again return to the climate which is most suitable.

In the stage of consolidation, the routine treatment should be as follows: the removal to a proper climate, carrying out the open-air treatment. In the

stage of breaking down, the same, but greater care should be taken as to diet. When the appetite is gone, the patient may live on milk and eggs, and as many as a dozen or more eggs may be taken in the course of the day, either raw or cooked. All phthisical patients may take small quantities of alcohol; unless there is danger of establishing alcoholism, all patients should take it. When there is fever, superalimentation and alcohol are invaluable. Laryngeal tuberculosis, when advanced, makes feeding difficult; some patients may be fed with the stomach tube; in others local anæsthesia of the larynx may be produced by cocaine, to a less extent by inhalation of bromides; rectal feeding is to be looked upon simply as an adjuvant.

It is not uncommon to find it necessary to select two different places for one individual as to the indications—one for summer, the other for winter—in order to provide more variety in surroundings and diversion. The presence of dust in summer may make it impossible for the patient to remain in the place first chosen; tropical rains may keep the patient indoors, so that changes are required. Special indications naturally will be followed by change. But climate must not be considered as the only effective means of treatment; much harm has been done by excessive laudation of climatic effects in certain quarters.

Tuberculosis of the Lymph Glands (Scrofula).—Tuberculosis of lymph glands is always produced by the tubercle bacillus; that this is always the case in scrofula has not been proved; furthermore, that scrofula is due to a diminution in virulence (Arloing, Lingard) or in quantity of bacilli (Nocard), or that in this state vaccination with tubercle (Marfan) takes place has also not been shown for every case. Yet scrofula is only a clinical entity, with a good prognosis in the vast majority of cases, but always forming a predisposition to tuberculosis. Unfortunately the clinical marks of scrofula cannot be described with precision, so that it would be well to discontinue the use of the term, or because of the frequent presence of the tubercle bacillus and the constant predisposition to tuberculosis, to accept the designation that heads this section. Under all circumstances the term should be restricted, as it forms a cloaca into which bad diagnoses are thrown. I am in the habit of demonstrating this by showing to my clinical classes cases of enlarged posterior cervical glands due to pediculosis capitis, which are always diagnosticated by them as scrofula.

In all those cases in which enlarged glands are found special care must be taken in the prophylaxis. All such local conditions as are followed by enlarged glands should be carefully treated. We find, notably in children, various forms of skin trouble, especially eczema and other forms of dermatitis; diseases of the nose—catarrh, ozæna; the various forms of stomatitis—carious teeth and diseases of the ear; hyperplastic tonsils, but especially adenoid vegetations in the vault of the pharynx. In some of the acute infectious diseases, such as diphtheria and scarlatina, the lymph nodes in the neck must be carefully considered as to treatment. Bronchitis may lead to enlargement of the bronchial glands, *per se* a tuberculous condition, or this may follow measles or whooping cough. The mesenteric glands require special attention because they are commonly enlarged after intestinal infections or other diseases leading to organic changes in the intestinal wall. For general treatment we have creosote, iodine, cod-liver oil. Creosote is applicable to all forms, and

it is immaterial whether the child be fat or lean; here benzosol (0.15–0.3 gm. —gr. iij–v) is a very valuable remedy, especially when intestinal symptoms are present. Iodine should be used, especially in those cases in which the nutrition is fairly good and a rapid result is required—i. e., in enlarged bronchial glands; it may be given in the form of the iodides or iodipin or, because of the common combination of anæmia, as the syrup of iodide of iron. The latter should be given in full dose according to the age of the patient, and when it acts it does so in three or four days, as is shown by increasing appetite, diminishing glands, and gain in weight. Cod-liver oil is very valuable, but need not be given to fat subjects; as a rule it is well borne by children, and can be given in large doses; its administration should be begun with small doses, to be increased up to one or more tablespoonfuls three times daily. It is best given as pure, light-yellow cod-liver oil; if it cannot be taken in this form it should be given in emulsion. These emulsions must be prepared extemporaneously in the household with the yolk of egg or in the pharmacy according to the ordinary rules for emulsions; ready-made preparations should be used only when their manufacturers are known to be trustworthy. As a rule they are not necessary in children, and frequently in adults the various flavoring matters are more objectionable than the taste of the oil itself; besides, the bulk is very much increased by the quantity of excipient required to make an emulsion of the less *objectionable*, but also less digestible, oils; lipanin, olive oil, cocoa, or any other fatty substance may be used as substitutes. For the local treatment of enlarged glands hydrotherapy is valuable, by Priessnitz applications. Iodine applied externally, especially in the form of iodovasogen, frequently does much good. When there is a tendency to suppuration the gland should be opened as soon as possible (v. Scarlatina) to prevent the formation of the horribly deforming cicatrices. If suppuration continues, the gland should be curetted. When a large number of glands remain enlarged, or the glands increase in size, or even when one gland continues to grow, or by its size promises to do harm, excision should be practiced.

XXXV. LEPROSY

PROPHYLAXIS

Given a specific cause, the *Bacillus leprœ* of Hansen, and the fact that the disease is confined to human beings, it would seem very simple to carry out prophylaxis. But on the one hand not all the properties of the bacillus are known, and on the other the predisposing qualities of human beings are not understood. This accounts for the difference of opinion as to the amount of contagiousness that exists in leprosy and the methods of preventing its spread. That segregation of patients is necessary cannot be denied by anyone who has studied infections, but the extent to which this is to be carried out must depend largely upon external conditions. Where leprosy is endemic segregation must be carried out with greater rigor than where it is sporadic. Leprosy is by no means so infectious as tuberculosis, yet leprosy, probably on account of biblical views, is feared more than any other disease. Absolute isolation is practiced in leprosies, but especially at Molokai, in the Hawaiian

Islands; limited isolation in Norway. In both places the results seem satisfactory as to the limitation of the disease, but in neither place has the disease been stamped out. For those lepers who cannot carry out preventive measures strict isolation should be recommended; on the other hand, those who are able and willing to carry these out at home should not be disturbed. In countries where leprosy is not endemic very little attention need be given to isolation; prophylaxis here can be carried out by proper instructions to the patient. Hebra, who had carefully studied leprosy in Norway, for many years kept two lepers in his wards in the General Hospital in Vienna, and according to this great observer no infection ever took place. Infection of physicians, sisters of charity, and attendants of institutions where the disease is endemic rarely takes place; Father Damien, at Molokai, and Father Baglioli, at New Orleans, are notable exceptions to this rule. Certainly the number of medical and other attendants infected by leprosy does not compare with that in scarlatina, diphtheria, septicæmia, and many other diseases. Unfortunately statistics are more than usually untrustworthy in this disease, on account of the long period of incubation, because mild cases are not easily recognized, and because, especially in endemic leprosy where isolation is carried out, lepers frequently withdraw themselves from observation, and are aided therein by their families. Care must be taken under all circumstances that close contact with the patient for any length of time should not take place, and this can be done, as in Norway, by having a special room, or at least a special bed, special toilet necessities and articles, and special eating utensils for the patient. All persons coming into direct contact with a leprous patient, especially physicians in performing operations upon them, should be sure that they are themselves free from open wounds. Wounds acquired during the operations should be carefully cauterized. In order to overcome predisposition, bad hygienic conditions should be corrected. Hutchinson ascribes specificity to the eating of fish—"no fish, no leprosy," according to this observer. As leprosy is found among people who have never seen fish, and as the bacillus has never been found in fish, indeed in no other lower animal, this article of food can be looked upon only as a predisposing factor. Overcrowding should be prevented, cleanliness of body should be insisted on. The fact must not be lost sight of that the leprosy bacillus possesses a low degree of virulence, although it may be present in large quantities in the body. The tubercular form is contagious to a much greater extent than the neural, the latter as a rule becoming so only when it is a mixed form. Sticker has pointed out that secretions from the nose especially contain large quantities of the bacilli, but that this obtains for all cases has not been proved.

TREATMENT

Although in a number of cases a cure has apparently been effected, leprosy should be looked upon as an incurable affection. This does not mean, however, that nothing can be done by treatment; much relief can be given and life prolonged.

Specific Medication.—A serum has been introduced by Carrasquilla, the serum of horses into which blood from leprous patients has been injected; unfavorable theoretical considerations as to its use seem to be verified by practical application.

Medicinal Treatment.—Certain vegetable oils have received favorable attention, chaulmoogra oil especially. This oil is made from the seeds of the *Gynocardia odorata*; is used in any form of leprosy, and is given internally in doses of from five to eight drops three times daily; it is also used externally as oil or in the form of an ointment. The best results are obtained when given for a long time in large doses, as much as 20 gm. (ℳ ccc) a day. The oil is very irritating to the stomach. It may be given in capsules or in the form of salts; gynocardates, of sodium, magnesium, or potassium. On account of its beneficial effects upon local and general conditions this drug is highly recommended by Page, of Calcutta, who introduced the remedy; by Beaver-Rake, Carter, and Abraham. Gurjun oil, made from dipterocarpus of several varieties, seems to be next in popular estimation. It was first recommended by Dougall in the Andaman Islands. It should be used like chaulmoogra oil; good results have been obtained by v. Bergmann, Roux, Ribb, and many others; Phillips treated one case for seven years, during which time, as Abrahams says, the man "practically lived in grease," with the result that the patient was cured.

Hoàngnàn is a powder made from the bark of *Strychnos gaultheriana*; it is especially used in China. Morrow speaks highly of it in connection with cases of nerve leprosy, as well as of the use of strychnine in anæsthetic leprosy in this country. Hoàngnàn should be given in pill form; no alcohol, and a simple diet, principally milk, is recommended while it is being taken. It may, like all preparations of its class, produce strychnine intoxication.

Because lepers have sometimes been cured by the bite of venomous snakes, the antivenene of Calmette has been used in this disease. Excellent results have been obtained by its use by Isadore Dyer.

Besides these remedies, a great number of others have been used—salicylic acid compounds, carbolic acid and creosote, ichthyol, mercury, potassium chlorate, organotherapy, tuberculin, and many others. Röntgen-ray therapy is on trial.

Whatever else is done, hygienic treatment is of great value: simple, nutritious food, milk in large quantities—some assert that fish irritates the cutaneous manifestations; frequent baths—in China they give three hot baths daily, which seems excessive; but always great cleanliness of the surface of the body should be looked after. Alcohol should be avoided, and also excess in everything. Plenty of fresh air and removal to a salubrious climate are recommended.

Local Therapy.—In the anæsthetic form, nerve stretching and splitting or excision of nerves have been followed by good results as to pain. The nodules may be excised when necessary, when interfering with some normal function, or incised when they cause suffering by tension. Amputation frequently becomes necessary. Intubation or tracheotomy may become necessary when the disease invades the larynx. For local application to the skin, Unna has especially recommended the "reducing agents" ichthyol, resorcin, chrysarobin; the iodides of phenol, especially europhen, have found favor. The treatment of the cutaneous lesions is best carried out by cleanliness and dressings containing some remedy that acts antiseptically. Electricity may be of service in the nervous form (v. Diseases of the Nervous System).

XXXVI. INFECTIOUS DISEASES OF DOUBTFUL NATURE

WEIL'S DISEASE

In the majority of cases the symptoms are those of jaundice combined with those of septicopyæmia, and unless some other cause can be found (santonin, Cramer ?) they should be treated as such. As we are dealing with a morbid entity due to different causes, we are often reduced to purely symptomatic treatment. This includes that of fever, headache, the jaundice, sometimes uræmia (q. v.).

GLANDULAR FEVER

An infectious disease, the cause of which is unknown, but the mode of infection is by the throat or the gastrointestinal tract, possibly by inhalation. Whatever the cause may be, and there are probably several causes, prophylaxis can be carried out only in the directions that have been recommended in those diseases in which infection takes place in the above modes. In an epidemic connected with influenza, I was able to shorten the disease by the use of quinine. When there are gastrointestinal symptoms small doses of calomel (J. Park West) are valuable; its routine use can do no harm, and good may come in diminishing the infecting cause if it exists in the intestine. Otherwise the treatment should be purely symptomatic; for the local swellings of the glands the remedies already recommended (v. Scarlatina, Tuberculosis of Lymph Glands); the usual methods of treatment for fever, including its diet, should be recommended. Local treatment of the throat is very necessary. In some instances the glands remain enlarged for some time; they should then be treated as recommended under the heading of Scrofula. During convalescence it sometimes becomes necessary to recommend change of climate.

MILIARY FEVER

This disease has never been observed in this country; in modern times epidemics have occurred in France, Italy, Germany, and Austria. To Brouardel, who described the epidemic at Poitou, we owe our knowledge of prophylaxis. The disease is contagious and infectious, and has a very short period of incubation—from a very few hours to twenty-four. All such prophylactic measures as have been recommended in this combination should be carried out. We have no specific, and the cause of the disease is not known. Our treatment, therefore, must be purely symptomatic, directed toward the sweats, the fever, the nervous symptoms, and the symptoms on the part of the circulatory and respiratory organs, as in all infectious diseases. Opium or morphine may be used with impunity in this disease. The feeding should be the same as in all fevers, and also the treatment of the convalescence.

FOOT-AND-MOUTH DISEASE (Stomatitis Aphthosa Epidemica)

PROPHYLAXIS.—This disease originates in cattle, is transmitted to man by means of their secretions and the food products derived from them, and is therefore both directly and indirectly contagious. The virus, probably a lower form of life which as yet has not been isolated, is very resistant and viable for a long time, so that the radius of contagion may be very great. For cattle, prophylaxis consists in isolation, and frequently in their slaughter, in order to prevent the spread of the disease. Strict quarantine against places in which the disease exists is carried out by all civilized countries. Ebstein's assumption that all cases of stomatitis aphthosa can be looked upon as due to foot-and-mouth disease can be rejected, at least for this country, where foot-and-mouth disease is very rare and stomatitis aphthosa very common. In man, prophylaxis must be directed against direct and indirect contact with diseased cattle and the food derived from them. All necessary precautions, as already described in connection with glanders and anthrax (q. v.), must be taken by those coming in direct contact with cattle; the same can be said for indirect contact. Milk from infected cattle, which on account of its altered properties is usually unfit for food, must always be thoroughly boiled or sterilized before it is taken; cream and butter should not be taken at all, the flesh should be consumed only after boiling. Infection of the human being has been produced by the ingestion of all these articles. Isolation of the patient, as a rule not feasible, should be practiced if possible, and all precautions should be taken as to direct and indirect contact with him.

TREATMENT.—Löffler and Frosch have produced a serum for prophylactic purposes which, however, has not been successful.

For the treatment of this disease the reader is referred to the chapter on the Diseases of the Mouth (Stomatitis Aphthosa Herpetica).

SECTION II

DISEASES PRODUCED BY ANIMAL PARASITES

I. PSOROSPERMIASIS

Internal Psorospermiasis.—The reader is referred to the sections on Diseases of the Liver and Kidneys.

External Psorospermiasis.—Darier's disease, Paget's eczema of the nipples, White's folliculitis belong to the skin diseases.

II. PARASITIC INFUSORIA

So much doubt has been expressed concerning the pathogenic nature of the organisms belonging to this group that at best we can take into consideration here only those methods that destroy them. For amœbic dysentery the reader is referred to the chapter upon this subject. The infusoria that are found in the gastrointestinal tract, outside of the amœbas that are found in dysentery, belong principally to two groups—the flagellata and the ciliata. Of the first group we find especially *Trichomonas*, *Megastoma entericum*, and *Plagiomonas hominum*; all these are characterized by the common property of living upon the surface of the mucous membrane. In order to remove them the best method is to give the patient calomel, beginning with small doses—0.05 gm. (gr. $\frac{3}{4}$) twice or three times daily—increasing the dose to 0.2 gm. (gr. iij) given for five days. P. Cohnheim especially warns against the futility of treating these cases, and has reported a number of cases of flagellate diarrheas in which the flagellates disappeared when the cause was removed (*the latter supposed to be atrophic gastritis*).

The majority of observers incline to the opinion that the *Balantidium coli* produces colitis; this is notably the case with those who have seen the greatest number of cases. As to the method of propagation, it seems settled that the organism normally lives in the intestine of swine, and but few exceptions have been found to the rule that patients with balantidium colitis have handled pig's intestines. The treatment of this form of disease does not seem to be very successful, for the mortality is very great (about twenty per cent). Many things have been recommended: the calomel cure just mentioned; local application, by means of the rectal tube, of quinine (1:1,000), of boric acid, of tannic and acetic acids combined (Henschen); the internal administration

of santonin, filix mas (Dehio), and of santonica. Cases are reported in which one or other of the remedies has proved successful; failures have occurred with all.

III. DISTOMIASIS

FORMS OF DISTOMIASIS

Distoma Hepaticum (Liver Flukes).—Under this general heading a number of kinds of distomes are described. The life history of the *Distoma hepaticum* is pretty thoroughly understood, so that prophylaxis may be taken into consideration in connection with it. The eggs are discharged from the sheep, the most commonly infected animal, with the stools; these eggs after being in water or moist places enter a host, a small mollusc, usually a gasteropod, where they develop into the stage of the cercariæ. The cercariæ, either swimming about or attached to some aquatic plant, are taken into the stomach of man, either by the drinking-water or by his eating aquatic plants.

Prophylaxis.—Upon this life history the prophylaxis is based; in the presence of sheep rot, the disease produced by the *Distoma hepaticum* in sheep, care should be taken to destroy the dung; furthermore, all drinking-water should be boiled, and all plants that grow in moist places and are used as food should be carefully cleaned before eating.

Treatment.—The treatment of the disease itself is highly unsatisfactory; it should be symptomatic as to the gastrointestinal tract, the fever, the pains, and the general condition of the patient. In some instances surgical intervention may be advisable, especially as to abscess of the liver. It is more than doubtful whether anything can be done in the direction of causal therapy; the so-called cholagogues have been recommended. When the diagnosis has been thoroughly established it would seem advisable to perform a cholecystotomy, by means of which local treatment may be carried out.

For *Distoma spathulatum*, or, as it is also called, *Distoma sinense*, the same conditions seem to exist as for the *Distoma hepaticum*. For the other distomes belonging to this class—the *Distoma lanceolatum*, the *Distoma crassum*, the *Distoma conjunctum*—our knowledge of their life history is very limited. The *Distoma sibericum* is found in cats. It is supposed that both they, as well as man, are infected by eating partly cooked or raw fish..

Distoma Ringeri.—This is found in cats, in dogs, and in the human being. In man it is principally localized in the lungs, and has very often been found in Corea, Formosa, and Japan. On account of the fact that the embryo lives in fresh water, it is probable that the host is some animal living in fresh water. The prophylaxis, then, should be similar to that of the liver flukes. There is no other treatment except symptomatic treatment; the disease is very mild in the vast majority of cases, but the hemoptysis may require special treatment. Other localizations of the distoma may have to be treated surgically. Removal of the patient from the place of infection has been recommended, in order to prevent reinfection.

Distoma Hæmatobium (Bilharzia Hæmatobia).—Prophylaxis.—The life history of this fluke is not understood, but there are some practical recommendations made for prophylaxis which seem to be based upon accurate ob-

servation. Brock, in South Africa, has verified the observations of Loos, that only those who bathe in fresh water become infected, and they both draw the conclusion that the embryo wanders into the human being through the skin and lives in the blood. In addition to the injunction not to bathe, it is important that the urine of the patients be collected, so as not to be allowed to contaminate the water, and that it be disinfected, as is done in typhoid fever. The other prophylactic measures recommended for the preceding distomes should also be carried out.

Treatment.—The treatment advised has been carried out so as to fulfill causal, general, local, and symptomatic indications. The removal of the cause seems impossible; filix mas and turpentine have severally been recommended, but most observers have found them useless. For general treatment all those medicines should be ordered which are used in diseases characterized by frequent small hemorrhages; the diet should be that employed in pyelitis or cystitis, and should include large quantities of fluid. Local treatment is without much value; injections into the bladder are of only temporary service, as the permanent source of infection is not removed. Renal or cystic calculi may have to be removed. The symptomatic treatment should be directed especially to the anæmia; at times to the symptoms produced by localizations of the bilharzia. Except in Egypt, the disease usually runs a favorable course, and spontaneous cure occurs in most of the cases.

IV. DISEASES PRODUCED BY NEMATODES

ASCARIASIS

Ascaris Lumbricoides.—Infection takes place by means of the ova, which are produced in great numbers and which, by feeding experiments, have been shown to produce ascariasis. The ova retain their viability under conditions usually fatal to lower forms of life, and adhere to food for a great length of time; they have been found in water and upon various articles of food, especially vegetables that have been grown in manured soil. The temperature of boiling water kills the ova.

Prophylaxis.—The prophylaxis is practically summed up in the obtaining of a pure water supply, and where this is not possible the boiling of liquid foods and vegetables given to children. In addition, cleanliness in the handling of stools is necessary; autoinfection is uncommon, but infection of others may occur in this way.

Treatment.—As many symptoms are ascribed to intestinal worms, the diagnosis should invariably be established before treatment is instituted; this can always be easily done by a microscopical examination of the fæces, for the ova, when ascarides are present, are plentiful and characteristic. Even when one worm has appeared, a little time should be allowed to elapse, after which the fæces are again to be examined, and the presence of the ova will show the necessity of treatment. In pursuing this method it is frequently found that further treatment is unnecessary because only one worm was present. As the ascaris lives only in the small intestine, although it may wander in all directions, the treatment is applied by the mouth exclusively; the only

remedy required is santonin. But santonin is not a harmless drug, and whoever, like myself, has seen a fatal case of santonin poisoning in a case in which there were no worms will be very cautious in its use. In children, as small a dose as 0.13 gm. (gr. ij) has been followed by death; in adults, 0.3 gm. (gr. v) has produced symptoms of serious intoxication. In children the dose should be small, not to exceed 0.02 gm. (gr. $\frac{1}{3}$)—not more than 0.065 gm. (gr. j) in twenty-four hours; in adults, 0.065 gm. (gr. j)—not more than 0.3 gm. (gr. v) in twenty-four hours. The administration of santonin to children in the form of worm lozenges should not be encouraged; they are looked upon as delicacies by the children, with the result that too many are taken, to say nothing of the harm done by promiscuous domestic medication. Santonin has no bad taste, so that the addition of a little sugar suffices to make it palatable. It should always be given together with a laxative, as the local effect of the drug is always thoroughly produced and the general effects are in a measure diminished by it. The best laxative is calomel; I always combine the two and always give a prescription calling for not more than three powders. Liebreich has recommended castor oil in combination with santonin; the objections to this method are quite apparent for children, though it is very valuable.

On account of the risks of producing unpleasant symptoms, santonin should never be given for diagnostic purposes, as is often recommended. Causal treatment is paramount, and for those symptoms due to the wandering of the ascaris local therapy is necessary. Concerning the presence of general symptoms the views are widely divergent, but wherever evidences of ascarides are found the treatment should be used.

Oxyuris Vermicularis.—PROPHYLAXIS.—In addition to the measures described under *Ascaris lumbricoides*, on account of the life history of oxyuris we find autoinfection and direct infection from man to man very common. Autoinfection is the cause of difficulty in curing this disease; the young female brood, filled with ova, lives in the rectum, and eventually all the worms belonging to this class are found in the rectum; they produce local symptoms which on their part are followed by manifestations resulting in the transportation of ova by means of the hands, towels, and sponges. Heller says that a microscopical examination of the accumulations under the finger nails of the patients will usually demonstrate the presence of ripe ova. Transmission of ova by fruit or vegetables, according to this observer, is of secondary importance, least of all by salad, as vinegar destroys the ova. To prevent transmission and autoinfection the most scrupulous cleanliness of the anus and vulva, as well as of the hands of the patient, is demanded. The latter is very difficult, in children especially, and not easy in adults, for infection takes place during sleep by scratching, rubbing, or mere contact with the anus or vulva. Cleaning the finger nails should be looked to; according to Vix, the worms as well as their ova are easily destroyed by soap. Care must be taken to treat all infected members of the household; otherwise renewed infection will take place.

TREATMENT.—Because all pinworms are finally found in the rectum, the treatment is principally local, by enemata. In order to facilitate and hasten the cure a cathartic should be given—calomel or a saline—so as to remove the adult worms from the small intestine as well as the young ones from the

large intestine. Santonin need never be used in a case of pinworms. The enemata must be given in the proper way; their principal object is by their size to distend the large intestine and to remove the mucus in which both the worms and the ova are found. Many substances have been recommended to be added to the water used for the enema: vinegar (1 : 2 of water); thymol, 0.05 per cent; menthol, 0.5 per cent in oil; weak sublimate solutions; boric acid; turpentine; garlic, a favorite remedy in Austria, and many other remedies. *Nil nocere* is the motto here; plain cold water or soap and water, when properly used, is as good as anything else. The enemata must be given once a day until the stools are free from ova; when necessary, injections into the vulva or vagina should be used. How long it takes to cure a case of pinworms depends entirely upon the methods of prophylaxis and treatment, as is shown by the different results obtained by different authors. Because of the difficulties met with in carrying out these measures, we frequently find that in private practice pinworms are not always easily cured. Under all circumstances patience, persistence, and knowledge are required.

TRICHINIASIS

Prophylaxis.—As this disease is always due to infected swine, the indications for prophylaxis are perfectly simple, their execution, as in all food infections, rather difficult. If nobody would eat pork there would be no trichinosis, and among those Jews who carry out the sanitary laws of Moses trichinosis does not occur. But general abstinence from eating pork is not to be looked for, and with proper precautions is practically unnecessary. In order to prevent the infection of hogs they should receive only grain or such food as has been cooked; rats and mice are also accused of causing infection in them. In Germany, as well as in some parts of this country, especially where pork is packed for exportation, the meat of slaughtered pigs is examined for trichinæ. The value of this method naturally depends upon the thoroughness with which it is carried out; one epidemic in Germany originated from pork that had been examined. The method of preserving the pork seems to be more valuable for prophylaxis, as not a single case of trichinosis in Germany can be attributed to pork cured in the American manner. All food containing pig meat should be thoroughly cooked; neither ham nor pork sausages should ever be eaten raw. Trichinosis is most common where uncooked ham is eaten; with us in this country the disease occurs most frequently among Germans. But the cooking must be thorough; free trichinæ are killed at a temperature of from 145° to 155° F., encapsulated trichinæ at from 190° to 200° F.; but as these temperatures must be applied throughout, not only upon the surface but also in the center of the article of food, it will be seen that this method is only a partial safeguard. Yet practically Wasserfuhr has demonstrated that epidemic trichinosis is prevented by cooking, for in those regions of Bavaria where pork is always cooked no epidemic has ever occurred, while where ham is eaten raw epidemics have occurred.

Treatment.—In order to remove the trichinæ from the intestine, laxatives are given—calomel, senna. It has been frequently observed that in those cases in which primarily gastrointestinal symptoms are violent the course of the disease is usually mild. In addition, the usual anthelmintics are also

administered—turpentine, santonin, pelletierine (cortex granati), filix mas. Glycerine, on account of its hygroscopic qualities, was recommended by Fiedler to be given with laxatives and in large doses, a tablespoonful every hour. G. Merkel, of Nürnberg, has obtained good results with it. The various methods tending to make the trichinæ harmless in the intestine should be used as early as possible, for in some instances the further development of the disease is prevented, though in a large number of cases this is impossible. because the trichina has already penetrated the intestinal wall; but even then the number that enter the muscles can be diminished. We have no remedy that acts upon the embryo if it is once outside of the intestine. Besides the intestinal treatment, the management of a case of trichinosis must be symptomatic. For the diarrhea the usual treatment should be applied. Pains in the abdomen and the muscles must be met with opium; for the latter the antipyrine group, too, is valuable. For sleeplessness the usual hypnotics are used. Upon the whole, the treatment resembles that of typhoid fever, for which this disease is often mistaken; the fever, the bronchitis, the profuse sweats or complications must be treated in the same way as recommended in the previous sections on infectious diseases. The diet must be nutritious. It is necessary to take the same precautions as in typhoid fever, as lesions are at times, though not always, found in the gastrointestinal tract. In the milder cases very little treatment is required; in the severe cases the mortality is very great, do whatever we may. The convalescence is to be treated as in all other acute infectious diseases.

ANKYLOSTOMIASIS (Uncinariasis, Hookworm Disease)

Prophylaxis.—As this disease is transmitted by food, and as the embryo lives in mud and muddy water, the indications for prophylaxis are precisely determined. The stools of the patient should be disinfected. The water supply should be regulated by filtration or boiling if uncontaminated water cannot be obtained. As in civilized countries, the disease occurs principally in miners, brickmakers, agriculturists, these must be carefully instructed to clean their hands before eating. In addition, as Loos has determined that infection can also take place through the skin, great cleanliness of skin should be insisted upon. As the ankylostoma produces local symptoms—redness, burning, and swelling—local treatment should be applied. Where the disease is endemic all these precautions should be carefully carried out.

Treatment.—Various anthelmintics have been used, but since its introduction by Bozzolo thymol is looked upon as a specific. The day before giving thymol the bowels should be thoroughly cleaned out, a purgative being given from twelve to eighteen hours before the drug is administered. It should be given in its solid form, never in solution in this disease, and in doses of 1 to 2 gm. (gr. xv to xxx) every two hours until four doses are given; a purgative should also be given from twelve to eighteen hours after its administration. About one week after the administration of the thymol the stools should again be examined for ova; if they are found, the treatment should be repeated. Thymol may be given in this disease in capsules, wafers, or gelatine-coated pills, to prevent intoxication by absorption of a large quantity at a time, as we are interested only in its local action, for which large quantities are

required. The solubility of thymol must also be taken into consideration; it is sparingly soluble in water (1:1,100), soluble in half its weight in alcohol, ether, and chloroform, and freely soluble in fixed and volatile oils. It is also soluble in glycerine, and forms soluble compounds with alkalies. While the thymol is in the intestinal tract of the patient, these various articles should not be given, and a diet should be prescribed that does not contain too much fat or too many alkalies; even the drinking of much water should be prohibited. Vegetable cathartics—senna is the best—are preferable, or calomel may be used. The symptoms of thymol poisoning are those of carbolic-acid poisoning, as far as absorption is concerned; when dizziness or discoloration of the urine develops, the medicine must be withdrawn and thorough cleaning of the bowel begun. Sir Patrick Manson, whose experience in tropical diseases permits him to speak with authority, states that the dangers of poisoning are "not sufficiently recognized by practitioners nor as a rule insisted upon by authors." Under all circumstances in my experience, thymol intoxication is easily prevented.

The anæmia must be treated by drugs and the nutrition of the patient must be looked to (v. Anæmia). Symptomatic treatment for the gastrointestinal canal and the various results of anæmia due to continuous small hemorrhages must be instituted.

FILARIASIS

Prophylaxis.—This differs with the various kinds of filariæ. For the *Filaria Bancrofti* (*nocturna*, Manson) it seems pretty well established that particular species of mosquitoes (Manson) act as hosts; that they suck the blood of filarial patients, and that in them the embryos are multiplied, to be deposited in the water where the mosquito lays her eggs. The prevention of filariasis, then, could be reduced to the following: All patients known to have filariasis should sleep under netting; the peculiar kinds of mosquitoes should be destroyed; no drinking-water should be taken which has not been boiled or filtered. For the *Filaria perstans*, which is supposed to produce the disease called the "sleeping sickness" (Manson), the life history has not been worked out, but the measures just mentioned should be carried out in this case also.

Treatment.—The *Filaria Loa*, which lives in the subcutaneous tissue, may be removed by surgical intervention. For the other forms, prophylaxis is more important than treatment. The principle upon which treatment should be based is the removal of the parent worm. All those who have seen much of filariasis assert that there is no drug that can be given internally that will kill the parent worm; destruction of the embryos is of no importance, even if it could be accomplished. There remains, then, the localization of the parent worm, and its removal. Because this localization is most commonly impossible, the adult worm cannot be removed. When, as happens, the parent worm can be found, and it can be excised without danger to the patient, the results are excellent.

FORMS OF FILARIASIS

Chyluria.—This symptom is the result of the formation of lymph varices in the kidney or the bladder, usually caused by obstruction in the thoracic

duct by mature filariæ. When these varices rupture, chyluria follows. As the varices cannot be removed, one object should be that of putting the patient in such a condition that the rupture in the varix may heal. The patient should be kept quiet. In order to diminish the amount of chyle, fluids and fats should be restricted. According to Manson, the patient is not healed until both the "lymphous clot" and albumin have disappeared from the urine. The proof of the closure or patency of the rupture can be had by giving a tumblerful of milk.

Filaria Medinensis.—This parasite requires special attention, as it differs largely from those above described in so far as they interest us. This filaria is the cause of dracontiasis, or the Guineaworm disease.

PROPHYLAXIS.—This can only be applied in respect of drinking-water. The host of the embryos is cyclops, a fresh-water copepod of minute size. The embryo, after having left the parent worm, goes through a process of development in cyclops, and then enters the human being by the stomach. In order to prevent this, all drinking-water should be boiled or filtered.

TREATMENT.—The most successful treatment seems to be the injection of a 1–1,000 solution of mercury bichloride into the track of the worm, which can be detected as soon as irritation of the skin is set up. By means of this the worm is killed, and then absorbed as a sterile ligature would be absorbed. Manson recommends frequent douching with cold water to facilitate parturition; this should be begun as soon as the worm first shows itself externally. Cold-water applications should be constantly made. As soon as the worm is empty its exit may be facilitated by rolling it on a small stick. All authors warn against premature removal of it, as this is liable to be followed not only by lack of success, but also, not infrequently, by very extensive inflammation of the parts.

TRICOCEPHALUS DISPAR (Whipworm)

It has not been established that *Tricocephalus dispar* is pathogenic in men. It is possible that symptoms may be produced by its presence in the colon when there is a large number of worms.

PROPHYLAXIS.—For prophylaxis it is necessary to take into consideration the fact that the eggs may be found upon fruit, vegetables, and in water.

TREATMENT.—For the treatment the various anthelmintics have been recommended, but, it is asserted, with only moderate effect; thymol, santonin, and filix mas are especially recommended; in addition, thorough evacuation of the colon should be carried out, either by means of laxatives or by lavage of the colon.

RHABDONEMA INTESTINALE

(Anguillula sive Strongyloides Intestinalis)

Recent research seems to show that this nematode produces diarrhea and anæmia when present in the intestine in large numbers.

PROPHYLAXIS.—The following facts should be taken into consideration: the embryos leave the human being with contaminated water; infection takes place by food that has come in contact with contaminated water, or by vegetables that have grown in soil infected by the nematode embryos.

TREATMENT.—This consists in the internal administration of thymol, as has been recommended in connection with *Ankylostomum duodenale*, with which the *Rhabdonema intestinale* is frequently associated. It is doubtful whether the usual anthelmintics have any effect in expelling it.

V. DISEASES PRODUCED BY CESTODES

INTESTINAL CESTODES (Tapeworms)

PROPHYLAXIS.—Tapeworms are propagated in two ways: first by food, secondly by the ova as contained within the segments, or, as in the *Bothriocephalus latus*, by the fæces themselves. The food should be carefully inspected in the abattoir. Beef should be examined for the *Tænia saginata sive mediocanellata*; measly pork for *Tænia solium*. Fish should be examined—pike, turbot, perch, trout, grayling, and possibly other fresh-water fishes—for the *Bothriocephalus*. In all instances the cysticerci are to be looked for. But even by careful inspection not all cases of infection can be prevented, especially for *Tænia saginata*, where the cysticerci may be overlooked on account of their size and location. No raw meat should be eaten; all food should be thoroughly cooked. This method cannot be successfully carried out, because many prefer their meat only partially cooked. Meat, or pork that has been pickled, is thoroughly innocuous. Fish must be boiled; it has been shown that even in frozen fish living cysticerci are still found. The whole of prophylaxis as applied to the preparation of food must of necessity be very unsatisfactory. For the destruction of the ova, it is necessary to instruct all those suffering from tapeworms that the segments which are found may do harm to others, if not also to themselves. It is necessary, then, that all segments that are found should be immediately destroyed by burning; furthermore, the patient should be admonished to clean his hands thoroughly after defecation. All specimens of tapeworms should be destroyed by burning, unless kept in some preservative. Everyone with tapeworms should be treated as early as possible, in order that a spread of the disease may be prevented. But with all these precautions, the number of cases (comparatively small in this country) will only be diminished; it is impossible absolutely to prevent tapeworms; this for obvious reasons, not the least one being that, except occasionally for the Bothriocephalus, the condition produced by them is not accompanied by danger.

TREATMENT.—The principles upon which the treatment of tapeworms is based are the proper use of a drug which kills or stupefies the worm, and, secondly, the removal of the worm. In order that the drug should come in contact with the worm in sufficient quantity to produce its effects, it should be given in such a way that its activity is not prevented by a full intestine, and only such drugs should be used as, when properly administered, are harmless to the host. Some of the anthelmintics are poisonous, and it is dangerous to give them in combinations so that they are more easily absorbed. Furthermore, sufficient time should be allowed to elapse so that the full effect of the drug shall have been produced before the worm is removed by a cathartic. To nonobservance of this may be ascribed many of the failures in using the

drugs that have been recommended for tæniæ. Not less important is the necessity of seeing that the drugs used are active; on account of neglect in this direction, charlatans frequently succeed where reputable physicians fail in the treatment of tapeworms.

It is difficult to say which drug is the most reliable for the cure of tapeworm. My own experience has been confined to the oleoresin of aspidium (Filix mas), tannate of pelletierine, pepo (pumpkin seed), and kousso. The last, including its constituent part, koussin, has seemed to me the most unreliable, so that I no longer use it; next to this comes pepo; as between the other two, I have had just as many successes with the one as with the other. But on account of the absence of unpleasant symptoms when Filix mas is properly used, I always try it first. Pelletierine should never be given to children because of the unpleasant and alarming symptoms that may follow its administration.

Before any tapeworm cure is begun, the patient should be prepared—i. e., his intestinal canal should be put into the proper condition. If he is constipated, a purge should be given on the morning of the day before administration. If there is no evidence of constipation, purgation is not necessary. The diet on the day before the anthelmintic is given need not be particularly restricted except in regard to the last meal of the day, when milk alone should be allowed.

Every one of the remedies should be given on an empty stomach, and no food of any kind should be permitted until the cathartic that is given to remove the worm has been administered. All arrangements should be made for the comfort of the patient; it is best to have a commode, the vessel of which is partly filled with water, upon which the patient can sit, and this should be placed in the room most suitable so that he may pass from eight to twelve hours uninterruptedly and as comfortably as his treatment may permit.

The *Oleoresina aspidii* (Filix mas) should be given in large doses—6–10 gm. (℥jss.–℥ijss.). It is most easily given in capsules or in mucilage. Ready-made capsules which act very efficiently are to be found in the market. For children, the dose should be much smaller—from 1 to 4 gm. (℔ xv to ℥j) for children between two and twelve years of age. Here it may also be given in capsules; but children can rarely swallow them, so it is best given in mucilaginous preparations, which may be flavored with wintergreen or peppermint. Under no circumstances should Filix mas be given together with oil, as is frequently recommended, for it is highly probable that the oil causes the toxic principle of Filix mas to be more readily absorbed, thus producing symptoms which may be followed by fatal results. Capsules containing Filix mas and castor oil should never be used. The best cathartic to use with this remedy is a saline cathartic, which should not be given until six hours have elapsed after the remedy has been taken. During this time no food can be allowed the patient, otherwise the drug may not come into the most intimate contact with the worm.

Tannate of Pelletierine.—Pelletierine is now given in the form of the tannate on account of its insolubility and its tastelessness. It is given in doses of 0.40 gm. (gr. vj), administered in one dose. The patient must be warned against its unpleasant effects. In order to avoid these the patient

should maintain a recumbent position and keep as quiet as possible. According to my experience the worm is not killed by this drug, therefore the importance of giving the cathartic at the proper time and the selection of a brisk cathartic. If this is not done the worm again begins to come out of its stunned condition, it does not loosen its hold, and the cure is a failure. Tanret recommends an ounce of the compound tincture of jalap, given about two hours after the administration of the pelletierine. A saline cathartic is just as efficacious, and not so disagreeable: the official solution of magnesium citrate comes to the patient as a gift from heaven, relieving the nausea and the thirst.

For *pomegranate*, the objections are the same as for pelletierine, but to these may be added others: uncertainty of obtaining a reliable preparation because it must be fresh in order to be active, and the preparation itself must of necessity be given in a large quantity of menstruum. It is usually given in the form of a decoction—30 gm. (℥j) in 750 gm. (Ojss.) of water, which after soaking for twelve hours is gently boiled and reduced to 500 gm. (Oj). One third of this is given warm to the patient every hour until the whole has been taken. The usual cathartics are given after two hours.

Pepo (*pumpkin seed*) is one of the most uncertain of the tænifuges. At times it works most satisfactorily, at other times it is absolutely without any effect. The chemical structure of this substance is not well understood, but the fact that the seeds in order to be active must be fresh is thoroughly understood. I have seen fresh seeds active, but when they have been kept for three months they lose all their activity. It is given in the following way: 60 to 120 gm. (℥ij to ℥iv) of the powdered seeds are mixed with honey or suspended in an emulsion which can be flavored at will. After two hours the ordinary cathartics are administered. The great advantage in using this remedy is found in the fact that very large quantities can be taken without producing any symptoms at all.

VISCERAL CESTODES

Cysticercus Cellulosæ.—The PROPHYLAXIS is that of *Tænia solium*, of which this cysticercus is the larval form. The treatment is the same as that of the following form.

Echinococcus Polymorphus (Echinococcus Disease).—This is produced by the larval form of the *Tænia echinococcus*.

PROPHYLAXIS.—The dog is the host for the tænia, the larval form thereof producing echinococcus or hydatid disease. The prophylaxis must take into consideration various animals. In order to protect the dog from tænia infection, it becomes necessary to inspect the meat of slaughtered animals; at least the offal from slaughter houses in echinococcus tænia-infected regions should be burned or so disposed of that dogs cannot eat it. When the offal is used as food it should be thoroughly boiled. For man, the principle of prophylaxis is the prevention of the introduction of the embryos into his alimentary canal. These embryos are always found in the fæces of the dog. Human hydatids could be prevented, then, either by the destruction of the bladder worm in the herbivora or by the killing of all dogs. The former seems impossible, for the present at least, and the latter impracticable. There seems

to be no objection to the destruction of stray dogs, among which the number of infected animals is especially great; this, then, should be done in infected regions, the geographical distribution of this disease being thoroughly well known. Beyond these measures we have specific ones which may act as preventives. It has been suggested to give dogs the usual remedies that are recommended in human tapeworms, but here subsequent disinfection of the fæces is also necessary. Drinking-water should be boiled, for the fæces of dogs reach the human being in devious ways. Dogs should not be allowed to lick human beings, for not only do they lick their anal regions, but many lick fecal material coming from themselves or from other dogs. All vegetables should be boiled before being eaten; those fruits which grow near the ground should be thoroughly cleansed before being eaten.

TREATMENT.—(*a*) *Aspiration.*—This method is being recommended with less favor than formerly; when it is done, the smallest possible needle should be used. The objections that are urged against it are many. The probability of infection of surrounding tissues is to be feared (Volkmann). It has been shown by Brieger that the cysts contain large quantities of ptomaines, and the toxicity of the fluid has been demonstrated clinically by the fact that in a number of cases death has followed aspiration with quite characteristic symptoms. Suppuration may follow aspiration, rendering a more thorough operation imperative, which under such conditions becomes more dangerous. The results of aspiration are doubtful and cannot be depended upon with certainty; favorable ones are obtained only in living, simple cysts. There is no doubt, however, that it cures in a number of cases. On account of the many objections, aspiration is no longer favorably looked upon even for diagnostic purposes. Baccelli's method of injection of a one-per-cent solution of corrosive sublimate has been followed by excellent results, but the objections raised to aspiration are equally valid here. The injection of other remedies into the sac has been given up.

(*b*) *Removal of the Parasite.*—A number of methods have been recommended, of which we need to take into consideration two only, as the others have been discarded. These consist in incision and in excision of the whole parasite. For the liver, that operation which consists in incision, stitching the visceral wound to the parietes of the body, and removing the parasite is the one mostly done in Australia (Verco and Sterling), the sac being allowed to drain externally. The results are very good, much better in cases where there is no suppuration; therefore early operation is advisable. When the hydatids are subphrenic the thoracic route should be chosen. For pulmonary hydatids resection of the ribs must be done, and then the procedure is the same as in liver hydatids. Aspiration is especially dangerous here, as the bronchial tubes enter into the cavity in which the hydatid lies; and when by aspiration a certain quantity of its contained fluid has been removed the cyst collapses and stands wide open, which is followed by flooding of the bronchial tubes with its contents (Verco and Sterling). Hydatids of the abdominal cavity should be treated like those of the liver. In the kidney the same operation may be used, or partial resection may be done. For echinococcus of the central nervous system the same surgical rules hold good as for other tumors.

VI. TRYPANOSOMIASIS

PROPHYLAXIS

This resolves itself practically into observing the hosts which carry trypanosomata, at least as far as our knowledge of to-day allows us to make statements based upon scientific observations. Infection of the human being is accomplished by the bite of the tsetse fly (glossina); the infected human being is in his turn a source of infection to others, in that he is bitten by insects which carry the trypanosoma with them, and then sting others. As in malaria, two methods of prophylaxis can be suggested: the destruction of tsetse flies, which according to Koch is impossible, and the destruction of trypanosoma, which at present seems equally impossible. The suggestion has been made that all patients affected with trypanosomiasis should be so placed that mosquitoes or other insects could not bite them; this could only be done if all these patients were collected in a hospital, which is manifestly impossible in the regions where trypanosomiasis is endemic. It seems, furthermore, that the disease may be transmitted by water and by food, so that additional prophylactic measures must be urged if this statement can be verified.

TREATMENT

The febrile form seems to have been successfully treated at times by the subcutaneous use of arsenic. For the sleeping sickness, which is due to localization of the parasites in the cerebrospinal fluid (Bruce), arsenic has been tried; Ehrlich has suggested trypan red, on account of its efficacy in the trypanosomiasis of rats; Laveran recommends a combination of arsenic and trypan red; Wendelstadt, malachite green. As yet the results have not been very favorable. Possibly direct application of drugs to the subarachnoid space will be found more valuable than introduction of drugs in the usual ways. Certainly in so fatal a disease as the sleeping sickness any method is worthy of a trial.

SECTION III

THE INTOXICATIONS

I. ALCOHOLISM

PROPHYLAXIS

Rational prophylaxis based on scientific principles may do much good, and even when sentimental methods are used some good may be accomplished. That excessive use of alcohol may be diminished is shown by comparing the habits of the Anglo-Saxons of a hundred years ago with those of the present day. That the use of alcohol by human beings can be absolutely abolished is an illusion cherished only by those who do not know human nature. The question is one so intimately connected with psychiatry, sociology, criminology, not to mention many other points of view, that *a priori* there cannot exist one single way of solving this or any other question connected with human desires. Public prophylaxis in this question is paramount, as the masses must be reached among whom, especially in the lower strata, the vice is most common, and on account of which the problem is so difficult of solution. An appeal to reason has been resorted to by teaching the children in the public schools the bad effects of alcohol, but usually this is done from the point of view of morals and religion; children are very subject to suggestion as to the physical effects of any cause, and when these are properly put before them they will act intuitively far better than from the presentation of statistics about poverty or crime, examples of which they frequently see in their own homes. In this country, experiments are making in various other directions, and the participators, in every instance guided by their zeal, not infrequently amounting to bigotry, are positive of the infallibility of their method. Absolute prohibition has been tried for many years, but is now retained in only one of the States, and most physicians argue that alcoholism has been increased by it. Unfortunately, in a republican form of government all public questions are associated with party politics; the party comes before the cause, and in the one remaining prohibition State conditions have tended to make dishonest officials. Local option—i. e., the right of citizens to decide whether liquor shall be sold in their locality—is only another form of prohibition. The diminution of the number of public drinking places is also tried by restricting the number in a given area and by demanding payment for a license. The latter method undoubtedly does good when the license fee is

high enough, and betters the quality of those keeping drinking places. Nearly all States have laws forbidding the sale of liquor to minors. All these laws do good, but it will be seen that they are active only in the way of removing temptation, and they are unjust to the saloonkeeper who, rightly or wrongly, is supposed by many otherwise right-minded people to be outside the pale of justice.

If we would aim at true temperance instead of abstinence, more good could be done to more people. This can be done, and has been effected in Germany by substituting cheap, pure beverages containing a small percentage of alcohol. Here again the aid of the State must be called in, as is done in this country and in many others. The great trouble in Anglo-Saxon countries has been that the alcoholic subject has been pampered and has been treated leniently unless he commits some overt act of crime; the results of his existence, brutality, immorality, crime, poverty, and transmission of defects to his descendants are lightly dealt with, frequently condoned. Whether the habitual drunkard is looked upon as a criminal or as a psychical deformity, he does harm to the State, which must protect itself by adequate and just laws—laws that are just both to the drinker and to the provider of alcohol. The results of the enforcement of the recent English law will be watched with great interest, although the law is not quite just to both parties. We should not be far wrong in asserting that the proper enforcement of proper laws would be an economy to the State and invaluable in helping to solve this great social question, which is apparently indissolubly bound up in the weal and woe of mankind. But the making of laws is not sufficient, they should also be enforced; institutions should be established to which alcoholics can be committed by the process of law, and this is done in England and Germany for their restraint, their treatment, and their possible cure.

Individual Prophylaxis.—Many things must be taken into consideration here. Education is of prime importance; home influence does much good. In the young, proper surroundings, plenty of exercise, prevention of idleness are invaluable. The establishment of proper places of amusement has been of great value, either with or without alcohol. In Germany and France people congregate in places of amusement where everyone partakes of light beer or wine, but, comparatively, there is little drunkenness. Our object in the individual should be to increase his resistance, and at the same time to diminish temptation; the more alluring the temptation the less the resistance, as in all things human. In the offspring of drinkers, welfare of body and mind is the most important. Whether in such total abstinence should be recommended or not depends largely upon the individual; all such as are defective in will power—"degenerates," neuropaths—should be so treated as to prevent their acquiring the craving for drink, and this is best done by total abstinence. In "hereditary" drunkenness, the occupation should be one which does not produce the greatest number of drinkers; this, in England, has been shown to be in the following order of frequency: dealers in liquors, drivers, night watchmen, street vendors, soldiers, domestic servants, sailors. Among the professions alcoholism is most common among lawyers, then physicians, officers of the army and navy, schoolmasters, and least common among the clergy. In this country the conditions vary somewhat from these, but all those occupations that interfere with regularity of life, that

produce too much wear of the nervous system, or necessitate the handling of liquor, should be avoided. For the latter, the retail dealing in liquors especially should be avoided; wholesale dealers are rarely alcoholics. The easiest method of treating children of alcoholics, neuropathically inclined subjects, is by abstinence; for once the craving for drink is established in them, it is impossible to eradicate it. When this cannot be accomplished, suggestive means should be used early, so that the children may learn to use, not to abuse, alcohol; in other words, not to take so much as to produce the alcoholic effects which finally lead to the habit.

The moderate use of alcohol does no harm, but daily use—i. e., habitual use—even in medicinal doses, has been shown to be harmful; it should be recommended only temporarily for special indications, and may be taken by the aged in the physiological dose (45 gm.—℥jss.) *pro die* in the proper form for any length of time with benefit. But even here I have seen the habit develop.

TREATMENT

Acute Alcoholism.—As a rule, this form requires no treatment except rest. When the patient has taken excessively large doses the stomach should be washed out—this may even be done as an inhibitory procedure against further transgression in ordinary cases—and enemata should be given. Evidences of collapse should be met with hypodermic injections of camphor, the internal administration of coffee or aromatic spirit of ammonia. In respiratory failure, artificial respiration is indicated. Very marked congestive symptoms should be met by local or general blood letting. Strychnine is very valuable, acting as it does upon the centers that are especially involved in alcohol intoxication. Passive movements, sinapisms, may be valuable for the purpose of stimulating reflexes and keeping up the circulation.

Chronic Alcoholism.—Here the withdrawal of alcohol is the indication of paramount value; as this can be done only when the patient is under surveillance day and night, it is best done in a hospital or an institution where he can be kept in bed. Whether alcohol should be withdrawn suddenly or gradually depends largely upon the patient. It should never be withdrawn suddenly where there are present any symptoms or evidences of any acute inflammatory disease, or in those in whom well-marked nervous symptoms are present, as in the latter condition it always leads to delirium tremens. Besides, sudden withdrawal may lead to collapse, and at all events it results in great mental and physical suffering. In mild cases the patient has repeatedly done this for himself, and in the patient who tries to give up alcohol altogether it produces no psychical effect, for he thinks nothing more is doing for him than what he can do for himself. In the great majority of cases gradual withdrawal of alcohol is the best method that can be adopted. In order to make a lasting impression upon the patient the withdrawal must be so gradual that no bad symptoms, from either too much or too little alcohol, are produced, and so as to have the procedure looked upon by him as a cure. I myself, according to the case, begin with what corresponds to 15 gm. (℥ss.) of whisky every hour, day and night. When symptoms from withdrawal are produced this quantity is increased. As a rule, in the beginning the patient looks upon the dose as very small, asks to have it increased of repeated at

smaller intervals. But in a few days his attitude begins to change: he finds it pretty hard to continue; he is astonished at the effects—different from the alcoholic elysium he promised himself when the method was first outlined for him. He now finds it irksome, begins to complain of the quality of the whisky, says he is getting nervous from it and from staying in bed. Sometimes at this stage the patient becomes so rebellious that he leaves the institution. Now is the time, if the pulse warrants it, to make some concession by giving a different brand of liquor or making a reduction in dose; and this must be continued, the intervals of time remaining the same, until the dose has been reduced to 2 to 4 gm. (3ss. to 3j), when the intervals are to be prolonged.

During the course of treatment the feeding must be carefully looked to; in the beginning the patient eats whatever is brought to him, but soon his appetite fails, and he must then be fed—two quarts of milk, eggs, and carbohydrates. When small doses of alcohol are reached, strychnine or nux vomica should be given. Massage and Swedish movements should be used daily. The whole treatment can be completed in three or four weeks. In this, as well as in other directions, modifications must be made according to the judgment of the physician. In my experience, no other remedies are required except, occasionally, large doses of the bromides; hyoscine hydrobromate for motor restlessness. After the treatment has been completed the patient must be told that he must never take liquor again in any form. The results of this method, which I have carried out for a great number of years, warrant me in stating that it removes the craving for liquor for a long time—in one instance for five years. On the other hand, one patient had to supplement it by a debauch, then remained free for two years. With the latter exception, there were no failures as to temporary relief. On account of the difficulty in abstaining, the crucial point after all in the so-called dipsomaniacs, it is questionable whether permanent results can be obtained by any method.

I have sent some patients to live in countries in which strong drink was not easily obtainable; while they remained there they had no attacks, but as soon as they came home the condition was the same as before. In some of these the temptation seemed irresistible; try as much as he could, the patient finally succumbed to it. One of my patients remained well for fifteen years, then relapsed, frittered away all the fortune he had acquired during the time, and finally died in a public hospital ward from an alcoholic pneumonia. Where chronic alcoholism is due to convivial habits, without the nervous element, the permanent results are much better. After the treatment has been completed, occasionally much good can be done by treating the nervous symptoms, which in their turn again produce the "crave." The patient should be instructed to come to the doctor and not to the saloonkeeper for medical advice. It will be found necessary to insist upon occasional changes of diet, regulation of the bowels, the giving of bromides, valerian preparations, ergot for the nervous symptoms; the bitter tonics, nux vomica, the ordering of more rest or more exercise; occasionally, but extremely rarely, the administration of some hypnotic as chloralamide, trional, paraldehyde. But with the latter all precautions must be taken so that a drug habit is not established, and morphine or cocaine should never be given; I have seen chloral, opium, cocaine, phenacetin, and sulphonal habits in alcoholics. The opium and cocaine

habits I have seen especially in physicians who have tried to cure themselves of the alcohol habit. A large number of alcohol cures have been exploited; these contain preparations of various sorts, most of them large quantities of alcohol; those not containing alcohol do good in a number of instances, but in dipsomaniacs the permanent results are the same as with any other method, for they act only by suggestion, sometimes in a very complex way.

For the treatment of the conditions produced by alcoholism the reader is referred to the appropriate chapters. One complex symptom requires special consideration.

Delirium Tremens.—As in about eighty per cent of all the cases this psychosis does no permanent harm, expectant treatment is principally recommended. Here the principal object of treatment must be that no harm comes to the patient or to those about him. This is accomplished by restraint; the patient must be put to bed and kept there. In mild cases suggestive influences can be used—best by the physician, but more especially by the nurse. In severer cases the patient can be wrapped in a sheet—strait-jackets are no longer in use—or held by somewhat elastic broad bands applied over the bed clothing. The patient must be adequately fed: milk, beef tea, meat juice, bovinine, in small quantities frequently repeated. If the stomach, as is frequently the case, rejects food, rectal feeding can be used temporarily: peptonized milk, yolk of eggs, claret and water, or brandy. The question of absolute withdrawal of alcohol is a very important one here; the symptoms of the condition are produced by the effects of alcohol upon the cellular elements of the body, which have been preceded for a long time by their having been fed by blood and lymph containing alcohol. We have here a condition resembling that of the fresh-water amœba which has been gradually trained to live in salt water and performs its biologic functions in its new environment normally; if this amœba is suddenly brought back to fresh water it dies. In delirium tremens in chronic alcoholism, alcohol should not be withdrawn suddenly, but enough alcohol should be given to prevent bad effects on the vital centers—the cardiac, respiratory, and vasomotor systems. When delirium occurs after a short debauch in a dipsomaniac or one who has not been addicted to alcohol, it may be tentatively withdrawn altogether. Otherwise the contraindications for absolute withdrawal are the same as stated before. When the patient can be fed adequately, small quantities of alcohol are usually sufficient.

Unless the patient gets a certain amount of sleep, if the condition continues for any length of time he may die of exhaustion. Because hyoscine hydrobromate, on account of its physiological effects, has seemed to me especially appropriate, I have used it almost from the time it was introduced. This drug should be administered subcutaneously—0.0005 gm. (gr. $\frac{1}{130}$)—until the effects upon the pupil are well marked; it controls the muscular restlessness, and in addition acts upon the nerve centers directly in producing apparently natural sleep. Of all the narcotics used in delirium tremens, it probably acts in the greatest number of cases; but sometimes it does no good at all, or even does harm by its lack of stimulating effect upon the respiratory center and the vasomotor nerves; if respiration is slowed or the pulse loses its tension and increases in frequency, hyoscine should not be continued. Morphine subcutaneously is the next remedy of choice; a large dose is required, but

care must be had that a complete narcotic effect is not produced, for this sometimes ends fatally; the injection should never be repeated while the pupils are completely contracted. Chloral hydrate must be used with great care on account of its depressant effect upon the heart. The other hypnotics—sulphonal, trional, paraldehyde—are unreliable, the more so as they must be given by the mouth, and absorption in this condition is very uncertain. When there are marked lesions in the kidneys or liver, none of these drugs should be used unless it is absolutely necessary. The presence of albumin alone in the urine does not contraindicate their administration, as albumin is found in the urine in fully ninety per cent of all the cases of delirium tremens. Hydrotherapy may then be tried, as it should be in all milder cases—the hot bath, the cold pack, or when there is kidney trouble the hot-air bath. It is in these cases that large doses of the bromides may be used, but their administration is rarely accompanied by good effects. The use of digitalis as a routine method of treatment of delirium tremens is fallacious; here, as elsewhere, digitalis should be used only for its effects upon the myocardium.

II. MORPHINE INTOXICATION (Acute and Chronic)

PROPHYLAXIS

The acute form occurs occasionally as a result of suicidal attempts or poisoning. In children, especially, great care must be taken in the dosage of opium and morphine (v. Diseases of the Intestinal Tract). In the chronic form, the morphine habit prophylaxis is very important, for there are certain individuals whose defective will power easily makes them slaves when once they have enjoyed morphine euphoria. In a large number of cases it is the medicinal use of morphine to alleviate pain that leads to the habit. The patient not only gets relief from pain, but finds also that he is able physically and mentally to enjoy life more, and he then continues the drug after the pains have disappeared. After morphine has been taken daily for three or four weeks, most patients find it difficult to get on comfortably without it, and sufficient will power alone prevents their becoming addicted to the habit. As a result, the physician should never write a prescription for morphine; every physician carries hypodermic tablets with him, and these should be given to the patient. In this way the patient may not find out what drug it is that is giving so much relief, the quantity administered is absolutely under control, and if a habit is induced it cannot be laid at the physician's door. It is not said that this method absolutely prevents the formation of a habit, for it is very easy for a patient to obtain morphine without a prescription, and in spite of these precautions, if they are not strictly carried out as to time of withdrawal, a habit may be acquired. In the first instance, however, the physician is without blame; in the second he is responsible, and it should always be prevented. As to the physician himself, he should always make it a rule never to take morphine unless ordered for him by his medical adviser, as it is a notorious fact that at least forty per cent of all morphinists are physicians (Pouchet). It should be laid down as an absolute law that no patient should use a hypodermic syringe upon himself; indeed, greater care

should be exercised in allowing nurses to use them upon patients; in one instance in my experience the habit was acquired in this way.

TREATMENT

Acute Intoxication.—The first attempt in all cases should be to remove as much morphine as is possible from the tissues of the patient. Alt has shown that in the human being a certain amount is eliminated by the stomach; the fact that a large percentage of morphine, when introduced hypodermically, can be recovered from the fæces is also well established. Immediately the patient comes under observation, the stomach should be washed out and his bowels fully moved. Potassium permanganate (0.5-per-cent solution) has been recommended in order to facilitate oxidation of the alkaloid; the paramount indication is to remove the alkaloid by repeated lavage of the stomach. This should be continued until the patient's condition forbids it or it is no longer necessary. I have found morphine in the stomach four hours after the first lavage was made. Emetics should not be used except when lavage is impossible, on account of their depressing effect; the local emetics should be used, zinc or copper sulphates; apomorphine when these do no good, at all events in small doses. The bowels should be cleaned out by copious enemata containing salines in order to promote osmosis into the intestines; with the lavage of the stomach it is impossible to give cathartics by the mouth; croton oil is ineffectual on account of diminution of reflexes; if this condition also prevents the enema from doing good, irrigation of the bowel with a double catheter should be tried. The best stimulant is caffeine, which may be given by the mouth in the form of strong black coffee or subcutaneously as caffeine (v. Diseases of the Heart). Atropine should be given subcutaneously when respiration begins to fail in a total dose not to exceed 1.5 mgm. (gr. $\frac{1}{40}$), as otherwise the depressing effect upon the respiratory center will be increased. The patient should be kept awake as much as possible; general reflex activity is kept up in this way, and also by cutaneous stimulation, the application of cold water, douching, mechanical or electric stimulation. When, notwithstanding all that is done, the respiration continues to fail, oxygen should be tried or artificial respiration, to be kept up as long as there is any evidence of cardiac action. When vasomotor paralysis threatens, the ordinary vasomotor stimulants should be used.

Chronic Intoxication (Morphine Habit).—In order that the best results may be obtained, the patient must be confined to bed and have a trustworthy attendant. Where the conditions are proper the patient may undergo the weaning from morphine at home. This is not a favorable way, for even in hospitals and institutions the patient frequently circumvents all precautions taken to prevent his obtaining morphine. A morphinomaniac has lost all his moral perceptions, he can never be believed, and besides, on account of the suffering attending the withdrawal of the drug, he will try to get morphine at any cost, using all his ingenuity to this end in the most unscrupulous manner. Before he enters the room in which he is to be treated it should be carefully examined—closets, bed clothing, indeed every nook and corner; the patient himself must be stripped, and all his belongings must be searched for morphine. If this is done carefully, the attendants, nurse, and servants

being absolutely trustworthy and the further precaution being taken to examine the patient's pupils carefully every day, he cannot cheat himself or hoodwink his physician. When possible, the removal of the patient to a proper institution should for these reasons be insisted upon; even here the physician must always be on his guard lest the patient find some means to get the drug. Those of us who have had experience in the treatment of these cases can look back upon temporary failures in which the solution of the methods used by the patient in securing morphine would be a credit to the sharpest detective.

The withdrawal of the drug can be done suddenly or gradually. The gradual withdrawal can be carried out in a short or a longer time. For the sudden withdrawal, only those patients are proper subjects who are robust, have no organic disease, and have used morphine in small doses only for a short time. For the second method—i. e., gradual withdrawal in a short time—the same indications exist except as to the doses that have been used, if above 0.3 gm. (gr. v) a day. Neither of these methods can be used if the original cause of the morphine habit—pains of various kinds—has not been removed. The third method, slow gradual withdrawal of morphine and in which at times substitutes for morphine must also be found for relief of pain, can be applied in all cases, and may take from four to six weeks or more. In the latter two methods the dose is decreased gradually—very rapidly in the second, almost imperceptibly in the third; the single dose need not be decreased every time morphine is given, but the quantity used in twenty-four hours must be reduced from day to day. The giving of relief to pain during the treatment is at times very difficult; if it fails, the treatment is apt to be a failure (v. chapters on Rheumatism, Neuralgia, Locomotor Ataxia, etc.). It is well, when any serious complication arises during the withdrawal, that morphine should again be administered; usually a comparatively small dose is sufficient (0.03 gm.—gr. ss.).

The feeding of the patient is very important; it should be conducted on the basis laid down for alcoholism. Relief for symptoms must be given while the doses of morphine are lessening, but no drug should be substituted which leads to a habit; the use of cocaine, chloral, heroine, or even codeine should be discouraged. As a result of using codeine, which in the majority of cases is harmless, I have seen the codeine habit established, the patient taking one half ounce of the drug daily, a habit that was uprooted with great difficulty. Large doses of the bromides sometimes do much good (8–15 gm.—℥ij–℥ss. in the twenty-four hours) combined with ergot; quinine or strychnine may also be valuable. The collapse which may occur should be treated as in alcoholism, but a return to morphine is the best method. Alcohol should not be administered at any time; morphinism and alcoholism are frequently found combined in the same patient, the one leading to the other, and it is difficult to say which is the worse; at all events, the physician is not justified in substituting one evil for another. The sleeplessness is difficult to overcome; hydrotherapy may be used; trional, sulphonal, chloralamide, the latter not too often, and carefully. It is necessary in every case to see that the bowels are regularly and sufficiently moved; with the withdrawal of morphine there comes back normal cellular activity, but the protective functions seem the last to resume their normal activity, therefore autoinfective conditions are common

and elimination is indicated. It is also probable that morphine is retained in the body, therefore there should be elimination, especially by the alimentary canal.

The results obtained in morphinomania are far from good, but in my experience they are somewhat better than in dipsomania. In order to make them as good as possible, the patient should be kept under observation for some time; he must be told never to use opium or morphine in any form under any circumstances; all, even the most trifling ailments, should be treated. He should be instructed how to live in a manner normal to his condition as to food, occupation, rest, exercise, and diversion.

III. LEAD POISONING

PROPHYLAXIS

Lead enters the system by way of the gastrointestinal tract, the respiratory organs, and the skin, and under certain circumstances the prevention of this poisoning becomes a difficult problem. As occupation intoxication we find it among all those that handle lead, entering at times by one route, at times by another, not infrequently by all of them. The workmen who suffer most are painters, those engaged in the manufacture of lead paints, miners, smelters, stereotypers and typesetters, potters, glassblowers, tinners. To these it is necessary to give instructions how by cleanliness of skin, hands, and finger nails poisoning may be prevented; if prevention is impossible, change of occupation may be recommended. When the occupation is such that the principal danger arises from inhalation of lead, ventilation must be carefully looked to; if necessary, the men should wear respirators. Dust should be avoided as much as possible. In order to render the lead as insoluble as possible, the drinking of sulphuric acid lemonade is commonly resorted to; this does not do away with lead poisoning altogether, as lead sulphate may also produce intoxication, but it diminishes the number of cases. A very common way of intoxication by the mouth is by drinking water, especially when slightly acid or heated, that has been conducted in lead pipes or stored in lead tanks. The doing away with the latter has been accomplished in this country, galvanized iron being usually used instead of lead. Leaden pipes at present can hardly be abolished. For conducting fluids containing carbonic acid, glass or tin-lined pipes are used; for common use these are too expensive. Fortunately it is new pipe principally that is to be feared, the old pipe being covered by an insoluble lead compound; but it is a good rule not to use water that has stood in lead pipes for any length of time. Leaden cooking utensils or cheap enameled dishes should never be used. Food wrapped in lead foil or preserved in tin cans soldered with lead may also lead to intoxication. Chewing-tobacco, on account of the wrapper; flour and pastry to which lead has been added as a coloring matter also produce intoxication. Shot should never be used for the cleaning of bottles; I have seen plumbism develop in children as a result of this, and glass beads or sea sand are harmless and just as efficacious. Intoxication through the skin alone occurs from the use of cosmetics containing lead. No face powder or hair dye containing lead should

be used. As it is well recognized that individual predisposition is of importance for chronic lead poisoning, anæmic or alcoholic subjects and females should not be employed as workers in lead.

TREATMENT

Acute Intoxication.—The stomach should be emptied by lavage; large quantities of fluid should not be used, and the fluid should be mucilaginous. In order to prevent damage to the stomach, emetics should be used with great precaution, if at all. The only antidotal effect is rendering the lead as insoluble as possible; magnesium or sodium sulphate or tannic acid preparations do this; the former are most valuable because the lead is also removed from the intestines by their administration. Milk, mucilaginous drinks, oils, should also be given, for they tend to protect the mucous membrane. The colic must be treated. When there are evidences of collapse, these should be met by stimulants. Potassium iodide seems to be without value in this form.

Chronic Intoxication.—In saturnism lead is deposited in the internal organs in an insoluble form; the object of therapy is to render the lead more soluble and cause its elimination. Potassium iodide is the drug always used, although authors differ as to its efficacy, on account of the varying results of experimental evidence of its utility; it is supposed to act according to the above indication, a soluble lead combination being eliminated by the kidneys and the intestines. In order to facilitate its action, saline cathartics should be administered from time to time. Sulphur baths are highly recommended, as well as diaphoretics and massage. Attempts have also been made at elimination through the salivary glands by applying mechanical, medicinal, or electric stimulants. Otherwise the treatment must be symptomatic. The colic must be controlled by hot fomentations, morphine, or atropine, the latter frequently being of great service. The bowels should be kept open and mechanically irritating food avoided. The mouth must be treated (v. Stomatitis). The general condition must be taken into consideration as to food, fresh air; when necessary, tonics or stimulants. For the treatment of the nervous symptoms the reader is referred to the appropriate section, as well as for that of the kidney lesions. The treatment of lead gout is that of gout in general in addition to that of the chronic intoxication.

IV. ARSENICAL POISONING

PROPHYLAXIS

Arsenic was an almost perfect substance for the use of poisoners of old, by whom it was frequently used, and was the principal constituent of the celebrated poisons such as aqua tofana. On account of the mathematical certainty with which the cause of poisoning can be made out it is not now used so frequently. Medicinal poisoning occurs, but can always be prevented by giving the arsenic in ascending doses, which should be interrupted when physiological effects appear. Accidental poisoning is not uncommon, as arsenic is used as a poison against lower animals; it is unnecessary to state that this can be prevented by proper precautions, the best of which is refraining from

the use of arsenic for this purpose. Poisoning as a result of occupation occurs among all those who work with arsenic, either in its solid or gaseous form (H_3As). To some degree this can be obviated by measures calculated to prevent the dissemination of the arsenic and by personal cleanliness. Arsenical poisoning from wall paper was first suggested by Gmelin, in 1839, but it was reserved for Halley, in 1858, first to demonstrate its existence. In this country, special attention was called to its occurrence by Putnam, and his experience has been verified by many, especially in Boston. To guard against this, the use, in the manufacture of wall paper, of colors containing arsenic should not be permitted, and this precaution has been taken in Germany. Danger of poisoning also exists in the use of aniline dyes, although this is not so common as formerly because arsenic is no longer used for the oxidation of aniline. Epidemics of arsenic poisoning have arisen by drinking water or beer (Manchester) contaminated with arsenic from manufacturing sources. Here simple prophylactic measures suggest themselves.

TREATMENT

Acute Form.—The stomach should be speedily emptied by means of lavage or emetics, and the local antidote be given. This consists of the ferric hydrate, which converts the soluble arsenic, in the stomach only, into an insoluble arsenate of iron. The conversion from a soluble to an insoluble compound is also effected by other iron preparations, dialyzed iron being a convenient form, and by magnesia. The best way to give ferric hydrate is as prepared with magnesia; it should always be given freshly prepared, according to the U. S. P.; 60 gm. (℥ij) of the official Liquor ferri tersulphatis (or persulphatis) are diluted with 120 gm. (℥iv) of water; 12 gm. (ʒiv) of calcined magnesia are rubbed up in a half pint of water; the two are mixed, and the combination is given, at first one to two tablespoonfuls every fifteen minutes, then every hour. No harm can be done by this preparation, and the dose should be very large in order to produce the desired effects. Its value is enhanced by the fact that the magnesium sulphate produced by the double decomposition is valuable as a laxative, causing watery stools and removing the arsenic from the intestines. The "arsenic antidote," as ferric hydrate is called, is absolutely without value against the arsenic after it has left the gastrointestinal tract. In the latter case the treatment must be partly symptomatic, as we have no remedy that removes the arsenic from the system; opium must be given for pain, stimulants for collapse. The quantity of soluble arsenic and the rapidity and thoroughness with which the treatment is applied determine the result. If the poison has been thoroughly removed and rendered insoluble, the patient recovers; if not, he goes into the *subacute form*, which usually is fatal in from one to three weeks. But here, as well as in the chronic form, attempts may be made at elimination by means of mild diuretics and by diaphoretics. In the *chronic* form, in addition, symptomatic treatment must be used for the affections of the nervous system—multiple neuritis, paralyses, disturbances of sensation, skin troubles, ulcers and various eruptions, renal complications; the general disturbances, the cachexia, the loss in weight and strength, dropsy, and febrile conditions must be treated as the occasion requires. For the treatment of other intoxications the reader is referred to the appendix.

V. FOOD POISONING.

Food poisoning, under all circumstances, depends upon the taking of food that is toxic either on account of some innately toxic substance in food or because of development in the food or admixture with it of poison. The latter has to some extent already been described in connection with poisoning by the heavy metals. But it also occurs as the ingestion of toxic material by the animal which is afterwards used as food. The development of toxic properties in food is usually due to bacteria, sometimes to changes resulting from diastatic bodies. The diseases that are produced by the bacteria themselves, as tuberculosis, anthrax, glanders, trichinosis, septicæmias, etc., cannot be looked upon as intoxications, but as infections, and should not be included in the term "food poisoning." The innate properties that render food toxic are the presence of leucomaines or of organs producing poisonous substances. Finally, wholesome food may be introduced which, on account of changes occurring in the gastrointestinal tract, becomes poisonous (intestinal autointoxication). Classification of these various forms of poisoning can at present be made only from the point of view of ætiology (Brieger and Marx, Vaughan), as the clinical evidences are frequently the same with different causes. Husemann first began the introduction of a nomenclature, which was successfully completed by Vaughan.

MEAT POISONING (Kreatoxismus)

This is produced by the biological activity of the *Bacillus botalinus* of van Ermengen; this has been proved for sausages and ham, and is probably the case for all forms which arise from the ingestion of meats of different kinds—ham, veal, beef, mutton, chicken—which have been preserved in one way or another. To this class belong the epidemics that are due to canned meat, although in a number of instances the admixture of zinc or lead with the food in the process of canning may be the cause. In a number of other epidemics fresh meat has been looked upon as the cause. I have seen an epidemic arise from fresh veal and from fresh beef; under these circumstances some saprophyte is present which produces a toxic body, but a pathogenic organism may also produce deleterious effects in the human being. In these latter cases it is probably the *Proteus vulgaris*, found by a number of authors, which is the saprophytic cause; in one instance Levi found this organism not only in the meat which had been eaten, but also in the ice chest in which it had been kept. Game, quail, grouse, and hares are sometimes poisonous, probably on account of the food they have taken.

Prophylaxis.—This consists in the proper, cleanly handling of meat, and of its preservation. We do not know the life habits of the saprophytes, but we do know that they cannot multiply or produce poison in a live animal; and further, the public is entitled to the enforcement of absolute cleanliness in slaughter houses; this exists in the large slaughter houses in this country, but much should be changed in the smaller ones.

The same can be said for canning establishments; here the meat may contain the toxic substance before it is put into the can; when this is not the case, the exposure to the boiling point, necessary to proper preservation, destroys the bacteria; in the former instance it has no effect in preventing poisoning. Cheap canned meats should never be used, as the presumption that they are produced by cheap methods is warrantable.

TREATMENT.—When any poisonous substance belonging to this group has been introduced into the stomach, the earliest possible attempts at evacuation should be made. The course of the poisoning shows this to be necessary, for in those patients who vomit and have diarrhea the outcome is much more favorable than in those who do not have these symptoms or who are constipated. Besides, these toxic bodies are largely eliminated by the alimentary canal itself, so that in a degree toxæmia is relieved by these measures. The stomach should be emptied by lavage, which may be continued as in acute morphine poisoning (q. v.). Copious high injections should be given into the bowel. Calomel should be administered in small but very frequent doses. There is no reason to believe that the poisoning may be neutralized by any one of the intestinal antiseptics. Even when the case is not seen very early, these indications should be met in the way described, except that the stomach lavage need not be so frequent and calomel should be given in larger doses when the vomiting has stopped. For the toxæmia, those methods recommended under septicopyæmia (q. v.) may be tried. Kempner has produced an antitoxic serum from the *Bacillus botalinus,* which experimentally promises much. Pilocarpine has also been used; it would seem to be especially useful here by increasing secretion not only in the skin and salivary glands, but notably, according to Heidenhain, in the glands of the intestine. The forms of poisoning found in kreatoxismus are the gastrointestinal, the paralytic, and the exanthematic. Symptomatically in the bad cases the gastrointestinal form should be treated like cholera (q. v.); in the paralytic form special treatment is required for the manifestations due to intoxications of the circulatory and respiratory centers (v. Acute Infectious Diseases). The eruptions may require local treatment (v. Eruptive Fevers).

FISH POISONING (Ichthyotoxismus)

Rho (quoted by Brieger and Marx) divides fish poisoning as to its cause as follows: 1. By fish which are indigestible, the symptoms produced partaking of the character of intoxication. 2. By fish which have been affected in such a way as to contain ptomaines. 3. By fish which by preservation or peculiar ways of cooking have become poisonous. 4. By fish which have taken up poisonous substances. 5. By poisonous fishes, temporarily or permanently poisonous or having poisonous organs; with the exception of the last division, oysters, clams, lobsters, and crabs may act in the same way. It will be seen that the indications for prophylaxis and treatment are the same as in kreatoxismus. Except in that form produced by specific fish poison, it is more than likely that the *Bacillus botalinus* with the accompanying ptomatropismus is the cause. The poisonous fishes are found principally in the tropics; eels, even fresh-water eels, have poisonous blood. The symptoms produced by poisonous fishes are of the exanthematic and paralytic type, and must be

treated accordingly. The relation of chronic fish poisoning to leprosy and beri beri has already been mentioned (q. v.).

Mussel Poisoning (Mytilotoxismus).—In this form we have poisoning produced by a ptomaine—mytilotoxine ($C_6H_{15}NO_2$), first isolated by Brieger in 1885. We know nothing of the prime cause for the formation of this substance. The important fact that mytilotoxine does not occur in normal mussels has, however, been thoroughly established. It occurs only when mussels live in polluted waters, usually then in harbors. The PROPHYLAXIS is very simple; mussels should never be eaten that come from harbors or where there is any chance of pollution of water. The condition produced by mytilotoxismus is the paralytic form of food poisoning, sometimes leading to death in a few hours. When the gastrointestinal form is present, the paralytic form may not develop. The TREATMENT is the same as in the other forms of food intoxication.

MILK POISONING (Galactotoxismus)

(See also *Milk Fever*)

Milk is rendered poisonous by the products of bacterial activity and by the addition of substances that have been given as food to the animal taking the milk. The early spring grass produces changes in the milk that, when it is given to infants, are usually followed by gastrointestinal disturbances. The absence of toxic properties in milk is especially important for the question of the feeding of infants. In order to be reasonably certain of the absence of toxicity, as well as of infectiousness, of milk, the following precautions must be taken:

(*a*) *The Cow.*—She should be perfectly healthy and be kept in stables that are clean and properly constructed; her urine must be frequently removed, and also her bedding; she should be groomed like a horse, the udder and teats washed, and the tail kept free from manure; when her milk is used for infants she should be confined to the stable; she should be fed in such a way as to produce chemically the proper kind of milk and to prevent the entrance of deleterious substances into the milk, therefore dry food or ensilage and plenty of salt are required; fluid food should contain only water free from bacteria; artesian well water, now so commonly used in model dairies, is a perfect drink.

(*b*) *The Collection of the Milk.*—The milker should be clean, as nearly aseptic as possible; he should carefully wash his hands before milking, and wear clean clothes. The udder and teats should always be washed with soap and sterile water. Milk tubes should be used when possible. Strippings should be thrown away. All the vessels used for the collection of milk should be sterilized. As soon as possible the milk should be strained through sterilized cheese cloth. The milking should be done in such a place as is freest from bacteria.

(*c*) *Storing of Milk.*—After milking, the milk should be reduced to a temperature of 50° F. and kept at that, with all precautions against contamination, ready for transportation. This is best done in a vessel which can be sterilized by superheated steam and be kept at proper temperature for cooling by pipes containing cold water. As average milk—i. e., milk from a

number of cows—is commonly used nowadays, this vessel may be large, and the milk may be kept in it until ready for distribution, when raw milk is used (from tested cows only). Or it may be put into properly constructed and properly closed vessels. As sterilization or pasteurization is done to greatest advantage in the model dairy, both artificial heat and cold being at hand, one or the other should now be attended to. After this has been done, each vessel should be stamped or labeled with the date and time thereof.

(*d*) *Distribution of Milk.*—This should occur as soon as possible after the milk has been thoroughly cooled and subjected to the required processes. In cities this is most important where the source of the milk supply must of necessity be more or less remote. When the external temperature is above 60° F., the milk should be kept on ice during transportation. As the methods of the handlers of milk are notoriously bad, only trustworthy persons should be engaged.

(*e*) *The Household.*—As soon as the milk arrives it should be put into a cool, clean place. A separate ice chest is the best place, but if it is put into the common ice chest a separate compartment should be provided. The milk, unless perfectly sterilized, should not be used for infants thirty-six hours after milking; at the latest, in warm weather, twenty-four hours should be the limit. It is a good rule never to use milk from a vessel that has been opened for a previous feeding. As we have no means of detection or of counteracting toxines of milk, the most scrupulous prophylaxis is paramount.

TREATMENT.—This will be found in the chapter on diarrheal diseases in children.

Intoxication from ice cream is probably also due to bacterial toxines, the bacteria developing very actively in the culture medium, especially when vanilla is added (M. Wassermann). Milk and cream that are free from bacteria do not produce poisoning when given in the form of ice cream. The same can be said for custard.

Cheese Poisoning.—Vaughan, who has done much in connection with this subject, concludes that cheese poisoning is due to a bacillus of the colon group. He and Cooley came to the conclusion that "the toxine is contained in the germ cell, from which it does not, at least under ordinary conditions, diffuse into the cheese, and that the toxicity of a given sample may be measured by the number of colon germs present, bearing in mind always that these germs may vary in virulence in different samples, and even in different parts of the same cheese." The ordinary symptoms of cheese poisoning may also be produced by the quantity ingested, and in certain persons by certain kinds of cheese innocuous to most other people.

The PROPHYLAXIS must be applied in the manufacture of cheese; this has improved very much, at least in this country, so that dangerous cheese intoxications are very rare. The TREATMENT is that of the gastrointestinal form of food infection.

GRAIN POISONING (Sitotoxismus)

Ergotism.—This is produced by the ingestion of the mycelium of a fungus, the *Claviceps purpurea*, which has developed on rye or darnel. According to Kobert and his pupils, the active principles producing this disease are sphace-

linic acid and cornutin, but it is not likely that this view is definitive; the former is said to be responsible for gangrene, the latter for changes in the central nervous system, convulsions, paralyses, and tabes spinalis. This form of intoxication does not occur in its chronic form in this country.

Acute Form.—Produced, as a rule, by taking ergot in enormous doses as an abortifacient. In these cases the stomach must be emptied by lavage; castor oil must be given in full dose, and the symptoms of collapse and danger of respiratory or circulatory failure must be met by proper treatment. The choleraic form should be treated as in other diseases.

Chronic Form.—Prophylaxis is of great importance, but difficult to carry out in this form, which occurs in epidemics, although Weir Mitchell's erythromelalgia, in some instances, has been attributed to ergotism. It is always associated in its epidemic form with poverty, poor hygiene, and bad food. All these must be counteracted, and bread made from diseased rye must be forbidden.

TREATMENT.—For the gangrenous form the treatment is surgical. For the convulsive form opium, chloral, chloroform, or ether should be used. The paralytic form should be treated in the same way as all other intoxication paralyses; the tabetic form like locomotor ataxia (q. v.). Whatever else is required, plenty of animal food, vegetables, and wholesome surroundings are needed.

Lathyrismus.—Poisoning due to several members of the lathyrus (vetch), occurring as in the case of wheat famine in India, or when present in too large quantity in grain fields. The symptoms are commonly those of spastic spinal paralysis (q. v.).

Maidismus (Pellagra).—This is due to maize poisoning, the exact cause of which has not been determined. The PROPHYLAXIS should be carried out as in all food epidemics. The TREATMENT is successful in early cases by change of food and surroundings. After this, in the second stage the gastrointestinal symptoms require treatment. In the third stage the symptoms due to changes in the nervous system (as those of motion or sensation), the trophic disturbances, and the psychoses require attention. Cachexia may develop at any time so that a tonic course of treatment is usually indicated throughout the disease.

VI. INTESTINAL AUTOINTOXICATION

PROPHYLAXIS

The importance of intestinal autointoxication as an ætiological factor of disease is still in doubt, notably because as yet no one symptom or sign can be found which can be considered as characteristic. While its importance is magnified by Bouchard and his followers, enough is left to make it very valuable for practical purposes, especially for therapy. The mechanism of intestinal autoinfection depends upon the consideration of the intestinal tract, the organs and tissues through which the digested food passes, and the eliminating agencies. During normal digestion in the intestine toxic bodies are formed—albumoses, leucomaines; if these are introduced into the circulation in sufficient quantity, intoxication occurs—acute intestinal autointoxication.

This may be caused by the introduction of too large quantities of improper food or by certain intestinal conditions, the latter followed by disturbance in the function of motion. But it can be prevented, partially or completely, by certain protective functions within the body: the so-called "filtering function" of the liver, certain changes in lymphatic tissue as yet not precisely defined, and alterations that take place in the blood. In addition, we have the counterbalancing effect of elimination, which goes on wherever there is a mucous membrane, in the whole respiratory and digestive tract, but also notably in the kidneys and skin. When these various organs and apparatus are insufficient because of absolute or relative functional inactivity, relatively small quantities of intestinal toxines may produce symptoms. When they are permanently insufficient, chronic autointestinal infection is produced provided the food which has been introduced into the intestine is the proper kind to give rise during digestive changes to a sufficient quantity of toxic bodies. But in addition to this, which may be called the physiology of intestinal autoinfection, there is the pathology. The toxic bodies circulate in the blood; we therefore find functional disturbances in tissues remote from the intestinal tract, in the nervous system, and in all the eliminating tissues and organs. The change in their nutrition may, as it frequently does, lead to infections. But, in addition, the chronic existence of toxines in the blood leads to organic changes in the liver, the blood vessels, the composition of the blood, the respiratory tract, any mucous membrane, the kidneys, the skin, and probably the nervous system; moreover, the toxines predispose to infection. The chemistry of the condition is not thoroughly understood, but it is likely, on clinical evidence, that certain resultant bodies like uric acid and the urates, ultimate derivatives of chronic autointestinal infection, also produce pathological changes. At present we must look to intestinal autointoxication as one of the causes of acidosis. The food that produces autoinfection is albuminous; it may be introduced containing saprophytes, therefore the toxines are produced within the body, or there may be normal or abnormal changes going on primarily in the intestine when the quantity or quality is abnormal or motion is impaired. The prophylaxis then must take into consideration all the various elements just considered. Upon the whole, prophylaxis and treatment are identical.

TREATMENT

Acute Form.—This form may be found in perfectly healthy people, but in the majority of cases it occurs in those suffering from the chronic form, where it takes upon itself the character of the so-called "bilious attack," or in especially predisposed individuals it may be an attack of migraine. It may also occur in those who have any condition leading to obstructive conditions of the bowels. Prolonged constipation, complete or partial, leads up to it. The treatment should be directed to the condition of the bowels, either calomel or blue mass, followed by a saline, being given; the diet should be directed toward the nature of the attack, not the underlying conditions; the less food taken the better, plenty of fluid when the stomach does not reject it, nutritious fluids, such as milk and gruels, when they can be taken. Meat preparations should not be given, no soups, no broths, unless there is a special indication for their use. In children these attacks are not uncommon, acute

intestinal autointoxication being much more common than the chronic form. Here also the bowels should be cleaned out by calomel, rectal irrigation, etc. In order to prevent recurrences, the underlying cause must be determined; when due to the character of the food this should be changed; much good is done in proper cases by adding mechanically mildly irritating substances like oatmeal, hominy, or grits, to the food. In the adult, as well as in the child, all obstructive conditions in the bowel should be removed when possible.

Chronic Form.—(*a*) *Food.*[1]—The ideal method of feeding these patients is by vegetables. The advantages are the administration of albumen, vegetable albumen, in such a form that it will do least harm; the production of large quantities of fæces which, on account of undigested material, especially cellulose, produce regular evacuation of the bowels, the organic acids in the food tending to the same end. The disadvantages are summed up in the fact that the human being is not a vegetarian by nature, so that we find as a result of pure vegetarianism especially gastric disturbances, the overproduction of fat, and changes in the blood composition. As a matter of fact, all vegetarians add animal albumen to their food in the form of milk and eggs, and the combination of fruits, vegetables, fats, and carbohydrates with these two forms of albumen is the best way to feed these patients. There is no difficulty in obtaining sufficient caloric value in the food; the difficulty comes in with the patient's inability to utilize this value for metabolism. If to these various articles meat once a day is added, the patient, as a rule, is perfectly satisfied and does well; but this diet must be kept up for a long time, frequently for years. There are, then, three gradations: pure vegetarian diet, very difficult to carry out in this country; vegetarian diet combined with milk and eggs; vegetarian diet with meat once a day, to be prescribed according to the nature of the patient's condition. The meat may be of any variety; perfectly red meat, because of the tendency to anæmia, and this notwithstanding Bunge's assertion of the hemoglobin-producing power of egg yolks; fish may be given, which need not be included as meat in the diet. In very bad cases it may be necessary to start the treatment by putting the patient upon an exclusive milk diet as a nitrogenous basis, to which, after a short time, carbohydrates are added; and gradually the normal diet for the individual case.

(*b*) *The Gastrointestinal Tract.*—As Rigg's disease (Stomatitis Ulcerosa Chronica, q. v.) is present in most of these cases, the mouth must be treated locally. The conditions that exist in the stomach or that may be produced by the diet, especially by flatulent dyspepsia, should be treated as recommended under the heading of Diseases of the Stomach. Constipation must be relieved (v. Constipation), but in intestinal autointoxication saline cathartics are especially valuable in that elimination by the bowel is obtained. Any saline may be used: Epsom or Rochelle salts, sodium sulphate or phosphate, singly or combined, or one of the many aperient waters—Rubinat, Hunyadi, Fried-

[1] The present state of our knowledge in connection with scientific feeding is given in the chapter devoted to Diabetes Mellitus (q. v.), in which feeding is paramount. It is better to limit the use of coffee, tea, cocoa, and alcohol to the smallest amount consistent with the comfort of the patient.

richshaller, Kissingen, Carlsbad, Saratoga, Congress, or Hathorne, or salts made from them. The saline is best given before breakfast, and warm.

Sterilization of food is an impossibility. It has been shown by Thierfelder and Nutall that extraordinary precautions must be taken to keep bacteria out of the gastrointestinal tract in the lower animal. While these observers have shown, in addition, that bacteria are not necessary to digestion, we know that they are found in the gastrointestinal tract, and that, as in pancreatic putridity and under all circumstances, they take part in the normal digestive act. How soon bacteria are found in the intestines is shown by their detection in fæces of the newly born. Even if we were to prevent the introduction of bacteria by giving sterile food, we should have to sterilize the air, as in the stomach a respiratory change goes on. Aside from these impracticable procedures, destruction of bacteria within the intestines without destruction of the individual is an impossibility. For the much-vaunted intestinal antisepsis there remains only the indication of lessening the number of bacteria (saprophytic or pathogenic) contained in the intestine, and this undoubtedly can be fulfilled in various ways. The best way to remove them is by purgation—*qui bene purgat bene curat* is notably true here. For this purpose mercurials and sulphur-containing mineral waters which combine antiseptic with eliminative properties are especially valuable. Among these we mention the waters of Aix-les-Bains especially, those of Aix-la-Chapelle, Baden near Vienna; in this country, many of the springs in Virginia—warm, hot, salt, sulphur springs; West Baden, in Indiana; and many of the waters at Saratoga; but some of these must be reinforced to produce purgative effects. Intestinal antiseptics are also of great value; in powder form only such remedies should be given as pass the stomach and are then decomposed in the small intestine—salol, salacetol, and benzosol. In the pill form they must be given in the intestinal pill—i. e., one in which the coating is dissolved only in an alkaline medium. The best method for preparing these pills is the one recommended by Waldstein—viz., the coating with an alcoholic solution of shellac containing salol. Menthol, thymol (0.1–0.2 gm.—gr. jss.–iij), β-naphthol (0.3 gm.—gr. v *ter die*) are the most important substances used in this form. Rachford uses potassium permanganate in salol-coated pills (0.30 gm.—gr. v) on account of the oxidizing effects of the drug, affecting principally the leucomaines. The special indications for the use of these drugs cannot be precisely defined: the salol and its various combinations can be used in most cases tentatively, but should not be continued for too long a time; the benzosol is of distinct value where there is glandular involvement or suspicion of a tuberculous underlying cause; menthol seems to be most valuable when there is production of gas, and may be given for any length of time; the β-naphthol when there are evidences of putrefactive changes due to excessive production of skatol and indol—indeed, by its prolonged use the stools may be made almost odorless. Care must be used not to produce intoxication, which in the dose before recommended has never occurred in my experience. Potassium permanganate is useful in many conditions, especially when uterine complications are present.

(*c*) *Elimination.*—The means used for elimination from the bowels has already been described. The skin can also be called upon to assist in elimina-

tion; in order that the gaseous exchange may be stimulated, the process called "hardening" by the Germans should be used (v. Respiratory Diseases). For the elimination of the toxic bodies various methods may be used: Russian or Turkish baths, warm or hot baths, with or without addition of various substances, sodium bicarbonate, sulphur, ordinary salt, the warm pack. These may all be reduced to a method, and if necessary or advisable the patient may be sent to resorts—hydropathic institutes where balneologic methods are carried out. In this country, Hot Springs, Virginia; Mount Clemens, in Michigan, and Martinville, Indiana, have been of great service in my experience. Occasionally removal to a warm climate is indicated. The lungs also help in elimination, which is facilitated by exercise and by general or local breathing gymnastics. Of greater importance are the kidneys, and the best diuretic is plenty of water. In order best to carry out this indication, it is wise to prescribe some form of mineral water; Poland Springs and Waukesha are followed by excellent results, and there are many others in this country that do exceedingly well, for nearly all the fresh waters in Maine, along the Great Lakes in Michigan, Wisconsin, and parts of Canada, have the same effect, and many of them sooner or later will be exploited. Any form of pure water taken in sufficient quantities, not less than a liter (one quart) daily, will have appreciable effects; in order to get the full effect it is necessary to take three or more liters in a day. Certain of the before-mentioned waters can be taken in enormous quantities—three or four quarts and more daily—because they do not affect the stomach. The presence of small quantities of lithium in the water is advantageous, but when the quantity thereof becomes too large, as is the case in artificial waters, it produces disagreeable effects upon the stomach, the water becoming too "heavy" and the ingestion of sufficient quantity of fluid is then prevented.

(*d*) *Exercise* acts by increasing elimination, by removing the cause, and possibly by oxidation of the leucomaines. A patient with chronic intestinal autoinfection should take daily exercise—active where this is best suited to his tastes and physical condition, passive where that is not possible or proper, by massage or Swedish movements. Patients with sedentary occupations should be especially cautioned as to its importance.

Both the physician and the patient must take into consideration the fact that a long time is required to produce any result by treatment. The physician should never make the diagnosis of intestinal autointoxication unless he has made a careful differential diagnosis eliminating everything else. Then he should always be mindful of the fact that in order to treat the condition successfully he must try to find the cause, the removal of which will cure the patient. Any other method simply gives relief, valuable in itself and frequently the only one that can be adopted, as the causes of chronic gastro-intestinal intoxication are so many and sometimes so impossible of detection. The condition itself is well enough marked to be easily diagnosticated, and much therapeutic good has been done by its acceptance as a substantive morbid entity.

VII. SUNSTROKE

(Insolation, Heat Exhaustion, Thermic Fever)

PROPHYLAXIS

Whatever may be the view maintained as to the direct agent producing this form of disease, clinical experience and experimental evidence (especially the work of H. C. Wood) have taught us proper prophylactic measures. Heat alone may produce the symptoms, it matters not from what source; heat with lack of oxygen, with moisture, with temporary or permanent individual characteristics, is the most common cause. In this country especially, the combination of heat and atmospheric moisture is the principal cause, no summer passing without a greater or less number of cases of sunstroke, and sometimes it occurs in almost epidemic form. In Cincinnati, in 1881, more people died of sunstroke within a given time than in the comparatively extended period of cholera in 1886.

General Prophylaxis.—This consists in the prevention of exposure to the principal causes. It is a good rule that when the maximum temperature exceeds 90° F., all schools and factories should be closed—a rule that has worked very well when it has been carried out. In cities every effort should be made for people, especially for children, to get out into the country or upon the water, and public baths should be established. Where there is a large tenement population, the roofs of the houses should be so arranged that their inhabitants may spend as much time as possible upon them, insuring lower temperature and better air. Children should be kept in the shade and in the open air day and night, for in them thermic fever is quite common and very fatal. All public gatherings should be discouraged, especially in closed places; where they must take place, the various general exercises should be confined to the cool hours of the day. Military parades, marches, or maneuvers should not be undertaken, or when begun they should be interrupted. Every summer a certain number of professional, and especially of amateur, soldiers are killed in this way. In those countries in which militarism exists it may be looked upon as a mode of applying the law of the survival of the fittest, but humane military authorities do not take this responsibility unless forced by the existence of actual war. Cool places should be selected for halting places, and advantageously situated camping places should be chosen. All tenements, factories, and boiler rooms should be thoroughly ventilated; the problem of artificial cooling has long been solved for theaters, and can also be applied to dwellings, hospitals, and factories, as by artificial ventilation both pure air and air of the proper temperature can be applied. An abundant water supply should always be at hand. One of the many charities is the supplying of ice to the poor, for ice is a necessity in this country, not only to cool the drinking-water, but to preserve food, especially the food of children.

Individual Prophylaxis.—This is directed against both exposure and the increase of individual resistance. The protection against the direct rays of the sun is best provided for by nonexposure; if exposure is necessary, proper headgear should be worn: the Indian helmet, as now adopted for mail carriers, is the best; in India a cotton pad is also worn over the spine (Sir

J. Fayrer). If the helmet cannot be worn, a moist cloth, handkerchief, or sponge may be carried under the head covering, the turban being an efficacious headdress in tropical countries. In the cities in this country, even horses are made to wear bonnets, under which there is a wet sponge!

All clothing worn should be light in color, and loose fitting; in this country, the hot seasons have originated a style of clothing in men which, while not conventional, is beneficial and comfortable. The best material that can be used for summer wear is flannel, light in weight and in color, for it protects from without and increases radiation of heat from within. It is a very common sight in this country to see street laborers, both negroes and whites, working in the sun while wearing heavy flannel shirts.

The mode of living during hot weather should be strictly regulated. All things should be done in moderation—physical and mental exertion, eating. Except in those using alcohol habitually, no liquor should be taken. The quantity of exertion necessary in cool weather would be excessive in sunstroke weather; mental fatigue, overwork, worry should be avoided. The skin should be kept in good condition—one or more cold baths a day or cold sponges, according to the habits of the individual. As radiation of heat is in direct ratio to the quantity of perspiration, it is important that this be kept up, and for this purpose large quantities of fluid should be taken. As a rule, as long as the patient sweats sunstroke does not occur. Cool, pure water is the best, the water to be cooled by being placed upon ice. When this cannot be done, ice water may be taken, but not too cold (about 50° F.) or in too large quantities, as gastrointestinal disturbance may be set up. The dangers of drinking ice water made from pure water and pure ice have been largely exaggerated, but there are individual conditions in which harm is done. Fruit juices—lemon, orange, lime, raspberries—may be added. Carbonated waters should not be excessively indulged in; small quantities of iced tea, or better iced coffee, in persons taking either of these beverages daily, can be recommended. On some lines of railways the engineers and firemen drink oatmeal water. In these various ways not only is the action of the skin kept up, but the thirst is relieved, the internal temperature somewhat reduced, the blood and tissues are supplied with fluid, and the bowels are kept in good order. The diet should consist of little meat and plenty of vegetables and fruit; fats should be avoided; smaller quantities of food than the normal should be taken. As the loss of water in summer by the skin tends to produce constipation, this diet is the best; but on the other hand diarrhea must be avoided. For the constipation only the mildest laxatives should be given, relief being most safely afforded by rectal means; cascara, senna, rhubarb are the most important laxatives in hot weather, but when necessary calomel may be given; large doses of saline cathartics should be avoided. With children, calomel and rectal methods may be employed, and the giving of plenty of cooled water is indispensable; this is frequently neglected in infants, and is the cause of much morbidity. Infants get as thirsty as their elders; in them thirst is mistaken for appetite, with the result of overfeeding, and this contributes not a little to infant morbidity in hot weather. Attendants upon infants must be told to give water; in addition, I always advise the giving to infants of a small quantity of brandy (15 drops) during the hottest time of the day, well diluted.

TREATMENT

The slightest manifestation of sunstroke, vertigo, headache, faintness should be heeded, and the patient should be immediately removed to a cool, shady place, with loosening of the clothes—if necessary, removal of them. The cold douche should be applied if there is any increase of temperature; if not, some cool drink or the treatment hereafter to be recommended. This will frequently be followed by a cessation of symptoms. If relief comes, the patient should not return to his occupation, but should be removed to his home and kept quiet for at least twenty-four hours. If relief does not come, the diagnosis of the form of heat stroke having been made, the proper treatment should be applied. Even without premonitory symptoms, as is the case in a certain percentage of patients, this is absolutely necessary, although combinations of forms occur. For therapeutic purposes there are two forms, one in which there are present symptoms on the part of the nervous system, the other in which there is hyperpyrexia.

In the first form are found the mild cases of heat exhaustion which have been already referred to. The severe cases manifest themselves by intense affection of vital centers, fatigue, and paralysis of the vasomotor, the respiratory, and cardiac centers. The method of treatment here consists in the application of such stimulants as have already been referred to in connection with the same conditions in the acute infectious diseases. Whatever is done must be done quickly; the stimulants should be used subcutaneously, alcohol, camphor, ether, musk. In respiratory failure inhalations of oxygen are valuable; artificial respiration should be tried. Strychnine should be used in this form of the attack. Digitalis does no good; indeed, it probably adds to the danger. Occasionally, when the right heart is much dilated, venesection may be valuable, but it should be used only for this indication; indiscriminately used, it does harm. Local blood letting, by leeches or cupping, is more generally applicable; leeches at the temple or behind the ear, cups along the spinal column. To increase the action of the centers the reflexes can be called upon by external application—the douche, mustard plasters; in paralysis this is useless, in fatigue of the nerve centers it may do good symptomatically and temporarily.

In the *hyperpyrexial form* the vital indication is the reduction of the temperature; here we have a condition of the patient where the temperature itself kills. It matters not whether the cause of this temperature be due to paralysis of the heat-regulating center, to the accumulation of retained bodies, to an infection, or what not; it may go so high (112° F.) that life is destroyed by it. That this is the case has been abundantly proved by experiment, and the carrying out of this indication in practice shows a great number of lives saved. For this purpose ice-cold enemata, rubbing with ice, douching with ice water, the iced pack, and the cold bath with ice are used. All are valuable, and good results are obtained by them. The cold bath with ice floating in it and occasional rubbing with pieces of ice is in my experience the best, as the patient can be controlled most easily, and his temperature be taken when necessary. Cold enemata act insufficiently unless the ice water is put into the colon, and then there is danger of collapse. Antipyretics should not be used as a routine method, but the hypodermic administration of quinine is highly spoken of by

physicians practicing in tropical countries. This drug is very valuable in the continued fevers (the "ardent fever," the "Florida fever") seen in hot countries. In the treatment of hyperpyrexia it is indispensable to measure the rectal temperature while the treatment is applied so that it may not go below 100° F.; failure to do this may result disastrously. With this treatment, the usual symptomatic measures for the heart and blood vessels, artificial respiration should be applied. When there is no hyperpyrexia, but moderately high temperature, the milder hydrotherapeutic measures may be applied.

SEQUELÆ

The methods just recommended are life saving; in a large percentage of cases the patient never gets perfectly well. As soon as the patient has recovered sufficiently from a serious attack of sunstroke, he should be removed to a cooler climate. Even the mildest forms are frequently followed by intolerance of heat, and a return of symptoms when exposed to it. Those who have had severe attacks will frequently find it impossible to live in a hot climate. In addition, there are left obscure cerebral or meningeal changes leading to various combinations of symptoms—epilepsy, paralyses of various kinds, severe headaches, blindness, deafness. Psychical disturbances are very common—irritability, loss of memory, maniacal conditions, finally dementia. The neurasthenic condition which follows is sometimes pitiable. For the treatment of these the reader is referred to the proper chapters. Convalescents who have had serious attacks should be watched in order to prevent suicidal attempts. Upon the whole, the after-treatment of sunstroke may become a very difficult matter, and may tax to the utmost the skill and tact, but above all the common sense, of the physician.

SECTION IV

CONSTITUTIONAL DISEASES

I. ARTHRITIS DEFORMANS

PROPHYLAXIS

As we are still in the dark as to the ætiology of this disease, prophylaxis cannot be carried out in a scientific manner. The disease in a number of cases is an infection, as has been shown by therapeutic results, not so definitely by bacteriological research. A number of cases are on record. The presence of pus, even in small quantity, should be looked for upon mucous membranes especially—stomatitis ulcerosa chronica, also gonorrheal discharges, notably in women, in whom it is more common and is associated with affections of the genital tract. The disease has also followed attacks of influenza, especially in those in whom inflammatory conditions of mucous membranes have persisted. I have seen one case resulting from chronic otitis media in a young girl, which was cured after a mastoid operation. All sources of suppuration or conditions that may lead to infection should be removed. In children especially the infection theory must be taken into consideration. Those who believe in the neurotic origin of the disease look upon grief, worry, poverty, exposure, unsanitary surroundings, especially damp dwellings, as the cause. All these are also predisposing causes in infection, and should be guarded against as far as possible.

TREATMENT

Except the causal treatment just referred to, the methods used cannot be looked upon as curative. When a cause has not been found it is important that the physician treat the patient, not the disease; he should divest himself of all preconceived notions as to the ætiology of the disease. Much harm is done in this direction in considering the disease of gouty origin, especially in dieting the patient so as to reduce his strength. Heberden, who in 1782 first described the disease, knew that gout was not the cause, and this has been universally recognized.

General Treatment.—For this the principal indication is to keep the patient in good health, for in this way, if it be an infection, his resistance is increased; at all events he can bear his affliction with more equanimity, and remain, if only in a limited way, a useful member of society. All that

pertains to this indication should be recommended—fresh air, good food, cleanliness, cheerful surroundings, exercise, diversion, and work. If the patient cannot walk, he should drive in the open air, take air baths. Cleanliness of the skin and mucous membranes should be insisted upon; the daily tub or sponge should not be withdrawn except for special reasons. Exercise should be taken until the condition of the patient makes it impossible. After this passive exercise—massage, movements of various kinds—should be ordered. As a rule, these can be carried out by some member of the family or an ordinary attendant. A professional operator is valuable and for special purposes indispensable, but the expense is great; and as the poor are often afflicted with this disease, this must be taken into consideration. A certain quantity of work is of great value to the patient; if it is physical labor, it improves the general metabolism, and in the absence of pain retards anchylosis; if mental, it gives diversion and adds to happiness. The quantity of food should be regulated as to the systemic demand; the human being at rest requires less food than when at work—the aged less, the child more, than the adult. Neither obesity nor a reduction in weight is to be sought after; a proper balance as to intake, nutrition, and output must be striven for. In some cases overfeeding must be resorted to; this is especially beneficial in emaciated, irritable individuals. The food should be adapted to the patient, properly prepared, and in sufficient variety, so that the appetite does not fail. There is no special diet list that can be followed and no special kind of food is forbidden except for individual indications. Alcohol may be used in moderation, but never habitually. Tobacco should not be withdrawn.

Special Treatment.—*Medicinal.*—This form of treatment is very unsatisfactory as to cure. In the early development of organotherapy I treated six cases with thyroid extract; two were temporarily benefited, in the other four no effects were produced. Tonics, iron, the bitter tonics are frequently indicated. Potassium iodide has occasionally been used with advantage. Arsenic may also be given. The salicylic acid preparations are recommended by some observers. Much was expected from salol, which, however beneficial as it may be in some directions, has no direct influence upon the disease. Relief should be given for pain, but opium should not be given in this disease unless it is absolutely necessary; these are patients who become addicted to the opium habit. Relief can be commonly obtained by the use of the coal-tar products (v. Influenza), the number of which becomes greater and greater, so that at least the quality of novelty attaches to the latest. Nothing should be given that reduces the strength of the patient.

Hydrotherapy.—Much relief can be given by the proper use of water locally, and possibly the local process may be benefited by it. Packing the joints according to Priessnitz, hot-water applications, the hot douche, douching with friction, or rubbing with hot soapsuds. The general application of water may be made in the form of simple warm or hot baths, but usually the sulphur waters are preferred, and sometimes astonishing results are obtained by their use. In this country we have the establishments at Hot Springs, Virginia; Mount Clemens, in Michigan (one of the best); Richfield, in New York; Martinsville, Indiana; Saratoga, New York, and a large number of others. Simple thermal baths, such as we find in the Hot Springs of Arkansas and of North Carolina, are also valuable. When possible, the patient

should try balneological therapy, but we have no means of foretelling which individual case will be benefited by it.

Other External Methods.—Massage and Swedish movements have already been alluded to; the former may be used against pain, but both are especially valuable in keeping up the muscular tone, both local and general. Electricity is also valuable in this direction.

Counterirritation is used in various ways, and there are very few of these patients who do not have a favorite liniment which gives relief. Blistering and the actual cautery have been resorted to. Blisters are barbarous; it is better to use the Paquelin or the galvanocautery, as their action can be definitely controlled. Occasionally relief is given by external applications of iodine and other rubefacients. In so chronic a condition as arthritis deformans the whole medical armamentarium must necessarily be used. Orthopedic measures are sometimes necessary; much relief can be given, and the patient may be put in such a condition that he may use his joints with less difficulty. The hot-air treatment has not proved so valuable as was expected.

The conclusion as to the treatment of this disease is, that while it promises little as to curative effects, it is serviceable for making the patient more comfortable and prolonging his life.

II. CHRONIC RHEUMATISM

PROPHYLAXIS

We know nothing of the cause of this disease. While we accept a subacute or even a more or less chronic form of articular rheumatism, it has not been shown that the disease has any connection with it. Indeed, the name of the disease is the result of pathogenic and pathological conceptions that have been largely discarded. In the older works rheumatic affections are regarded as of great importance, especially as to serous membranes; but at present, with few exceptions, all these have been found to be due to specific causes. Whatever the cause of this form of rheumatism may be, it tends to chronicity. We know that it usually occurs in persons beyond middle life; that those engaged in certain occupations are frequently affected—washerwomen, laborers of various kinds, stablemen, street workers, all those employed in occupations necessitating exposure to dampness and moisture. We know that when occupation is changed, benefit may arise. Permanent residence in a dry, warm climate is of great value. The use of the baths recommended for arthritis deformans acts not only beneficially, but also prophylactically, in that exacerbations are prevented.

TREATMENT

The treatment resembles that of arthritis, with the addition that in some cases medicines are of more decided value. Potassium iodide seems to do most good. In some cases prolonged use of salicylic acid or its compounds is valuable. Guaiacum, the simple tincture or the ammoniated tincture, has been used, and on account of its constituents is valuable in various directions. The probable existence of autointoxicative processes must not be overlooked

in this disease; tentative therapeutic attempts in this direction should always be made by organotherapy or the other methods recommended for intestinal autointoxication.

III. MUSCULAR RHEUMATISM (Myalgia)

PROPHYLAXIS

This form of trouble occurs in people with individual predisposition, but it may occur in anyone. Here again, in the present acceptation of the term, there seems to be no connection with rheumatism. The clinical type of the condition is one represented by the result of quick, unpremeditated or unaccustomed muscular movement. A person stoops down or lifts something and finds that pain comes on suddenly so that he can hardly raise himself. Another indulges in some unaccustomed exercise: a middle-aged man indulges in some sport that he was proficient in as a college student, and he finds he has to go to bed with myalgia. The prophylaxis in such conditions is simple. In those predisposed the best prophylaxis is daily muscular exercise, but it must be applied generally. Occupations which call into play principally one set of muscles lead to myalgia; thus a great number of railway employees, especially conductors, complain of "kidney trouble"—i. e., lumbago. Some of these predisposed subjects watch themselves very carefully and try to prevent excessive motion of the group of muscles that become affected. Others in whom a diagnosis of a special disease has been made finding the wearing of an orthopedic apparatus of value. Most, however, apply some external measure to give support—bandages, plasters. The production of various kinds of plasters is an enormous industry in this country, showing both the frequency of this affection and the efficacy of support. This latter is the principal indication. Most of them produce counterirritation, and medicated plasters should be used with great caution, if at all, as poisonous effects (atropine) have followed their application. Exposure to cold should be avoided. If there is a gouty tendency it should be treated.

TREATMENT

In general the pain may be so great that relief must be given, and antipyrine or phenacetin or their compounds may be tried, but the most efficacious is a hypodermic injection of morphine. The quickest way to get over an attack of myalgia is by rest, and this is especially the case because, in all probability, an element of traumatism in the muscle must be taken into consideration. Electricity is of value, both the galvanic and the faradic currents; the former applied for a long time (five to ten minutes), the latter to produce counterirritation by the faradic brush; but this should not be used in the beginning of an attack, when the pain is very violent. Sittings should be had daily, and when the galvanic current is properly used relief follows, lasting after the first sitting for an hour or two; then with successive applications the pain is relieved for a greater length of time. After this massage may be used, and various counterirritants, such as the hot-water

douche or friction. In all these cases heat is beneficial; cold applications do no good. In a number of cases salol or its compounds are distinctly beneficial.

Lumbago.—In addition to the general treatment, dry cups will be found most valuable. They are to be applied over the seat of affection, as many as possible, and allowed to draw for a quarter to half an hour. Heat may be applied in the form of the hot-water bag, poultices, or hot fomentations. When the patient is able to get up, some form of support should be given to the affected part. This is best done by applying strips of zinc oxide surgical adhesive plaster; the advantages of this plaster are that it can be applied accurately, that it produces no dermatitis, and that the patient can keep himself clean while wearing it, as it is not affected by water. In patients having recurrent attacks, a well-fitting elastic bandage is of great service.

In those forms that may be called chronic, the treatment must be applied to the cause. It is a common view of laymen that this form of pain is due to some kidney affection; this is true in a number of cases, and these should be treated accordingly (v. Diseases of the Kidneys). In a large number of cases the cause is found in the intestines, in which case the pain is due to nerve impulses coming from the source of irritation, and then projected. In this connection we also find constipation or internal hemorrhoids. Some of my best results have followed massage of an enlarged prostate gland. At times the wearing of a suspensory bandage in cases of a very much relaxed scrotum or in varicocele is of great benefit.

Backache is a common symptom in neurasthenia, and the treatment of the cause, plus local treatment, as in the other form of lumbago, cures the affection.

Pleurodynia.—In pleurodynia the treatment is the same as in lumbago, except that dry cups are not of the same value.

Torticollis.—A form of torticollis described by Henoch, Holt, and myself is due to malaria, presents itself in intermittent attacks, and is easily cured by the administration of quinine in the proper way (v. Malaria). In ordinary acute cases, in addition to the general treatment, salol and antipyrine, or their compounds, are found of service. In many chronic cases surgical intervention must be resorted to.

IV. GOUT

PROPHYLAXIS

Gout is due to some faulty metabolism of the nitrogen bodies, the end product of which is uric acid, and which, as has been shown experimentally, produces nervous and fibrous change, the characteristic changes in the joints (His, Freudweiler, and a number of others). It is not absolutely proved that the bodies arising intermediate to urid-acid production (xanthine group) produce general symptoms, but that some toxic body is at work can be accepted, and experimental evidence shows that this is not uric acid. Anyone can demonstrate this to his own satisfaction. If pure uric acid is taken, dissolved in any state, any amount of it can be injected into lower animals without producing toxic symptoms. Gout, then, is due to the presence in the blood

of some body which may be developed within it or may be introduced into it, endogenous or exogenous, which can be localized in the form of uric acid in various parts of the body, or which may circulate in the blood, producing symptoms of intoxication and organic changes.

This substance accumulates within the body as the result of improper nitrogen metabolism, also by intestinal autointoxication and by improper elimination; it is developed from without by the introduction of food containing substances producing faulty nitrogen metabolism or the bodies themselves. The nitrogen metabolism is changed by hereditary tendencies, by the introduction of alcohol, in plumbism, and as the result of wear and tear, especially of nerve tissue; for the latter, Horbaczewski's view as to the origin of uric acid from nuclein, while clinically not proved for all conditions, may be accepted. Autointoxication plays a very important rôle in gout, how great no one can determine. Improper elimination may act absolutely in that there is an insufficiency of the eliminating organs due to either functional or organic changes, or relatively in that the work put upon the eliminating organs is too great. The introduction of improper substances reduces itself to the precursors of uric acid, and to those substances belonging to the purin derivatives: caffeine, theobromine, and theophylline. Prophylaxis, then, must be directed to these various points. It is especially the hereditarily predisposed who must be protected, and here Haig's principle of limiting the introduction of uric-acid producers is valuable. Sometimes the balance in the predisposed is so fine that a small quantity is sufficient to produce symptoms. Here as well as in most gouty subjects the diet must be looked to as regards quantity and quality (v. Treatment); the conditions of elimination, bowels, kidney, skin, respiration, must be attended to. Alcohol should not be used, except for special indications, in gouty subjects; tea, coffee, or cocoa, only in moderation. Open-air occupation combined with exercise is very valuable; sedentary habits should be discouraged. The "poor man's gout" is due to improper food and hygiene, and to alcoholism. Chronic lead poisoning (q. v.) should be guarded against, and here the condition is probably due to insufficient renal elimination, or possibly to excessive formation of uric acid.

TREATMENT

Acute Form.—The patient should be put to bed, the affected part being wrapped up in cotton so as to prevent increase of pain by contact with bedding. Occasionally hot applications, fomentations, lead and opium wash, tincture of opium added to the hot water, give additional relief. The remedy which seems to give most comfort is colchicum; this may be given in the form of Vinum colchici radicis (0.5–1 gm.—ℿ viij–xv), the Tinctura colchici seminis (0.3–1 gm.—ℿ v–xv), as colchicine (0.001 gm.—gr. $\frac{1}{60}$) or colchicine salicylate in the same dose. The wine and the tincture may be given three or four times daily, the colchicine preparations not so often. I prefer the whole drug to the alkaloids. We have no adequate explanation for the benefits derived from its use in the acute forms; unless the attacks come too frequently, it gives relief with great regularity. Care must be taken that a good preparation is given and that poisoning is not produced, the first symptoms of which should cause the remedy to be withdrawn. Opium can be combined with the

colchicum, and this is absolutely indispensable in some cases, even the subcutaneous use of morphine becoming necessary. In my experience nothing takes the place of colchicum, although the salicylates, salol, antipyrine, salipyrine, etc., have found some favor. The bowels should be kept well open by a saline cathartic. The proprietary preparations, usually containing excellent preparations of colchicum, commonly also contain some cathartic. The addition of alkalies is of value; citrates or carbonates of potassium or sodium are used. During the attack the food should be fluid, but nourishing, and according to the appetite may be more or less abundant. In some badly nourished, weak individuals alcohol is valuable; it should not be withdrawn during the attack from those patients who habitually use it. The fever can be controlled by some mild antipyretic; sometimes it goes high enough to require treatment. All those remedies used for dissolving uric acid, such as lithia, piperazine, etc., are without value in the acute form. In order to prevent recurrences it is necessary that the patient be put on a diet—that of chronic gout. He should be warned not to indulge in alcohol. If the patient is debilitated by frequent attacks or other causes, it is paramount that his general health should be improved. It may be necessary under such circumstances to resort to overfeeding, those articles of diet being chosen that have the least tendency to produce gout; of these, milk feeding is the most advantageous.

Chronic Gout.—The local treatment is that of arthritis deformans (q. v.), the general treatment that of irregular gout, to which must be added the treatment for the special complications that may develop, owing to its course.

Irregular Gout.—*Diet* is the most important element in the treatment of this condition. Many diet lists have been made out, depending upon the theoretical conceptions in vogue at the time or on the views of their authors. As will be seen, some are diametrically opposed to one another, and yet they do good in individual cases, showing how complicated the ætiology of this affection must be, and how little understood is its essence. My diet list, which seems to be beneficial to a large number of gouty subjects, is as follows: *Breakfast*—A small cup of black coffee, two eggs, crisp fried or broiled bacon, toast, and fruit. *Luncheon*—Fish, oysters, vegetables, fruit, milk, bread. *Dinner*—Meat, vegetables, salad, fruit, and bread. As this diet leads to deposit of fat, fatty substances in the form of salad dressings, rich sauces, cream, or butter are restricted. Of vegetables, only such as produce stomach symptoms should be avoided; the others should be prepared in the simplest way, not with stock, for soups are not to be used at all. Sugar is not given and carbohydrates are restricted because both may cause indirect fermentation in the stomach, and this does harm to intestinal digestion. When the digestive function is well developed (a rare occurrence in gouty subjects), sugar and carbohydrates should be given in moderation. White meat is preferred to butcher's meat, but so far experimental evidence fails to find any difference in result as to uric acid. All those organs containing large quantities of nuclein, such as brain, liver, sweetbreads, kidneys, should be prohibited. The eggs may be prepared in any way most agreeable to the patient—boiled, poached, or in the form of an omelet.

The late Dr. W. H. Draper followed a method of diet, which he said was the result of Bence Jones's investigations, for a great many years and with excellent results. It consisted in the use principally of meats to the exclusion

of carbohydrates, and therefore also of sugar. Physiological experiment has shown that carbohydrates prevent the complete utilization of nitrogenous food; if Horbaczewski's view is correct, uric acid is not produced from ordinary albumin, but only from nuclein. I have not been able to verify the statement that urea, which would be formed in large quantity by this diet, is a good solvent of uric acid. Provided uric acid is the only cause of gout, this dietary is absolutely correct from theoretical considerations as we now see them. It is certainly true that in a number of gouty patients, especially in the anæmic obese, it does good.

Sir Dyce Duckworth recommends a régime somewhat like the preceding, as follows: "Six or eight ounces of hot or cold water may be taken half an hour before breakfast. *Breakfast* shall consist of one or two ounces of well-toasted stale bread without butter, grilled white fish, grilled mutton chop or beefsteak, or cold chicken, game, beef, tongue, or lean ham. One or two small cups of tea or coffee, with a little skimmed milk without sugar, may be taken. Saccharin may be used as a sweet flavoring agent, but is commonly disliked. Six ounces of bouillon or clear soup may be taken between breakfast and luncheon by weakly patients, and with it a gluten or almond biscuit. For *luncheon,* order cold meat or a poached egg, with spinach or lettuce or other green vegetable, such as watercress, and mustard and cress, or a small omelet. A glass of good Bordeaux or Moselle wine (dry) may be taken with as much water. A cup of tea with a little skimmed milk and a rusk or gluten biscuit may be taken in the afternoon. For *dinner*, as a rule, no soup is to be given, but occasionally about eight ounces of a thin consommé may be allowed; then a little grilled or boiled fish, without fatty or starchy sauces, but flavored sometimes with anchovy or some other sauce, oysters, or caviare; a little grilled or roast meat, mutton with gravy, or fowl with a small proportion of fat; green vegetables, but no potatoes; and some stewed fruit, flavored with saccharin or made less tart by the addition of half a teaspoonful of Rochelle salt. Two glasses of claret or of a dry Moselle with water are allowable. Later in the evening a cup of hot weak tea without milk, or as much hot water, should be taken." No fat, no sugar, no starches except in the vegetables, but tea, coffee, soup once a day, and wine—a modification of Bence Jones's method, then, and also very valuable.

Ebstein's method of feeding is very much like that in obesity, and will be found in the following chapter.

Liquids.—The patient should drink as much water as possible. Alcohol is not allowable when the patient does well without it; but when he has no appetite, is weak and emaciated, small doses should be used. For this there is nothing better than diluted whisky, which contains very little, if any, sugar, and does not render the stomach acid. Malt liquors of the stronger kind should be forbidden, but the light German beers seem to do little harm, if we may judge by the comparative rareness of irregular gout in Germany. The heavy sweet wines—Spanish, Italian, Greek—cause gout more frequently than any alcoholic beverage. Burgundy is especially notorious for its bad effects, and champagne should be taken only very dry. An acute attack of gout may be set up by the liberal use of any one of these; one of my patients cannot take even light German beer without having an acute attack. Coffee, tea, and cocoa should be taken in very limited quantity; coffee and tea, when the

patient cannot do without them, without sugar and cream on account of the indigestibility of the combination. The patient should drink plenty of water; alkaline waters are used on the theory that uric acid is kept in a more soluble state in the blood by the addition of an alkali. Simple saline waters are also very valuable. In this country we have the waters at Saratoga, Bedford, Pa.; the Virginia Warm Springs, and the waters mentioned in the chapter on Autointestinal Infection. Alkaline waters have not as yet been much utilized with us except at Saratoga. Abroad we have Carlsbad, Marienbad, the various sulphur baths and indifferent waters. When the patient goes to a resort to take a cure, much of the benefit of mineral waters is due to the systematic way in which water is taken, to its large quantity, to the régime the patient is subjected to, to the change of surroundings and scene, and to the aperient effect of some of these waters. It will not do to say that the water alone produces the required effect when taken in the proper way or the proper quantity. Physical chemistry shows why waters differing very little from each other may have differing effects. For most of the lithia waters which are now being exploited in this country, the effects can be ascribed to the water and other substances; there is scarcely enough lithia in them to do either harm or good.

The diet and the drinking of water must be kept up for a long time; when possible, "cures" may be taken, as yet not so conveniently in America as in Germany and France. Some patients must always live upon their peculiar diet, which for the individual can be known only by a trial of one or the other methods or of combinations. But here, as elsewhere, no preconceived notion on the part of the physician should cause him to do harm to the patient; it is easy enough to reduce uric acid in a given quantity of urine; it is much easier, however, to reduce the patient when the physician is injudicious.

The character of diet should be selected with regard to the individual case: if there is endogenous gout, that form of diet should be selected which prevents cellular death; under these circumstances, especially in the obese, Draper's or Duckworth's diet might be tried. If the gout is in a spare, underfed patient, and of endogenous origin, more carbohydrates or fats should be used in addition to the regular administration—i. e., three times daily—of meat containing little nuclein. In exogenous cases, the number of which predominates in this country, the diet at the head of the list should be used, but always with individualization.

Medicinal Treatment.—Lithium is supposed to dissolve uric acid, but we know very little of its effects upon the human economy. Salicylic acid is said to have an effect upon the elimination of uric acid. Both these substances leave the economy by way of the kidneys. I am in the habit of giving daily a powder containing lithium benzoate and sodium salicylate, āā 0.3 gm. (gr. v), before breakfast, in Vichy water if there is no constipation; when this is present, the powder, combined with some aperient mineral water as in chronic intestinal autoinfection (q. v.). Piperazine, a solvent of uric acid in the test tube, has failed in practice against this form of gout. Quinic acid has been recommended on account of its producing an artificial hypoleucocytosis, and therefore diminishing decomposition of nuclein, also on account of some hypothetical effect upon glycocoll. It is used in combination

with lithium carbonate (urosine), with urotropine (chinotropine), and with piperazine (sidonal). In some cases I have seemingly derived benefit from the administration of the first substance combined with saline cathartics. Further experience is required to test its general usefulness. In a number of cases it will be found that the gout will be relieved by tonic treatment—with small doses of alcohol to stimulate the appetite, and thus to improve the general condition, and especially the nerve tone. In so-called "poor man's gout" this method is usually necessary, but frequently in the well-to-do we find patients who are reduced, especially from nerve strain and the consequent loss of sleep, loss in weight, and general adynamia, in whom the following out of this method gives complete relief to the gout. It is also indicated in those patients reduced by a large number of attacks following rapidly upon one another.

Exercise.—Here again the individual must be considered. Upon the whole, muscular exercise is valuable in gouty subjects. But given an emaciated, middle-aged subject with hardened arteries, who moreover has never taken much exercise, it would be manifestly improper to prescribe much in this way. On the other hand, the robust, who enjoy exercise, who are built with muscles that require usage, should be advised to indulge in it; but care is required even here.

Treatment of the Symptoms Produced by Changes in Organs.—This will be found in the respective chapters devoted to the diseases of those organs.

V. DIABETES MELLITUS

PROPHYLAXIS

The cause of this disease has not been definitively determined, but the more we study it the more we can come to conclusions valuable both for prophylaxis and treatment. There is in most cases a predisposition; in some only a direct cause. When these elements occur together in a great degree we are apt to have bad cases. The predisposition consists in some elementary cellular weakness, either inherited or acquired. The direct cause may be sought for in diseases of the nervous system, especially affecting the medulla, the pons, and the cerebellum; in diseases of the liver; in Graves's disease, and notably in diseases of the pancreas when organic changes exist. In all these diseases it is not necessary to have a predisposition, disease of one or the other of these organs being sufficient to produce diabetes mellitus. In a number of direct causes the predisposition plays a most important rôle, in that without it no diabetes can develop; here are found syphilis, a number of the acute infections, traumatic and surgical neurasthenia; excesses of various kinds, mental or physical. It may be stated that prophylactic measures are of the greatest importance as applied to the direct cause, notably in syphilis and malaria, in both of which it is necessary to treat the infectious disease as thoroughly as possible, and in the prevention of excesses of every kind.

The *predisposition* is a cellular weakness as to the binding of glycogen, which has not as yet been experimentally completely proved, but which is

more marked the more it is abused. Its existence can be determined by the family history, which is that of diabetes, gout, obesity, and of neuropathies. If 100 gm. of glucose are given before breakfast and the urine passed after six hours is examined, the presence of glucose must be looked upon as an indication that glucose metabolism is not normal. The late Dr. W. S. Christopher attempted to establish a "saccharine diathesis" in a very interesting essay, which however awaits verification by other observers.

Prophylaxis should begin with children. When children of hereditarily predisposed parents are found especially with tendencies to neuroses, gout, or obesity, the physician should give directions as to diet, exercise, and general hygiene (v. the Treatment of Gout, Diabetes Mellitus, the Neuroses). Ebstein states that individuals in whose families are found grave forms of diabetes should not be allowed to marry any more than those having an hereditary tendency to epilepsy or severe psychoses. All adults with hereditary tendencies should be warned as to the necessity of keeping within bounds as to quantity in diet; they should not take much sugar, too much food of any kind, either solid or fluid. When obesity has developed, this should be treated in a rational way—i. e., reduction of weight should not be accomplished too quickly, for in the prediabetic period it may be followed by diabetes, as I have seen it in several cases. When glycosuria exists, reduction in weight may be followed by grave forms of diabetes. When one member of a married couple becomes diabetic, strict measures should be applied to the other, especially if in the latter there are hereditary diabetic tendencies. In my experience I have seen five cases of so-called "conjugal diabetes," and I believe, with Lecorché, that in all these cases only improper food plus the predisposition was to be looked upon as the cause. Acting upon this principle, I am sure I have been able to prevent a number of instances of conjugal diabetes by putting the unaffected member of the couple upon the same diet as that of the affected one. To show how this method operates, I may repeat the following: The husband became diabetic twelve years ago; as the wife had hereditary tendencies, her father having died of diabetic gangrene, she was warned of the possibility of the development of diabetes in her own case. She was advised to live on the same diet that was ordered for her husband. After ten years, no diabetes developing, she became tired of her diet and ceased to conform to instructions, and in a short time diabetes mellitus manifested itself in her. This case at the same time demonstrates the difficulties in carrying out prophylactic measures, as in adults who have the right of doing whatever they may please as regards health it is practically impossible to act prophylactically. In children, however, it may be much easier, yet at the ages when it is most necessary even here prophylaxis is most difficult.

TREATMENT

Dietetic Treatment.—Before attempting to give the treatment of diabetes mellitus it is necessary to describe the principles upon which the treatment of all nutritive diseases is based. In all these diseases both the quality and the quantity of the food must be taken into consideration. The quality of the food is determined by what is considered the cause of the disease under treatment; it thus becomes a question of chemistry. As far as chemistry itself

is concerned, it must be confessed that suggestions only can be obtained from it, as the chemical structure of most of the complex bodies we have to deal with is but imperfectly understood. No chemist can tell us why the serum of an animal that has been treated by injections of human blood will precipitate only human blood or blood of apes, although the chemical reactions of all the precipitins seem to be the same. The same may be said of the reaction in diabetic patients to potatoes and oatmeal, both of which we may at times use in diabetics with impunity, and then always with benefit. And yet, rudimentary as the science of physiological and pathological chemistry must be regarded, it would be wrong not to try those methods that have been suggested by deductions made from chemical experiments and investigations. The quantity of food we are now expressing by means of figures which, if right, at first sight would seem to be mathematically correct; these figures are the result of physiological experiment. As such, the statement of the physiologist, A. Fick, who was also an eminent mathematician, that an average error of twenty per cent in a physiological experiment was as little as could be expected, must be taken into consideration. Besides this there are other limitations to the mathematical expression of the quantity of food. The human being is not an ordinary machine; as has been stated, the chemical processes which go on within him are but imperfectly understood. Above all, the human being has individual characteristics which, in consequence not only of their variability but of their complexity, cannot be expressed by any mathematical formula. It is especially in individualization that the physician gets the best results in this class of disorders. And yet the expression of quantity of food in mathematical terms has its value, as it gives us a working formula which can be controlled by other evidences—the appetite, the digestion, the blood-forming functions, the weight, the general tone, the condition of the various systems.

The quantity of energy (potential) that is contained within any food is determined by its caloric value, it being understood that all the functions of the body are dependent upon energy of some sort. The unit of energy used here is the calorie, which is defined as being the amount of heat which will raise the temperature of one kilogramme of water one degree centigrade. As the result of direct investigation by means of the calorimeter it has been found that one gramme of albumin or one gramme of carbohydrates is equal to 4.1 calories; one gramme of fat equals 9.3 calories. From this the heat value, or, if necessary, the mechanical value, of any given food (the latter in that one calorie equals about 1.50 foot-tons) can be found. If the chemical analysis of any food is taken, it is necessary only to multiply the percentage of each constituent part by its appropriate caloric value, and the sum of these will be its whole caloric value, which is the unit we use in feeding. The following example will illustrate the determination of values in calories.

In 100 gm. of cow's milk we find:

3.6 gm.	of	albumin	× 4.1 =	14.76	calories.
4.0 "	"	fat	× 9.3 =	37.20	"
4.7 "	"	carbohydrates	× 4.1 =	16.40	"
		100 gm.	of milk =	68.36	calories.

It has furthermore been determined that for twenty-four hours the human being requires a given number of calories for every kilogramme (2⅕ lbs.) of his weight, as follows:

For the adult:

At rest	30–35	calories	per	kilogramme.
In motion	35–40	"	"	"
When working moderately....	40–45	"	"	"

From this latter table we are enabled to establish the quantity of food required for any given individual, thus: For a patient weighing 68 kgm. (150 lbs.) the amount of food expressed in calories would be $68 \times 35 = 2{,}380$. In order then to keep this human being supplied with enough energy, it would be necessary to give him this number of calories in twenty-four hours. In health, for complete nutrition these calories must be divided between the albumin, the carbohydrates, and the fats in such a way that, according to the Munich school, there shall be present 17.5 per cent albumins, 8.4 per cent fats, and 74.2 per cent carbohydrates. Given, then, the weight of the individual, the number of calories required in twenty-four hours, and a table containing an analysis of foods and the relation of the various foods to each other, we are prepared to feed the patient as a furnace is fed—the limitation, as stated before, being that the human being is not a furnace. However, we know approximately what the output of this human machine should be under normal conditions by examining the urine, the fæces, the sweat, and the expired air. By regulating the intake and changing it the output can be regulated and changed. In various diseases both are abnormal; and as both can be changed by diet—for we know approximately how the various foods enter and leave the human being—the importance of treating certain diseases by diet seems self-evident. It will be stated, and with justice, that in treating or removing from the output a substance which is abnormal we are treating only a symptom, which in the end cannot be of great service to the patient, since the cause of the disease is not thereby removed. This is exactly the objection that has been raised against the dietetic treatment of diabetes mellitus. In answer to this objection the following points must be taken into consideration:

1. The longer sugar can be kept out of the urine in a diabetic the greater becomes his tolerance of carbohydrates.

2. Because of the presence of an increased quantity of sugar in the circulation and the tissues, any number of symptoms are produced, as well as organic changes, which in themselves may cause a fatal issue.

3. As the result of chemical changes, the result of faulty metabolism, a fatal issue may follow.

4. Because some of the intake which is converted into glucose cannot be utilized there is a deficiency in calories; therefore the patient's nutrition suffers.

5. The patient as a rule feels better when he is sugar-free.

The following example will illustrate the gross effects upon a patient with diabetes mellitus: A diabetic patient weighing 68 kgm. (150 lbs.) requires 2,380 calories to retain metabolic equilibrium, as 35 calories per kilogramme of weight is sufficient in most of these. If this patient has diabetes mellitus

and passes 4 liters of urine containing three per cent of sugar, there is a deficit of just as much as is represented by the number of calories in the sugar—viz., 492 calories (120 gm. of sugar × 4.1 calories = 492 calories).

This patient's metabolic deficit is represented by this figure, for instead of obtaining 2,380 calories by his food, he gets the difference between this sum and 492—i. e., 1,888—which deficit must be made up by destruction of his own tissues; and thus ensues a loss in weight. In order to prevent this deficit, the 2,380 calories must be derived from such food as does not produce sugar (grape sugar, glucose, or dextrose); for ordinary cases of diabetes this means albumins and fats. Apparently we are not giving here food that contains carbohydrates, but it seems to be shown that in the decomposition of albumins in the system, 100 gm. of albumin produce 45 gm. of carbohydrates. But from what has already been said, this rigid diet is not permanently necessary. To this food may be added alcohol, of which 1 gm. equals 7 calories; it is not necessary, however, to give it except to such patients as are accustomed to taking it daily. In so far as dextrose alone is concerned, the dietetic question has been answered for ordinary cases.

But there remains another, even more important point: the prevention of harm from a number of substances which follow the metabolic changes in diabetics; these substances are grouped under the general term of acetones. By acetones are meant oxybutyric acid, diacetic acid, and acetone itself; it is supposed that oxybutyric acid is the mother substance, which during normal metabolism is oxidized into the higher oxygen compounds, diacetic acid and acetone, the latter being the end product. Under normal conditions the oxidation of oxybutyric acid goes on to the production of its end product, so that only traces of acetone are found in the normal urine. In the diabetic, however, there is always danger that this oxidation may become incomplete, and there is then produced that condition called acidosis. Acidosis is one of the great dangers to diabetics; in its completely developed form it produces diabetic coma; when less developed, many bad results are due to it. It becomes necessary, therefore, to arrange the diet in such a way as to prevent it, or when present in moderate degree to counteract its harmful effects and to prevent its further development. The prevention of acidosis depends largely upon the care with which the patient is watched, notably in the examination of the urine for acetones. For acidosis in general, estimation of the ammonia in the urine is sufficient.

The acetones are derived from the oxidation of fat, albumin, and in the diabetic also of the carbohydrates. In order to prevent acidosis in most diabetics, the first rule is to restrict the whole quantity of food given; the latter can be controlled by repeated weighing of the patient; when the weight of the patient diminishes without sugar or acetones (a few decigrammes of the latter in twenty-four hours is considered a normal amount—v. Noorden) in the urine, the quantity of food should be increased. When the weight diminishes with sugar or acetones in the urine, the quality of the diet must be changed—i. e., it must be found whether the fats or the albumins are producing the acidosis. When the weight is stationary or, what is rare, increasing, and sugar or acetones are found again, the diet must be tentatively changed to find the cause. As soon as the slightest evidences of acidosis present themselves, alkalies should be given; Naunyn recommends the giving of as

much sodium bicarbonate as will make the urine slightly alkaline; as much as 50 gm. and more, given during the twenty-four hours, may be found necessary. Von Noorden adds alkalies to his first test diet, and with good reason, for we know that sometimes the complete withdrawal of carbohydrates, with or without the addition of large quantities of fat, leads to acidosis.

What has been stated applies in general to the dietetic treatment of diabetes mellitus, but each case of diabetes mellitus must be treated as an individual case. What advantage is it to the patient if we reduce the sugar or the acetones and he dies of inanition? How much benefit to him will it be to prescribe food of sufficient caloric value which he cannot eat, or if he eats it cannot digest? In addition, it must be borne in mind that the chemistry of diabetes is far from being so conclusively settled that it can be applied with mathematical certainty to any case. I firmly believe that the dietetic treatment is the best for this disease, for reasons stated above, but I should not like to be confined to it in treating diabetes mellitus. In other words, it is necessary here, as everywhere, to treat not only the disease, but the patient.

For therapeutic purposes we may divide the cases into the mild and the severe. The mild form is that in which the urine can be made sugar-free by diet, and tolerance is well marked; the severe form, that in which this is difficult or impossible, and where carbohydrate tolerance is very small.

My *routine method* of treatment is to give to the patient a test diet; after the urine is sugar-free his tolerance of carbohydrates is established, and from this his permanent diet is computed. In order to diet a patient a food table is required, and I have used Atwater's table of American foods, which will be found in the Appendix. The routine method may be used in all cases in which there is no evidence of a dangerous complication, so that further reduction in weight can do no harm. It must be used with great care in cases which at the outset show severe glycosuria and polyuria; also in such as have the evidences of marked acidosis (v. Treatment of the severe form). It is not necessary, as a rule, for the patient to go to a hospital; usually he can go about his business. All that is required of him is to weigh and to measure his food; in practice this meets with very little opposition, for after the patient has done this three or four times he can approximate the quantity of food without weighing it. If the patient, for some reason, is so situated that he cannot diet himself properly, then he should be sent to a hospital.

The test diet which I have used will be found below; it is calculated for a man weighing 150 pounds; it may be tried for lighter individuals, and in the majority of instances it is taken with satisfaction. In some instances, however, the patient cannot eat all that is prescribed. In order to prevent any possible trouble by sudden withdrawal of carbohydrates to begin with, 25 gm. of bread are allowed with each meal; the second day this is allowed for only two meals; the third day for one meal, and then not at all. After the patient has been sugar-free for a week his tolerance to carbohydrates is tested by the addition of wheaten bread. As wheaten bread contains about fifty-five per cent of starch, it will be seen that by giving quantities of bread until we reach the point at which sugar appears in the urine we shall find the quantity of carbohydrates the patient can take, and this quantity can then be applied to a diet which will have to be followed for a greater or less length of time.

TEST DIET.

		Calories.
Breakfast.	Six ounces of coffee or tea with one-half ounce of cream	25
	One-quarter pound of ham or bacon with one egg	565
	Twenty grains of butter	150
Luncheon.	Omelette made from two eggs without flour, with vegetables	175
	One-quarter pound of meat with sauce prepared without flour. Salad or cucumbers with French dressing	350
	Twenty grains of butter	150
	Six ounces of tea or coffee.	
	Six ounces of some table water.	
Dinner.	Meat broth or soup with one egg	75
	Five ounces of fish prepared with butter	200
	One-quarter pound of chops	350
	One-eighth pound of vegetables	15
	One-half ounce of cheese (full-cream cheese, Neufchatel, Stilton, or Brie)	130
	One drachm of butter	450
	A small cup of coffee and some table water.	
	Total	2,635

In the beginning there must be added the calories contained in bread: 100 gm. = 55 calories.

Salads can be made from lobsters, chicken, shrimps, crabs, cucumbers, lettuce, tomatoes, string beans, asparagus, water cress. The following vegetables may be allowed: Cabbage, cauliflower, spinach, asparagus, tomatoes, egg plant, string beans, artichokes, okra, Brussels sprouts. They all contain more or less starch, but this may be neglected because the quantity of vegetables taken at one time is very small.

As a result of this procedure we have now found that the patient can be made sugar-free—i. e., that the case is a mild one, and also how much carbohydrates may be given as food. After the lapse of a week or ten days the patient is put upon a more liberal diet than the test diet, but one still free from carbohydrates. It may be said that, strictly speaking, it is not a carbohydrate free diet any more than was the test diet. The more so is this the case in that I add to it either oatmeal or potatoes or both. First the tolerance to oatmeal is tested; an ordinary breakfast dose of well-prepared oatmeal is given; if after three days no sugar appears in the urine, it may be added permanently to the diet. If sugar appears, it must be given up. The same is done with potatoes, of which not more than an ounce or an ounce and a half should be given in one day. It rarely occurs that patients tolerate both at the same time. If they do tolerate one or both, the foregoing table, with this addition, will be found perfectly satisfactory to most patients. Oatmeal may be used as a breakfast food; bread can be made from it, and also desserts. The importance of giving some form of bread to diabetics cannot be overestimated. Those who can take potatoes are best off, because many desserts, and even bread, can be made from potato flour. The patient can now, with these additions, be left either upon the test diet or upon the one which follows (modified from v. Noorden):

I. *Fresh meat* of all kinds of animals, prepared in any way, with any kind of sauce except those containing flour. Internal organs may also be eaten, but

not in too large quantities (four ounces). All preserved meats may be allowed—smoked ham is better than sugar-cured ham. Sausages.

II. *All fish*, whether salt or fresh water. All the crustaceans—oysters, clams, lobsters, etc.

III. *Eggs.* Prepared in any manner—except with flour.

IV. *All* animal or vegetable fats.

V. *Cream*, sweet or sour, up to one-fifth litre a day.

VI. *Cheese*, especially full cream cheese.

VII. *Fresh vegetables.* Salads: Lettuce, endive, Romaine, dandelion, and those mentioned before. Garnishing: Parsley, dill, leek, garlic, celery, water cress. Green vegetables: Those mentioned before. Bulbs: Onions, young turnips, radishes, horseradish. Stalks: Asparagus, celery, chicory, rhubarb. Blossoms: Cauliflower, Brussels sprouts, artichokes. Mushrooms. Also truffles in small quantities.

Fruits. Strawberries, blackberries, cranberries. Sweetened either with saccharin or crystallose; better eaten cooked when not quite ripe.

Preserved vegetables. As a rule these contain less carbohydrates than raw vegetables. All the green vegetables mentioned before may be used in this form, to which may be added haricots verts, string beans, small green beans, wax beans, pickles, olives, chow chow, and the various combinations of pickles.

Spices. The various kinds of pepper, salt, cinnamon, curry, cloves, lemon juice, vinegar, allspice, mustard, capers.

Soups. Meat broths or soups of any kind made from any kind of meat or from vegetables allowed. To which may be added anything contained in this list.

Desserts. Made from eggs, cream, almonds, lemon or gelatin—in proper cases oatmeal or potato meal—saccharin or crystallose to be used for sweetening.

Drinks. Artificial and natural carbonated waters. Lemonade sweetened with saccharin, crystallose, or glycerine. Alcoholic drinks: Brandy, rum, whisky; very dry champagne, hock, Rhine wine, chablis, Burgundy, or claret. (Special sugar-free wines for diabetics may be obtained in this country.) Coffee and tea as before indicated.

This is a very liberal diet, and in its use the patient requires very little supervision. With the addition of bread it is sufficient in scope for anyone. The bread question is a very serious one; oatmeal or potato bread may be used, the latter giving complete satisfaction. All the so-called diabetic breads should be analyzed before they are given to the patient, provided no analysis of them exists. Wheaten bread may be given up to the quantity indicated by the patient's tolerance, or any one of the following carbohydrate-containing substances of which the number of grammes placed next to it represents 100 gm. of wheaten bread (also modified from v. Noorden to represent American foods. American wheaten bread contains 56.3 per cent of starch):

Breads. Graham bread, 93; rye, 106; pumpernickel, 120.

Crackers. Boston, 122; soda, 125; pilot bread (hard tack), 131; oyster, 137; oatmeal, 123; Graham, 123.

Natural Meals. Wheat flour, 74.9; whole wheat flour, 70; rice, 79.4; corn, 70.6; hominy, 77.4; barley, 78.1; rye, 78.7; Graham, 70; cracked wheat, 74.6; buckwheat, 76.1.

Starches. From whatever source, 170 to 175.

Fresh Fruits. Cherries, apples, pears, from 540 to 600; plums, gooseberries, 750; strawberries, 850; apricots and peaches, 1,000; raspberries, whortleberries,

1,200; plums, blackberries, 1,500; watermelon, 560; nutmeg melon, 1,080; bananas, 2,600; oranges, 1,600; lemons, 600; pineapple, 800; cranberries, 1,050.

Milk. Milk, 1,350; sour milk, 1,500.

With these tables we are now in a position to determine the exact diet in a mild form of diabetes; the longer the patient can keep it up the better for him in every respect; his sugar tolerance increases; he feels better; indeed, everything is accomplished that was set forth in the beginning of the chapter. I make it a rule to examine the urine once a month; by many one per cent of sugar is considered a satisfactory therapeutic result, but in my opinion this is erroneous; for if the patient can be made sugar-free, he can be kept so, and only in this way can the best permanent effects be produced. I have never seen a case of diabetes mellitus cured, but by this method of treatment I have seen tolerance established for nine months, during which time the patient ate ordinary food in quality and in quantity.

The *treatment of the severe form,* such as we find it principally in children and young adults, differs somewhat from the treatment of the mild form. After a test diet has been given it is found that the urine cannot be made sugar-free, or if this can be accomplished, the tolerance of carbohydrates is very small; but in either instance the polyuria persists, the patient continues to lose weight, or the acetones do not diminish. Here the principal object of treatment is to see that the metabolic deficit is diminished or prevented. The diet must be studied out for each individual case according to the rules laid down when considering the mild form. In some of these cases the feeding with large quantities of oatmeal (250 gm. in the twenty-four hours), large quantities of butter (300 gm.), albumen derived from eggs, and cognac or whisky succeeds in causing sugar, acetone, and ammonia to disappear from the urine. In addition to this the patient gains in weight, and his tolerance begins to increase.

Here we also have to take into consideration the milk cures. According to our table for converting food into so many grammes of wheaten bread, 100 gm. of bread equal 1,350 gm. of milk, so that in this ratio milk may be used in any diabetic. In the very severe cases, where there is no appetite but great reduction of strength, and as constant waste of tissue, something must be done. Here two liters of milk, when possible, or as much as can be given, is of enormous value. There is no theoretical explanation for this; but a similar condition exists as to the carbohydrates of oatmeal, potatoes, and sometimes of rice, any of which in proper cases cause reduction in sugar as well as in the other abnormal urinary constituents. One of my patients takes commercial glucose not only with impunity, but with benefit to herself. It is only by trying different forms of carbohydrates that we can tell which one will be of benefit to the individual patient. In very bad cases meat should not be given, for when the digestion is not normal meat in and of itself tends to the production of acidosis (not diabetic acidosis), resulting in an increase of urine ammonia. When the urine cannot be made sugar-free certain medicaments should be given (v. Medicinal Treatment). I have succeeded in several instances in thus making the patient sugar-free when dieting alone did not accomplish it.

Hygienic Treatment.—*Psychic.*—In the psychic treatment of these patients much judgment is required; they have to know what ails them in order that the treatment may be carried out, and they must not be made nervous about it, as it is thoroughly established that there is a neurogenous form of diabetes, and that any excessive psychical effort will make the diabetes worse. To sensible patients, the proper explanations as to prognosis and duration of the disease will suffice. In neurotics much more is required; frequently the fact that the sugar can be entirely removed by diet is most reassuring, but the relapses due to errors of diet again bring on the uneasiness about the danger from the disease. Under no circumstances should the physician examine the urine too frequently; above all, the patient should not be encouraged either to examine it himself or to have it examined by anyone else except his physician. It is a miserable existence to have one's happiness controlled by the amount of sugar in the urine.

The patient should be spared as much worry and irritation as possible. He should not be encouraged to give up his occupation, except in the severe form, as idleness tends to encourage introspection. But his duties should be reduced in such a way as to be accompanied with as little friction as possible. Yet we all see middle-aged diabetics who continue in full work, apparently without damage to themselves. One of this class, a lawyer with a very extensive practice, was under my observation for twenty years, all this time doing full work; in addition he was a bleeder, and died of an uncontrollable hemorrhage.

Climatic.—Every subject of a mild case of diabetes should be encouraged to try a change of scene and air once a year; when possible, twice. This should not be done by continuous travel, but by settling down in a place different in every respect, as much as possible, from the patient's home. It is self-evident that if the patient is absolutely cut off from his daily occupation, his chances of rest are much more favorable than when he is constantly informed of the daily goings on in his business or profession. It does not matter so much what climate he chooses, although high altitudes are not usually beneficial; the principal thing in the choice of a place is its suitability as to surroundings, so that the patient may have proper exercise and proper diversion, but especially that he may have the diet appropriate to his condition and his individuality. Before he leaves home it is well to have him sugar-free, but this may be put off until he arrives at his destination, provided it can then be done in a scientific way. Ocean voyages are not contraindicated; in some instances excellent results have been obtained by long sea voyages. As there are no special climatic indications, the choice of place must be determined by the characteristics of the individual case.

Exercise.—The effect of exercise upon sugar elimination was thoroughly understood by Trousseau, but with the accurate use of gymnastics it has again been reintroduced as a method. Its benefits depend partly upon the effect produced upon the patient by diversion, increased nerve tone, and general oxidation. But a large part of the good done is due to direct oxidation of glycogen. It has been shown that when a dog is subjected to forcible muscular movements the glycogen disappears from the liver, being converted into sugar in the blood, but again reduced to glycogen in the muscles, for whose contractions it seems to form the normal source of energy. When muscle

contracts, then, glycogen is oxidized; when this contraction is very great the glycogen in the muscle is used up, and the glycogen stored up in the liver is called upon to take its place. As a final result, we find, both in the liver and the muscles, less glycogen to be converted into sugar, to be bound by the cells, and to be eliminated by the urine.

The selection of the kind of exercises, active or passive, depends upon the nature of the case and of the individual. As far as the individual is concerned, his tastes should be consulted. For the case, the condition of the urine, the heart, and the blood vessels, and the coexistence of gout or obesity must be taken into consideration in accordance with the indications set forth in the respective chapters.

For active exercise golf, tennis, rowing, walking, riding, or hill-climbing, or any other form which requires the patient to be out of doors, may be ordered. For passive exercise massage may be used in any case. All severe forms are excluded from the active forms of exercise.

Care of the Skin.—As diabetics are predisposed to various kinds of skin troubles, a great many of them being due to infections, cleanliness of skin is of enormous importance. This cleanliness can be attained by daily bathing; it matters not very much what kind of baths are used. *Neutral soaps* should be used in washing, some of the soaps containing mild antiseptics—tar, boric acid, eucalyptus, etc.—may be recommended. When an infective process has started, the greatest care should be taken that the surrounding skin or that of remote parts does not also become infected. Here the local use of iodoform, iodol, or aristol, or of Lassar's paste may be recommended.

When patients can bear cold water upon the skin in the form of a douche, sponge, or plunge bath, the effects upon the general nervous system, as well as upon the peripheral circulation, are excellent and very important in that certain skin lesions may be prevented.

Gastrointestinal Tract.—The condition of the mouth should be looked after (v. Stomatitis); special attention should be given to the teeth (Riggs's disease and carious teeth). Ewald lays great stress on the condition of the stomach, and Sawyer has reported a series of cases in which the results as to glycosuria and general condition were excellent, due solely to the symptomatic treatment of the gastric condition.

The treatment of constipation in diabetics is of great importance; constipation is followed by autointoxication and acidosis, and the danger in its persistence lies in the production of diabetic coma. Diabetics are usually constipated because of the loss of so much fluid by the kidneys; the diet should always be arranged in such a way, when possible, as to prevent this. If this is not possible, then saline cathartics, Carlsbad salt, sodium phosphate, Epsom or Rochelle salts, or any of the many aperient mineral waters should be tried. If these are not efficacious, the other remedies mentioned in the treatment of chronic constipation (q. v.) should be tried. Pilocarpine is very valuable here.

Diarrhea is treated in the ordinary way.

Medicinal Treatment (Causal).—**Syphilitic Diabetes.**—If the diabetic has a syphilitic history, it will do no harm to put him through an antisyphilitic treatment. It is needless to say that it should be done without harm to the patient; the greatest attention should therefore be paid to the condition of

the mouth, and the treatment should be of the mildest kind in order not to produce reduction in general health. When the antisyphilitic treatment is not carried out most carefully more harm than good is done. We are not all in accord as to the beneficial results to be obtained by this method in diabetes; for myself, I have never seen any benefit from mercurial treatment in diabetes, whether due, supposedly, to syphilitic lesions in the pancreas or in the brain.

Neurogenous Diabetes.—I use this term because it includes a large number of cases in which the nervousness *per se* seems to be the cause of the disease. Here the treatment should be that of neurasthenia (q. v.); in these cases medicines are most valuable, since the nervousness may be reduced by their use.

Pancreatic Diabetes.—Lancereaux (1877) was the first to point out a clinical connection between diseases of the pancreas and diabetes, and his discovery was confirmed by experiments by v. Mering and Minkowski in 1890. As a result, pancreatic preparations were given to cure the disease. Since 1891 I have given to all my diabetic patients pancreatic preparations, and I have proved them to be active by artificial digestion experiments. Yet I have had no results whatsoever with this therapy. In steatorrhœa, Fairchild's pancreatin gave good results in doses of 0.3 gm. (gr. v) three times daily, but this was not accompanied by any marked change in the urine. In two cases of steatorrhœa iodine preparations were much more useful, and the permanent result was arrived at in a shorter time. The whole subject of pancreatic diabetes in human beings is as yet obscure, but it seems self-evident that whatever form of disease is found in the pancreas, arteriosclerosis, cysts, pancreatitis, or calculi, should be treated when possible.

Symptomatic Treatment.—The dietetic treatment, which is largely symptomatic, has already been stated. As for medicines, in order to state whether a remedy reduces the diabetes it is necessary that it should be tried alone—i. e., without putting the patient upon a diet. With this in view, I can recommend the following remedies: Arsenic is of value in the greatest number of cases; it acts by preventing the conversion of the liver glycogen into sugar, but this can be accomplished only when the animal upon which the experiment has been made is poisoned by the drug. In the human being intoxication is not necessary; but large doses are required, and this is the reason why all authors who have not obtained any results from arsenical therapy have failed. The arsenic should be given as in chorea (q. v.), and up to such doses as to produce physiological effects. It does not act curatively, and tolerance is not increased by its use; but it is most valuable in the severe form, especially when combined with diet, as it does reduce the sugar, increases the weight of the patient, and improves his nerve tone; in other words, makes a complete interruption in his downward progress. Combined with the proper diet, it is invaluable in these cases. Next to arsenic in efficacy is opium; it should be given in small doses at first, and then be gradually increased. It, too, does not cure, and no increased tolerance is produced by it; but, like arsenic, it is valuable to tide the patient over a difficult place or to make him more comfortable when he can no longer be tided over. Neither morphine nor codeine can be used as a substitute. Accidentally one of my medical friends found that in a case of pyelitis in a diabetic the administration of urotropin caused the sugar to disappear. Since then (two years) I have

given it to patients whom I could not trust as to diet, with the result that in many of these patients the urine remained sugar-free while they took the drug, and apparently tolerance was set up for some time afterwards. They took urotropin in doses of 0.3 gm. (gr. v), three or four times daily, for months, without any untoward effects.

All the other remedies recommended have only an indirect effect upon the sugar in the urine. Such are the bromides and ergot; the various creosote preparations and salicylic acid preparations; antipyrine and its combinations; iodine preparations; chloral hydrate and lactic acid, all of which find indications, and then are good for the patient. For jambul or myrtilla, which have been recommended as specifics, there is no indication, and no benefit follows their administration.

The use of alkalies will be referred to again in connection with diabetic coma (v. Complications).

Mineral Waters.—For the purpose of treating diabetes mellitus, alkaline-sulphur and alkaline waters are taken internally. Among the former, Carlsbad is the most effective. Among the latter we find Vichy and Neuenahr. In this country mineral waters have not been much used for the treatment of diabetes mellitus. At Waukesha good results are obtained; Saratoga and a number of other places have suitable waters, but in order to get good results great stress must be laid upon the diet and surroundings of the patient. The best results are obtained at Carlsbad because all these things are taken into consideration there, and also because the Carlsbad waters are beneficial to the greatest number of cases. In Carlsbad great care must be taken not to reduce the patient too much; therefore patients in the latter stages of diabetes should not be sent there. As a result of proper treatment in the mild cases, the patients improve enormously, their tolerance is increased, and some of them get well. The severe forms are not improved so often as are the mild ones; indeed, some are made worse by the treatment.

COMPLICATIONS

The most important of these is diabetic coma. The prevention of this complication has already been referred to. In addition to the urinary evidences, which may be counteracted by alkalies, it is distinctly understood that other things besides dietary transgressions may bring on diabetic coma. In a certain number of cases it seems to be a terminal condition. Excessive fatigue, either mental or physical, is frequently followed by diabetic coma. In one of my cases of diabetic coma, fatigue brought on by excessive exercise was the cause; in another worry, excitement, and disappointment in connection with an unfortunate love affair was followed by coma.

The *treatment* of diabetic coma is exceedingly unsatisfactory; while there is a possibility of preventing its development, the probability of curing it is very remote. I have seen improvement follow treatment in one case, but cure never; that some are cured, or possibly get well, cannot be doubted. The treatment is based upon the theoretical assumption that the coma is due to an intoxication. The acidosis is treated by intravenous injections of alkaline solutions when coma has developed; before this by large doses of alkalies. For venous transfusion a five-per-cent aqueous solution is used, of which

250 c.c. are injected at a time, every three or four hours, until 1,000 c.c. have been used. As soon as symptoms of acidosis set in the diet should be changed; as before stated, a saline cathartic should be given, and all other medication stopped. Various stimulants may be tried as the case progresses—ether, valerian, ammonia, caffeine.

For some of the other complications the rule holds good that removal of sugar from the urine removes them; this is notably the case with the skin complications. For the pruritus there may be added, for external use, ichthyol (ten- to forty-per-cent aqueous solution, or in salve form), unguent. diachyli (Hebra), yellow oxide of mercury ointment (one to five per cent), or douching with weak solutions of mercury bichloride.

In gastrointestinal complications the diet should be regulated in accordance with the indications for the complication, not as to the diabetes.

In pulmonary tuberculosis the urine should be made sugar-free, plenty of fats being given unless the patient is too far advanced in the tuberculous process.

In the various forms of neuritis, dietetic therapy is without value. Neuralgic conditions must be relieved, but with them diet is essential.

VI. DIABETES INSIPIDUS

PROPHYLAXIS

There is no prophylaxis except in so far as the cause of this condition is concerned. The mechanism of the production of this disease, or syndrome, is not thoroughly understood; we must therefore be satisfied with clinical classification and therapeutic results largely based upon experiments.

TREATMENT

Causal Therapy.—In those cases in which there is organic brain disease the result of the treatment depends upon how much or how little can be done for the condition of the brain. As a rule very little can be expected here; the lesions are commonly found in the pons, the medulla, or the cerebellum, where surgical intervention is out of the question and medical treatment, except in syphilis and arteriosclerosis, is without effect. In those cases in which diabetes insipidus follows trauma purely symptomatic treatment should be used, which is efficacious or otherwise in accordance with the nature of the traumatic injury. Gerhardt mentions one case of tuberculosis of the cervical vertebræ in which the diabetes insipidus disappeared after treatment with suspension.

Syphilis produces this disease in one of two ways: either as the result of syphilitic brain lesions or in an indefinite way, the diabetes frequently developing years after infection. Many cases have been cured by antisyphilitic treatment, and as in the adult a syphilitic history may or may not be definite, it is a good rule to place every adult with diabetes insipidus upon a course of the iodides. This will be efficacious likewise in connection with the treatment of arteriosclerosis, which either with or without the presence of syphilis plays a very important rôle in the ætiology of this disease. If there is a

syphilitic lesion, the result of treatment upon diabetics depends upon the effect of the treatment upon the lesion.

The most common cause for this disease is hysteria, or the ill-defined condition called nervousness. In patients with hysterical stigmata, suggestion alone frequently cures, as also does hypnotism in a number of cases. Certain it is that those remedies are most successful which have the most direct effect upon the nervous system. The neurotic origin of diabetes insipidus is much better marked in children than in adults, and consequently the therapeutic results are better. The statistics of hospitals in regard to frequency and course of this disease are absolutely without value, for in private practice, especially among the better class of patients, most physicians see more cases than can be found in the records of most hospitals. In the treatment of this form of diabetes, then, all measures that act by suggestion or upon the nervous system should be used. Hydrotherapy is given in the form of douches, warm or cold baths, packs, the half bath; I can recommend the latter, especially in all nervous children. Electricity may be tried; I do not believe that it matters how or where it is applied; one patient failed to respond to galvanization of the cervical sympathetic and promptly got well after franklinization; in another the faradic brush applied to the soles of the feet and the palms of the hands was followed by cure. The remedies to be used are the following: Valerian preparations in the form of zinc valerianate (v. Epilepsy), the fluid extract, or the tincture, and always in large doses; antipyrine in normal doses frequently is very valuable; it gives relief in the greatest number of cases next to valerian; and finally the bromides.

Symptomatic Treatment.—The object of this is primarily to relieve the polyuria; for when this disappears the patient's condition improves, and in most instances he is cured. In some cases the withdrawal of water is of great benefit; the cases in which this method should be used cannot be determined precisely. Where the output of water is greater than the intake the results are not always good; where the opposite condition exists, all that is necessary is to limit the quantity of water taken to about 1,000 c.c. in the twenty-four hours. The withdrawal of water should be gradual, as a sudden withdrawal may cause great suffering except in those cases which are purely hysterical, where the permanence of the effect is greater in cases of sudden withdrawal. As a rule this method of treatment can be successfully carried out only in a hospital.

Many remedies are used to control the activity of the kidneys; ergot, to cause vasomotor constriction of the blood vessels, is at times efficient. Jacobi uses atropine, and recommends it very highly, either with or without ergot. Opium and codeine are also recommended; they relieve thirst and diminish secretion. Chloral hydrate and the bromides may also be included here, but the fact must not be forgotten that all these remedies have a decided effect upon the causal neuroses, and their action may be explained in this way; this is certainly the case with belladonna and atropine.

Another method of relieving the polyuria is to increase the activity of the skin by means of sweating produced by sweat baths, jaborandi, or pilocarpine, a method that can be of service only in the neurogenous form.

The result of treatment is excellent in all these cases except in those in which there is an irremediable organic cause.

VII. OBESITY

PHYSIOLOGY

In the human body fat is produced by food, and by any kind of food—proteids, carbohydrates, and fats. The greatest amount of fat deposited in the body is derived from the fat in the food; next to this come the carbohydrates—100 gm. of starch or 111.1 gm. of sugar, producing about 41.1 gm. of fat; last are the proteids, which produce small quantities of fat. The normal function of the fat in the human body is to produce energy by its decomposition into H_2O and CO_2. This probably occurs in two ways: by its production of glycogen in the liver, and directly from the tissues in which it has been deposited. The human being cannot subsist on a meat diet. This can be shown by the following simple calculation: a man weighing 70 kgm. would require 40×70 calories $= 2{,}800$; now, as lean beef yields about 950 calories to a kilogramme, it would be necessary for him to consume about 3 kgm. of meat in twenty-four hours, which is an impossibility for any length of time. It is equally impossible for him to live on starch or fat, for the simple reason that no proteid is supplied to the economy. For the deposition of fat in the human being, then, we have to take into consideration mixed diet—i. e., meat plus starch and fats. If in a mixed diet a quantity of proteids is sufficient to meet the requirements of nutrition, and to this almost any amount of fat is added, nearly all the proteid will be decomposed and nearly all the fat will be deposited. If under the same circumstances carbohydrates are taken, they will be converted into fats, and then deposited.

The deposition of fat is always due to a disproportion between intake and output of food. This disproportion may depend upon the quality and the quantity of the food; it may also depend upon the individual taking the food. The quality of food has just been referred to; the quantity is always an excess (absolutely or relatively).

Individual characteristics that predispose to obesity are many. Heredity is probably the principal predisposition—certain races have a peculiar tendency to obesity. The sexual function has a decided effect upon deposit of fat—in females the development of puberty, gestation and lactation, the menopause; in males it is said that castration produces obesity, although this is contraindicated by some observers. The habit of eating and drinking too much, which frequently depends upon environment as well as heredity, is the most common cause. The "too much" is the quantity unnecessary for nutritive requirements, and this of necessity varies with the individual. When this excess can be utilized by excess of effort, then no deposit of fat takes place. A quantity of food may be normal for one condition of life and excessive for another; thus we see a patient, who has never before accumulated fat, do this after he has reached a certain age; when he changes his occupation; if he has any disease which prevents the normal oxidation of food; chlorosis or anæmia, chronic diseases of the brain, the lungs, the heart, all tend to induce obesity.

PROPHYLAXIS

This is very difficult. It is sometimes even difficult to say when a patient is fat enough to require medical attention. Again, it is almost impossible to convince people, especially young people, of the danger of gaining too much weight. This is quite natural as, apart from more or less inconvenience, no symptoms are produced by the obesity, and as long as the patient feels well no steps will be taken to prevent the development of symptoms. It is easier with those who have seen the bad effect of obesity in relatives. If the points mentioned in the introduction are taken into consideration, prophylaxis is easy, consisting as a rule of the various measures to be recommended under treatment. In boys and girls I have found it necessary in more than one instance to send them away from home, so as to change their dietary as well as their sedentary habits.

TREATMENT

The objects of treatment are: (1) To reduce the fat without harm to the patient; (2) to prevent the reaccumulation of fat, again without harm to the patient. The indications for reducing fat are to be found when it accumulates too much. The question of when there is too much fat is one of diagnosis, as in other diseases, which can be answered only by the physician. Tables I and II, on the opposite page, may be of assistance in this direction.

Treatment is contraindicated sometimes. Obesity should not be treated in tuberculosis unless there is more danger from the fat than from the tuberculosis. At present, with the exact methods of reducing fat, there is not so much danger as formerly, but even now the greatest care should be exercised in these cases. I have frequently seen dietetic reduction of weight in patients with latent phthisis pulmonalis followed by an active tuberculous process. Neurasthenics also should not be reduced in weight unless the fat does harm or is excessive (fifty per cent or more than indicated in the table). It is a universal experience that a deposit of fat is favorable in neurasthenia. Young people, especially during or shortly after the sexual development, should be treated very carefully. If their weight is much reduced, they become anæmic and nervous. In them, as well as in children, the rule should be followed not to permit them to gain weight—i. e., measures should be prescribed which cause the weight to remain stationary. In the fat heart, or any other myocardial disease, reduction of weight should not be attempted unless accompanied by the proper treatment for the heart.

Dietetic Treatment.—As was seen in the introductory physiological remarks, the quality of the diet is not of such importance as it was formerly thought to be. In order to fulfill the requisites of a proper method of treatment the diet must be mixed, for no human being can live on one form alone. All articles of food lead to fat formation—i. e., storage of fat in cells; it is true that meat leads to less fat deposit than carbohydrates or fats, but this is somewhat compensated for by the proteid-sparing function of the two latter groups. That the success of dietetic treatment depends not so much upon the quality as upon the quantity of the food can be practically demonstrated by the good results obtained from one of the many dietetic methods now

TABLE I.—FOR ADULTS

Average American Weights and Chest Measurements for Given Heights.

(Life-Insurance Tables.)

Height.	Chest Measurement.	Weight.	Height.	Chest Measurement.	Weight.
5 feet	33 inches	115 lbs.	5 feet, 7 inches	38 inches	145 lbs.
5 feet, 1 inch	34 inches	120 lbs.	5 feet, 8 inches	38½ inches	148 lbs.
5 feet, 2 inches	35½ inches	125 lbs.	5 feet, 9 inches	39 inches	155 lbs.
5 feet, 3 inches	36 inches	130 lbs.	5 feet, 10 inches	39½ inches	160 lbs.
5 feet, 4 inches	36½ inches	135 lbs.	5 feet, 11 inches	40½ inches	165 lbs.
5 feet, 5 inches	37 inches	140 lbs.	6 feet	41 inches	170 lbs.
5 feet, 6 inches	37½ inches	143 lbs.	6 feet, 1 inch	41½ inches	175 lbs.

TABLE II.—FOR CHILDREN. (Landois.)

Age, Average Length and Weight—Males and Females.

Males.			Females.		
Age.	Length.	Weight.	Age.	Length.	Weight.
Years.	Cm.	Kilos.	Years.	Cm.	Kilos.
1	69.6	10.00	1	69.0	9.30
2	79.0	12.00	2	78.0	11.40
3	86.0	13.21	3	85.0	12.45
4	93.2	15.07	4	91.0	14.18
5	99.0	16.70	5	97.0	15.50
6	104.6	18.04	6	103.2	16.74
7	111.2	20.16	7	109.6	18.45
8	117.0	22.26	8	113.9	19.82
9	122.7	24.09	9	120.0	22.44
10	128.2	26.12	10	124.8	24.24
11	132.7	27.85	11	127.5	26.25
12	135.9	31.00	12	132.7	30.54
13	140.3	35.32	13	138.6	34.65

used. A comparison of some of them will show how they differ in regard to the relative quantities of various foods. (I may state here that the Banting method will not be taken into consideration; it has only historical value; for practical purposes it is unnecessary nowadays. It is not a method that gives permanent results, because in the majority of cases the human being cannot use it without detriment.)

In twenty-four hours there is allowed

By Oertel.....	170 gm. of albumin,	120 gm. of carbohydrates,	45 gm. of fat.
" Ebstein.....	102 " "	47 " "	85 "
" Hirschfeld.....	134 " "	122 " "	46 "
" v. Noorden.....	155 " "	112 " "	28 "
" Landois.....	156–170 " "	156–170 " "	43–125 "

All these methods are valuable, as I know from experience. The quantity of albumin is relatively the largest; next to this comes the quantity of carbo-

hydrates, except in the method of Ebstein and Landois, to which special reference will be made hereafter; and lastly the fat. But in all these methods the number of calories is small (from 1,300 to 1,600), and this is the secret of success in the dietetic treatment of obesity.

How, then, do we estimate the quantity of food to be given in a given case? Supposing a man weighs 220 lbs. (100 kgm.), do we give him a diet the caloric value of which is $100 \times 40 = 4{,}000$? If we wish to reduce his weight we go to our table of heights and weights: our man is five feet eight inches in height, he therefore should weigh 148 lbs. (65 kgm.), and his caloric value for treatment is calculated from what he should weigh—either $65 \times 35 = 2{,}275$ calories or $65 \times 40 = 2{,}600$, depending largely upon the rapidity with which the reduction is to be accomplished.

We have so far spoken entirely of solid food. It now becomes necessary to speak of liquid foods. Beverages containing alcohol should be prohibited if possible, but if they are taken, their caloric value must be included as food given (v. Appendix, Food Tables). Chauveau first discovered the fact, which was already known to the ancients (Pliny), in an observation upon a horse of the Cents Gardes, that withdrawal of water prevented deposit and reduced the quantity of fat already deposited. This fact has been taken advantage of by a large number of physicians, and the withdrawal of water alone has been successfully prescribed by them in the treatment of obesity. Oertel has added this to his method, and has given a hypothetical explanation of the way in which it acts, which however does not explain. In order that water shall have no effect upon fat deposit, it must not be given with the meals; one to two hours after meals it may be drunk with impunity. The reason why water taken with meals increases fat is because it improves digestion and facilitates absorption. When fat people drink much fluid with their meals, the withdrawal of this is frequently sufficient to cause reduction in weight unless they eat too much at the same time, when the consumption of the solids must also be looked into. Some patients find it very difficult to abstain during meals from fluids, and this term includes not only water, but all beverages—coffee, tea, soup, etc. In such cases a wineglassful of fluid may be permitted at first; usually no reduction, or very little, takes place, and then the patient is willing to try total abstinence.

Whichever one of the dietetic cures is used, some additional treatment is necessary, principally in the form of exercise, to be described hereafter.

With a food table and the principles before given, a diet list for the obese can be constructed by anyone, if he takes care to individualize for each case. But it is convenient to use one that has been tested, so that the use of it becomes like the use of a tool to which one is accustomed. For this reason I use Oertel's table principally, but where the patients are very fond of fat and digest it perfectly I prescribe Ebstein's. I have one patient who has a great fondness for fats; this man, when he wishes to indulge himself, will take as much as 300 gm. of fat with one meal in the form of butter and olive oil. He originally weighed 325 pounds, and would have continued to gain because of his inordinate joy in the pleasures of the table if a fat heart had not prevented his following his occupation. Using the Ebstein table as a basis, with suitable exercise, he has lost 100 pounds in the course of two years; but one day of joy, as he understands it, will result in a gain of from

six to eight pounds. Fat, even when not agreeable, prevents to a certain degree the deposit of fat because it inhibits digestion; the trouble with its administration is that the degree of inhibition cannot be controlled; if there is too much, gastrointestinal symptoms develop; if too little, the fats, in connection with the proper caloric calculation, simply act as any other food.

Oertel's table, modified for American patients, is as follows:

		Calories.
Breakfast.	Wheaten bread 1½ ounces; one soft-boiled egg; coffee, 4½ ounces; milk, 1 ounce; sugar, 60 grains.....	415
Luncheon.	Caviare, 1½ ounces; 1 or 2 soft-boiled eggs; beefsteak, fowl, game, 5 ounces; salad (green), 1 ounce; cheese, 1 dram; bread, 1½ ounces; fruit or water, 4 to 5 ounces.....	130
Dinner.	Soup (clear), 3½ ounces; fish (containing little fat), 3½ ounces; roast or boiled beef, veal, game, poultry, 6 to 8 ounces; green vegetables, 1½ ounces; bread, 1 ounce; fruit, 3 to 4 ounces; light wine, 4 to 5 ounces; coffee, 4 ounces; milk, 1 ounce; sugar, 60 grains.....	765
	Daily total	1,310

The caloric value of the food, when the smaller quantity mentioned is given, is represented by 1,310 calories; when the larger quantity, as 8 ounces of meat instead of 6, is prescribed, there is a difference of nearly 200 calories. The diet list as it is given is sufficiently extensive for anyone; indeed, a large number of my patients complain that they cannot eat all that is prescribed. It is, however, to be remembered that in the beginning of the treatment, at least, no other fluid is to be taken except that taken at meals; here I differ somewhat with Oertel, who allows more fluid. After the first few weeks of treatment, during which time most patients will lose from six to eight pounds, they are permitted to drink as much water between meals as they wish. After this, with the Oertel method as a basis, their permanent diet is to be worked out, upon which they should lose not more than a pound a week, in some cases even half a pound a week is sufficient. This diet should be kept up until the normal weight is reached. After that the diet may possibly have to be changed; as a rule this is the case, because our caloric computations are only approximately true.

Ebstein's diet table is as follows:

Breakfast. A cup of black tea, 8 ounces; without milk or sugar; toasted wheaten or rye bread, 1½ ounces; butter, ½ to 1 ounce.

Luncheon. A cup of tea, 8 ounces, as above; one egg, or roasted meat, ham, or fish, 2½ to 3 ounces; wheaten bread, 1 ounce; butter, ½ to ¾ ounce; occasionally a small quantity of cheese, fresh fruit, or cooked fruit.

Dinner. Beef soup with some marrow, or egg, or any other addition having the same effect as these (i. e., about 75 calories); fat meats, when possible, 4 to 6 ounces; such vegetables as do not contain too many carbohydrates (no potatoes, v. Food Table in Appendix), especially in the form of purées; fresh fruit, especially strawberries, cherries, and apples; canned or preserved fruits. Salads (green). Two to three glasses of light wine.

After dinner a cup of black tea, about 8 ounces.

The caloric value of this list is 1,400 calories. One advantage possessed by it is that by the addition or subtraction of comparatively small quantities of fat the caloric values may be increased or diminished. As will be seen, carbohydrates are given in comparatively small quantities, their caloric values being made up by small additions of fat.

This method is not applicable to the majority of obese patients as we find them in this country. When an individual is found who is very fond of fats, it may be used.

I have never tried von Noorden's method, which will be found in his article on Obesity in Nothnagel's handbook; it is based upon the principle of sufficient calories for the normal weight of the individual. He divides the daily food into six meals, and in this country his method can be carried out only in hospital practice.

In using any method changes must be made for individual tastes, preferences, and digestive peculiarities, everything else being equal. The patient should be kept under observation until the time arrives when he can intelligently watch himself. With any method failures are sufficiently common from the fact that many patients are not intelligent enough or are unwilling to carry it out.

Hygienic Treatment.—*Exercise.*—This is necessary for two reasons: first, it increases oxidation, and secondly, it improves the condition of the whole muscular system, including the heart muscle. The quantity and quality of exercise are determined largely by the taste of the patient, but principally by the condition of the heart and the arteries (v. Chronic Myocardial Insufficiency). Any form of exercise or gymnastics may be permitted when the heart and arteries are sound; open-air exercise is most satisfactory. Massage and Swedish movements may also be used to advantage in suitable cases. Massage is frequently used, especially in women, for local accumulation of fat in the abdominal wall and the gluteal regions. Care must be taken that increased appetite which follows exercise does not cause the patient to become careless in his diet.

Cold baths of long duration, followed by friction, are best because they increase heat dissipation. Hot or warm baths of short duration will produce the same effect. The patient should not cover himself up too much at night, and should always sleep in a cool room. The clothing should be so arranged as to facilitate heat radiation; this can easily be so managed that the functional activity of the skin may be stimulated at the same time.

Sleep.—Fat patients should not be allowed to sleep too much, as we try to increase both physical and mental labor. A maximum of from seven to eight hours of sleep out of the twenty-four is as much as should be permitted provided the normal nerve tone does not suffer. As rest after meals improves digestion and absorption, these patients should be instructed to take mild exercise after meals, provided always that the condition of the heart and the blood vessels does not contraindicate it.

Mineral Waters.—This method cannot be looked upon as fulfilling the requisites of treatment demanded by us. It acts by increasing output by the intestine, the result of watery passages the source of which is the blood, and which contain more or less albumin, peptones, and fat. Furthermore, the digestive process is hastened by this method; therefore it is not so complete,

and absorption is diminished. It is carried out especially at Marienbad, Franzensbad, Tarasp, these waters containing Glauber's salts. In addition to the drinking of large quantities of these waters, the patient is also placed upon a diet, so that the loss of weight is very great in a short time. Great care is required in carrying out the method, for reasons before stated. The cold saline waters of Kissingen and Homburg, combined with diet and exercise, are also used. When it is impossible for the patient to go to these places, salts (Marienbad) made from the water are used. The more violent methods should be reserved for exceptional cases in which there is no other alternative.

Medicinal Treatment.—In addition to the alkalies just mentioned, preparations containing iodine have been used. Here only the administration of thyroid gland or its preparations can be considered. Thyroid gland produces distinct reduction in weight due to loss of water, albumin, and some fat; but it produces a number of symptoms described in connection with thyroid therapy (v. Myxœdema), so that generally it cannot be given for a great length of time. It must be classed with the treatment by mineral waters, of importance especially in the case of those who want to reduce without any exertion to themselves. I have seen one vain woman reduce herself by taking thyroid gland for three months, and go to a sanatorium for a rest cure lasting for three months more, from which she returned—fat. But, aside from this, the administration of thyroid preparations does not succeed in some cases in reducing fat.

Ovarian tablets also reduce the weight in a small number of women when the obesity seems to develop during or after the menopause. When the obesity is very great, however, they do not produce sufficient reduction to be of value. They possess the advantage of being harmless.

It is unnecessary to refer to many remedies that have been recommended—fucus vesiculosus, adonis æstivalis, and others.

COMPLICATIONS

It is immaterial whether we look upon the anæmia as a cause of obesity or as a result; in a number of cases it must be looked upon as a complication. In those cases in which it precedes the development of obesity or occurs in its early stages, the ordinary treatment of obesity also suffices for the anæmia. In those cases, on the other hand, in which anæmia develops in the last stage of obesity it is doubtful whether much can be done for it. Under all circumstances, however sanguine the physician may be in his views, when the anæmia does not improve he is sure to treat it by the ordinary methods (v. Anæmia). Following this rule, I have obtained good results in bad cases of obesity by breaking in, as it were, upon a *circulus vitiosus*.

Much more difficult is the decision as to what to do with gout or diabetes mellitus as complications. That disease should be attended to especially which requires treatment most urgently; if both are of equal importance, a certain amount of compromise in the diet must be made. In gout the diet need be changed but little. The albumin of meat can be advantageously substituted for that of milk or vegetables. Restrictions as to drinking water must be removed; the less water gouty patients take, the greater the chance for urate deposits, the less the chance for elimination.

In diabetes mellitus the fact must never be forgotten that reduction in weight is contraindicated as a general rule. When it becomes necessary to reduce weight, it must be done very slowly. The principal indication for the treatment of obesity in a diabetic patient is found in the cardiac and blood-vessel complications—the fat heart and arteriosclerosis. Here it sometimes becomes absolutely necessary to treat the obesity. In the diet the carbohydrates will have to be reduced below the tolerance point of the individual when the tolerance is great; if it is below 100 gm. of wheaten bread, the albumins and fats will have to supply the proper number of calories. In mild diabetics reduction in weight is frequently carried out without danger, even with great benefit. In these cases reduction can be made at Marienbad or at Carlsbad. In the severe cases the danger of producing diabetic coma is very great.

VIII. SUPERALIMENTATION

In a large number of abnormal conditions it becomes necessary to see that the patient receives more food than is requisite to retain his metabolic balance —in other words, to see that his diet is so arranged that the intake is greater than the output, resulting in a gain to the patient. This gain to the patient can evidently be either in the form of albumin or fat. As far as albumin is concerned, Voit has shown that an increased amount of food albumin does not increase the tissue albumin, but does increase the albumins in the blood, remaining, as he called it, circulatory albumin. How far this is the case when the protoplasm has been reduced, if it is reduced, by wasting processes has not been determined. At all events, it has been shown that for practical purposes there is a limit to albumin production by the introduction of albumin, and that the excess over the necessary quantity goes to fat formation; so that in reality we are, in superalimentation, principally striving to increase the quantity of fat of the patient—the opposite of that which we aim to accomplish in the treatment of obesity. Superalimentation can be accomplished in one of three ways: (1) By increasing the intake; (2) by diminishing the output; (3) by combining methods (1) and (2). In practice, the most common method is the last one; the intake is increased by adding to the caloric value of the food beyond the normal requirement of the individual; the output is diminished by controlling oxidation. whether the result of exercise, of functional or of organic activity.

TREATMENT

Causal Therapy.—Primarily the condition of the digestive organs must be taken into consideration; it is impossible to expect extraordinary functional activity of any organ already below par. How important this is has already been shown in connection with Ewald's treatment in diabetes mellitus. In all chronic diseases the treatment of fever is of the greatest importance. The same can be said for the treatment of tuberculosis, Graves's disease, syphilis, diabetes mellitus, occasionally diabetes insipidus, and many diseases of the nervous system. As a matter of fact, in practice superalimentation in these various conditions is frequently able to break into the vicious circle and help

along the causal treatment of the disease itself. In all these conditions cases will be found in which the superalimentation is the principal therapeutic factor, frequently producing a cure of the condition without any other treatment. But there remain a number of cases in which there is no cause for the leanness of the patient; he is perfectly well, simply weighs too little, as in the case of one of my patients, a female, 5 feet 2 inches in height, weighing only 84 pounds. For one reason or another these patients must be treated, and gain of weight is sometimes difficult of accomplishment.

Dietetic Treatment.—The method of procedure here is to increase the normal caloric food value of the patient, principally by the addition of fats and carbohydrates. Von Noorden calculates as a basis the following: 120 to 130 gr. of albumin, 300 to 350 gm. of carbohydrates (1,720–1,965 calories), to which may be added a sufficient amount of fat until the proper number of calories is obtained. He also recommends alcohol—a common enough method employed by the patients themselves, but one not to be recommended unless special indications exist.

The dietary must be arranged according to the needs of the individual, which usually means the digestive function as to one or another kind of food. In one patient very large quantities of fat can be given; in another, large quantities of carbohydrates; in a third, a moderate increase in both may be possible; so that, beyond the rules laid down above, no special diet list is of value. In my experience, in the greatest number of cases an increase of carbohydrates is borne much better than an increase in fats.

Of carbohydrates, the following may be given: bread, crackers, gruels made of oatmeal, farina, sago, barley; condensed milk; the various malt preparations; macaroni; the addition of sugar or sugar of milk to food; desserts, cake, honey, or syrup.

The albumins may be given in the form of milk, eggs, meat, or some of the predigested albumins. Even vegetable albumin, as in the form of bread, may be given with advantage, especially in gouty cases. The fats are used as cream, butter, oils, or fat meats, chocolate, or cream.

My "standard" diet is to begin with the following, provided the patient is kept in bed: two quarts of milk and two quarts of oatmeal gruel in the twenty-four hours, which, according to the strength of the oatmeal gruel, equals from 1,160 to 2,100 calories (v. Food Table in the Appendix).

Experience has shown that it is best to have the patient gain slowly; at the same time he should gain in strength.

Medicinal Treatment.—Outside of those preparations that contain oil, malt, or alcohol, little can be done directly. Indirectly all those medicaments may have to be taken into consideration which improve the patient's digestion or his general or nervous condition—arsenic, iron, nux vomica, the ordinary bitters, etc.

Hygienic Treatment.—Increased output is reduced or prevented by psychical and physical rest. The best method to accomplish this is that of Weir Mitchell, the details of which will be considered in connection with hysteria. Unless there are special indications, the patient should be instructed to take physical exercise. He should always rest after meals. He should have as many hours of sleep as possible—not less than ten hours in bed. Whatever exercise is chosen, it should be selected with the object of keeping

his muscles in good condition; if possible, to cause their increase. These patients should not fatigue themselves; wherefore graded exercises are the best for them. Psychical rest should also be prescribed; the wise physician in his prescriptions always tries to adapt the proper remedy and the proper dosage to the individual patient.

It is not wise to have the patient sweat too much; it is much better to see that he takes plenty of water, especially with his meals; in other words, we should see that he takes in more water than he loses.

Prolonged warm baths are valuable; they or warm douches may be used. In addition, everything should be done to improve the patient's appetite; the importance of psychical effects must not be underestimated here. In some cases active exercise has a beneficial effect; in others, especially if the patient is weak, a drive into the country or some diversion may have the same results.

IX. RICKETS

PROPHYLAXIS

In a large percentage of cases of rickets the condition is congenital. A child born at full term with a patent small fontanel or other morbid evidence of lack of osseous development of the cranium should be looked upon as rachitic, provided always no other cause can be found for the bone changes. In doing this the development of serious symptoms, such as laryngospasm or convulsions, may be prevented by instituting proper measures. The ætiology of rickets has not been worked out; there is no one theory or hypothesis that is thoroughly satisfactory; we know only that certain conditions favor the development of rickets, and some of these are doubtful. At times this disease presents itself in such a way that the idea of infection cannot be excluded; again it looks like a chronic intoxication; always it is a profound disturbance in general metabolism, which manifests itself in changes in the process of ossification and by symptoms on the part of the organs concerned with elimination—the skin, the kidneys, the gastrointestinal tract, and the mucous membrane of the air passages. The nervous system also suffers more or less. In children of rickety parents precautions should always be taken; it is immaterial whether their children become rickety by heredity or by disease, they live under the same conditions that have produced rickets in their parents; the fact remains that rickety parents frequently produce rickety children, as is shown in the colored race and in the descendants of immigrants. Improper food should be avoided; my experience does not agree with that of Fischl, who states that there is little difference in the number of cases produced by natural and artificial feeding. As a prophylactic measure, breast feeding is of the greatest value; but the breast milk must be that adapted to the child, a point unfortunately, in the case of the individual child, only to be determined by the result, as all milk analyses are without value. I have frequently seen children become rachitic upon human milk which had been analyzed and found normal as to fat, proteids, sugar, and salts, and change to artificial food was necessary and acted beneficially. In the prophy-

laxis of this disease, in this way only can anything be accomplished to prevent its progress. A large number of rachitic cases, especially those that develop toward the end of the first year of life, can be traced back to prolonged nursing, as has been shown in animals by subjecting them to prolonged feeding with human milk. It has been shown that puppies which were used to prolong the period of lactation in women, in order to prevent pregnancy, always became rickety. But these changes in human milk may come on early in the period of lactation, and then the child must be fed either by mixed or by artificial feeding. Overfeeding and underfeeding must be avoided. The giving of improper food, especially large quantities of carbohydrates before they can be utilized by the infantile gastrointestinal tract, should be especially cautioned against. In Germany, where in some parts nearly every child is rickety, and in the colored race, this cause seems to be especially active. The frequency of rickets in Germany can be best illustrated by the fact that Kölliker, in his first description of normal ossification, described the process going on in rickets. Insufficient air supply should be avoided. Although the disease occurs quite frequently in the country, it is especially in cities that we find the greatest development; Wachsmuth's theory, that rickets is due to a chronic CO_2 poisoning, can be taken into consideration in a number of cases. The child should have the benefit of the best possible hygiene and sanitary conditions: absence of cleanliness affects the skin and the food; light is necessary for the child's development; overcrowding produces moisture, bad air, and danger of infection; damp dwellings should be avoided.

Special attention should be given to the clothing of children; the common notion that because a child's hands or feet are cold the child itself is cold leads to a method of clothing children that is irrational and unhygienic. Because rachitic children are prone to "catch cold" they are kept indoors as much as possible; the causal condition is thereby intensified and the disease prolonged. To prevent rickets, children should be kept in the open air as much as possible. While Parrot's view, that all rickets is syphilis, is not correct, yet aside from the peculiar form of bony changes in syphilitic children a large number of these become rachitic; in other words, syphilis is an important predisposing factor in the production of rickets. As a result, everything should be done to prevent congenital and hereditary syphilis, and it should be thoroughly treated whenever its manifestations are found.

TREATMENT

General.—*Feeding* should be conducted on the lines laid down as to prophylaxis. Every rachitic child should have salt added to its food. The reason for this is not clear, although rickets is supposed to be due to a diminished calcium composition of the blood; the absorption of calcium is affected by the presence of HCl in the stomach, and therefore of NaCl in the blood (Soxhlet). Delcourt, who has made animals rachitic by giving large doses of potassium salts, affirms that these salts withdraw the sodium compounds from the blood, and thus again is shown a need for giving salt. Zweifel, in his monograph on rickets, asserts that the disease is caused by an insufficient quantity of common salt in the bread used in Saxony. Under all circumstances rachitic children are very fond of salt; it is not uncommon to see

them eat it as other children eat sugar; for this reason, and because it seems beneficial, it should be given.

Baths are very useful, outside of their necessity for cleanliness. As the result of years of accumulated experience, we know that sea bathing is a good remedy in rickets; whether the influence lies only in the chemical nature of the water, in the *compositio aeris et terræ*, or in both, is immaterial. The child should have a salt-water bath daily; the ordinary rock salt is used for this purpose, a large handful being dissolved in an ordinary bucketful of water, and of this solution a quart is used for an infant's bath. In older children, it can be made as strong as one half per cent. The bath should be given warm or cold, depending upon the individual case; in very young infants always warm, in older children, cool or cold. When it is possible, these children should be sent to the seashore and be given sea baths. The other hygienic laws have already been laid down in connection with prophylaxis.

Medicinal.—Kassowitz's phosphorus treatment has found many opponents, but the facts that it has stood the test of time, and that since its introduction, in 1884, it has steadily gained adherents, prove its value. Wagner was the first to find that phosphorus had a specific effect upon growing bone, especially, he supposed, upon the osteoblasts; at all events, in the direction of bony deposit wherever bone is forming from cartilage. Kassowitz continued Wagner's experiments and found that phosphorus produced in the bone a diminution in the number of blood vessels formed and also contraction, conditions that are directly the opposite of those found in rickets. Mima and Stöltzner believe, not that an antirachitic effect is produced by the administration of the drug, but that it acts beneficially upon the osteoporosis so frequently present in rickets. Whatever the theoretical grounds have been that lead to the use of this drug, I believe it to be the most valuable of all the remedies used in rickets. Besides its effect upon bones, which cannot be estimated accurately in the human being, it is of great benefit to the nervous symptoms, laryngospasmus, tetany, and convulsions. Its effect in laryngospasmus is most remarkable; the attacks are diminished in frequency and intensity, and then disappear. Besides these good effects, phosphorus shortens the disease and prevents, *pari passu*, the development of serious deformity. I have always given it in the form first prescribed by Kassowitz: ℞ Phosphori, 0.01 gm. (gr. $\frac{1}{10}$); olei olivæ, 5 gm. (℥ l); pulv. acaciæ, sacch. albi., āā 10 gm. (gr. c); aquæ, 75 gm. (℥jss.); of which from one half to one teaspoonful is given two or three times daily, each teaspoonful containing about gr. $\frac{1}{160}$ of phosphorus. The objections raised to this preparation are, on the one hand, that phosphorus settles to the bottom of the bottle and the patient receives very little of the drug; on the other hand, that poisoning has occurred in children. Both these results can be prevented by the proper use of the prescription. It is true that the mixture is very unstable, that it spoils easily; but it is not objected to by the patients, and when kept in a cool, dark place it is rare that the whole quantity cannot be used. In order to obviate these difficulties, Jacobi uses the elixir phosphori, of which 4 gm. (℥j) contain 0.001 gm. (gr. $\frac{1}{65}$) of phosphorus. In some cases, however, phosphorus seems to be of little value; even in cases of laryngospasm I have sometimes found it inefficient.

The next best remedy in rickets is cod-liver oil, the administration of

which in this disease was introduced to the notice of the profession by that great master, Trousseau (v. Scrofula for the method of giving it). Even in fat rachitics the remedy may be used. A combination of phosphorus with cod-liver oil can be highly recommended when the oil is not contraindicated by gastrointestinal conditions. Apart from this contraindication, cod-liver oil will frequently control the symptoms, such as bronchitis and constipation; it will often improve the general condition of the patient, even if it does not affect the general process. During hot weather no oily substances should be used with infants. Kassowitz's formula—℞ Phosphori, 0.01 gm. (gr. $\frac{1}{10}$); olei jecoris aselli, 100 gm. (℥ij)—may be used, the dose being the same as in the emulsion given above; more cod-liver oil may be added, its dosage being adapted to the case.

On account of the views regarding calcium as a cause of rickets, in one way or another, preparations of this base have been used and are still recommended, especially the phosphates of lime; beyond the well-known fact that most of the lime phosphates are not absorbed, and lactophosphate only to a limited extent, they do no good. It is probably somewhat different with the hypophosphites, absorption taking place to a limited extent; but I have never been able to convince myself that they have any effect on the rachitic process. Calcium or sodium glycerophosphate may be more valuable, especially for the nervous symptoms.

Organotherapy has been tried in this disease, as in so many others; the suprarenal body, the thymus, and the thyroid glands—all have been lauded and all have been found wanting.

The anæmia, which is frequently very disturbing, usually disappears under the phosphorus treatment; if this is not the case it should be treated (v. Anæmia). On account of the common occurrence in this disease of enlarged glands—mesenteric, bronchial, and submaxillary—the syrup of the iodide of iron will frequently be of service.

Symptomatic.—Besides the general treatment of rickets, special attention is required for the symptoms of the gastrointestinal and respiratory tract (q. v.). In laryngospasm the child must be guarded against exertion and excitement; very few conditions give rise to so much anxiety and care, because the child may die in any attack. Parents and attendants must be told of the danger, for then instructions are more apt to be carried out faithfully and the physician is held blameless. In order to lessen the number of attacks, the bromides or chloral may be given; they are both valuable in view of the fact that laryngospasm and general convulsions frequently occur together. The attack itself is of so short duration, even the fatal ones, that nothing can be done except to keep the child quiet; no external irritants should be used, as it is our purpose not to increase the respiratory reflex, but to give relief to the spasmodic contraction of the laryngeal muscles which produce inspiratory dyspnœa. Permanent intubation might be taken into consideration, and this would prevent inspiratory dyspnœa, but in this condition it is connected with so many difficulties that it will be very rarely successful.

The prevention of deformity in rickets is of great importance. It has been said that a physician who allows a rachitic child to become seriously deformed should be looked upon as criminally negligent (C. Gerhardt). This obviously should be so far modified as to say that if the physician does not

give proper instructions in this direction, he may be criminally negligent. It is doubtful if deformity of the head can be prevented; the exuberance of bony deposit lies in the nature of the process, and craniotabes is not due to pressure, as was supposed by Elsaesser. Yet the child should not be allowed to lie upon its back all the time, for thus the form of the head is too much changed; it should lie upon a hair pillow, the covering of which should be changed frequently on account of the profuse sweats about the head.

Deformities of the thorax may be prevented, in a measure. Very few people know how to pick up a child; if this is done in the ordinary way, by catching hold of the child under the arms, damage is done; indeed, the most common deformity, next to the rosary, will be found exactly where the thorax has been pressed by the hands in picking up the child. Upward pressure from the intestines upon the diaphragm, when due to flatulence, can be neutralized; usually it is a complex condition, due, in addition, to diminution of abdominal and pelvic vertical dimensions. By posture much good may be done here; all rachitic children must be kept on hard beds, with hair mattresses and without springs. In this way, by keeping the child upon his back, on one side or the other, partially raised or turned to one side, or by a combination of two or more of these positions, benefit is obtained. Compressed air by inhalation has also been recommended, as acting from within and thus preventing thoracic deformity; it is questionable whether any good result can be expected from this method.

Great care should be exercised in the prevention of deformity of the vertebral column. When there are evidences of kyphosis the child must be kept upon its back, again upon a hard mattress; this mattress must be so arranged that it can be transferred from the bed to the baby carriage, so that it and the child can be lifted together. Under all circumstances, the child must be out in the open air as much as possible. When the process has come to an end, orthopedic measures should be adopted. Fortunately, rachitic children do not walk so early as healthy children; as soon as they begin to walk, a suitable brace should be applied. On the other hand, unless too much deformity exists, too much attention need not be given, for the vertebral curvatures usually disappear about the sixth year of life. In an individual case it becomes a question of nice judgment how much or how little should be done; but here again the physician must always keep in mind the general welfare of his patient and not make too much of the local condition. Rachitic deformity usually occurs in the dorsal region; when it is high up in a child with an hereditary tendency to tuberculosis it requires especial attention.

Deformities of the lower extremities are best prevented by not allowing the child to be put upon its feet. This is carried out with some difficulty; parents are usually very proud of their children's accomplishments—i. e., early teething and early walking—and, aside from this, many are so situated that their children cannot, or do not, receive proper care; so that we find, especially among colored people, those horrible angular deformities that all of us who have studied the disease in Europe have found so common there. It is a mistake to suppose that bad deformities from rickets do not occur in this country; they are, it is true, not so frequently found here, but the number is steadily increasing, so that, at least for clinical demonstrations, every form

of rachitic deformity can always be demonstrated, which was impossible twenty-five years ago. When the patient presents himself with deformity after the process has come to an end, orthopedic measures for bow legs or knock knees must be used. For the angular deformities subperiosteal osteotomy gives most excellent results.

In female infants special attention should be paid to rickets of the pelvis, for this produces in after-life the most common deformity of the pelvis, resulting in difficult labors. In rare instances the diagnosis can be made only tentatively, but in most cases marked changes will be found about the bones of the pelvis or in its conformation. When such evidences are present the child should be kept upon its back, as in vertebral deformity, and the weight of the trunk should not be directly transmitted through the pelvis until the rachitic process has come to an end.

SECTION V

DISEASES OF THE DIGESTIVE SYSTEM

I. DISEASES OF THE MOUTH

PROPHYLAXIS

General.—The mouth, like all cavities that communicate directly with the outer air, is a veritable breeding-place for bacteria. The first prophylactic principle, therefore, is cleanliness. As soon as children can begin to look after themselves they should be taught how to keep their mouths clean, so that this becomes fixed as a habit that shall be kept up for life. The more we study the mode of infection by bacteria the more we come to the conclusion that the mouth and pharynx must be looked upon as a frequent portal for the entrance of infectious agents. The mouth, then, should be thoroughly rinsed and the throat gargled at least twice a day. This is done very effectively by using very large quantities of pure water, to which may be added some antiseptic, more for the purpose of having the method carried out conscientiously than for any other. Care must be taken that only such antiseptics are used as do not irritate the mucous membrane; any one of the numerous combinations that contain aromatics, boric acid, very weak solutions of thymol, or mildly alkaline solutions of sodium bicarbonate or biborate may be used.

The *care of the teeth* forms a very important chapter in the prophylaxis of oral diseases, as well as of some general infections. Generally this is fairly well done by intelligent people, as a means of saving the teeth. But even here much can be done, as is shown in cases of so-called pyorrhœa alveolaris (stomatitis ulcerosa chronica); in every instance in which I have seen large quantities of pus the patient has not had an accurate idea of how to clean the teeth, so that when proper measures were applied the formation of pus could be checked and the case converted into the simpler, necrobiotic form. Here, again, the more important principle is that of mechanical removal, not of antiseptics. The teeth should be brushed at least twice, better three times, daily, and preferably after meals. Some preparation that aids the mechanical removal of deposits upon the teeth should be used, but such preparation should contain only substances as do not affect the enamel too much, either mechanically or chemically. The substances that can be used with impunity daily for any length of time are orris root, soap powder, magnesia, calcium carbonate, sodium bicarbonate, and common salt. To these may be added any one of the harmless milder antiseptics—menthol, gaul-

theria, or cinchona. As the structure of the enamel differs in individuals, it will be found that even these mild remedies may be too strong for some persons; for these, one of the many fluid preparations now so much in vogue may be recommended. All, even the slightest, diseased conditions of the teeth should be immediately referred to the dentist, who in this country at least is possessed of remarkable skill and intelligence.

All mechanical sources of injury to the oral mucous membrane must be removed; in adults, sharp teeth, malformations, badly fitting plates, sometimes rubber plates in which, possibly on account of individual predisposition, the mercury does harm; in children, improper nipples, deformities of the mouth, but most commonly undue zeal in cleansing the infant's mouth. Epstein and myself have shown that Bednar's aphthæ are due to mechanical violence, the cleansing finger of the nurse being the only factor that produces them; at present this affection is very rarely found.

In a number of cases food that is taken too hot or too cold will be found to be the cause of trouble. Chemically irritating drugs should be avoided as much as possible. The use of tobacco—smoking, chewing, or "dipping"—frequently produces irritation, which may be followed by more serious consequences.

As in all diseases due wholly or partially to lower forms of life, general causes are of great importance. In children we find all those causes at work which tend to faulty nutrition—improper food, poor sanitation, bad hygiene, the so-called diatheses, and a number of the acute infectious diseases. In adults it is especially intestinal autointoxication and gout that must be looked to, but a number of wasting diseases also predispose to mouth diseases —e. g., tuberculosis, diabetes mellitus, prolonged fevers. In all these cleanliness of the mouth should be insisted upon.

In order to prevent the introduction of lower forms of life into the mouth, adults under special conditions should be cautioned as to the possibility of infection by the introduction of infected substances into their mouths. In children, however, active measures must be taken. By far the larger number of those conditions of the mouth that are ascribed to teething are infections. Cleanliness of the mouth in children is as essential as it is in adults. This is accomplished by rubbing the mouth with cotton dipped in pure water. When children play upon the floor, their hands should be kept clean. For infants, the most scrupulous care should be taken of all the various parts of the feeding utensils, especially of the artificial nipple. The various kinds of teething facilitators are prolific causes of infection, and their use should therefore never be encouraged. In stomatitis hyphomycetica (thrush) the bottles and the nipples should be kept in an alkaline solution, and should always be cleansed with special care. In breast-fed babies, the mother's nipples should be washed before and after nursing with a solution of sodium bicarbonate (one-and-a-half- to two-per-cent solution), or if necessary they can be penciled with a weak potassium permanganate solution (1.5 per cent).

STOMATITIS CATARRHALIS

TREATMENT.—**Acute Stomatitis.**—The removal of the cause is the principal indication. When this is done the disease usually runs its course with-

out therapeutic assistance. Apart from this indication, there comes the necessity of giving symptomatic relief. In children, severe local as well as general symptoms may be produced; the many symptoms ascribed to teething are due to a stomatitis in most instances. The food should be given cool or cold; the mouth should be washed out with cool or cold water, care being taken that no injury is done to the mucous membrane. This usually gives relief to the pain. Any one of the following solutions may be used: Boric acid (three per cent), sodium biborate (five to ten per cent), zinc sulphate (one half to one per cent), sodium salicylate (two per cent). It is doubtful if they do anything more than insure careful carrying out of directions as to the application of the menstruum in which they are dissolved. The addition of glycerine to the solution is of value. Potassium chlorate should never be used. Local anæsthetics—e. g., cocaine, menthol—are without value. Penciling with potassium permanganate (0.5 to 1.5 per cent) every two hours, especially when the child already has teeth, is of great value. Here the application must be made especially to the gums. When the pain is very marked the mouth should be most carefully examined; usually there will be found some abrasion of the mucous membrane or a so-called catarrhal ulcer. These cases are best treated by the direct application of silver nitrate to the ulcer, a small quantity of the mitigated stick being fused on a silver probe. If the stomatitis does not show decided improvement after three or four days of treatment the mouth should be penciled once a day with a weak solution of silver nitrate (one half to one per cent). When cysts form they should be incised; if they fill up again, their walls must be cauterized. The general symptoms must be treated symptomatically: sodium bromide for the restlessness; the digestive tract should be looked to; feeding should be regulated. With prompt local treatment there are usually no general symptoms.

In adults the treatment is carried out on the same lines. The pain is alleviated by ice, taken in small pieces and allowed to melt in the mouth. Sprays are sometimes required, especially when the stomatitis extends to the uvula or the pharynx; adrenalin may be used, and cocaine, with or without one of the remedies mentioned before. Sometimes it becomes necessary to make incisions into the œdematous uvula. With involvement of the lymphatics, hydropathic measures are of value.

Chronic Stomatitis.—This form is comparatively rare in children. When it is found it is usually due to general causes, such as atrophy or wasting diseases. The local treatment remains the same as in acute stomatitis; the general treatment is that of the cause, and with its removal the disease disappears.

In adults the disease is not so rare, being quite common in smokers and drinkers, but it may be due to gastrointestinal disturbances or to local causes, such as carious teeth or badly fitting plates. The removal of these causes is the prime indication. Locally, frequent rinsing of the mouth with normal saline solution; when necessary, the application of astringents—alum (five per cent), tannin in glycerine (five per cent), or silver nitrate (one to two per cent)—may be recommended.

Stomatitis Due to Chemical or Thermal Irritation.—For the pain, local applications of cocaine, orthoform, anæsthesin; small pieces of ice to be taken frequently; when necessary, hypodermic injections of morphine. In order

to prevent infection, topical application of iodoform or iodol, potassium permanganate, or weak solutions of carbolic acid (one to two per cent) may be used. When the injury done is great or swallowing is very painful, the patient should be sustained by rectal alimentation, especially by the injection of large quantities of water. In order to prevent cicatricial contracture, Sticker recommends gymnastics of the muscles of the tongue and jaws. In one case he used a wedge, which he inserted between the teeth; by means of this he thinks he prevented cicatricial closure of the jaws.

STOMATITIS HERPETICA (Aphthosa)

PROPHYLAXIS.—It is doubtful if anything can be done in this direction in the acute form. In all the acute infections in which it is found, cleanliness of the mouth should always be attended to. In that form characterized by repeated attacks, prophylactic measures must be applied to the cause, which will usually be found in the gastrointestinal tract. Combined with the treatment of the local cause, the treatment of the general condition of the patient is of great value. Some of these patients are neurotic, others anæmic; in others, again, there will be found some temporary cause, such as worry, excitement, a special error in diet, or lack of exercise, which when permanently removed prevents the attacks.

TREATMENT.—The object of this is to give relief for pain and to prevent infection of the ulcers. Both these indications are fulfilled by touching each ulcer with silver nitrate. Baginsky recommends the application of a solution of potassium permanganate—0.1 in 15 gm. (gr. jss. in ʒss.)—as almost a specific. The remote cause of the disease has usually disappeared when the aphthæ appear, so that nothing can be done as to causal therapy. In cases in which there are frequent relapses, to which class also belong those cases described by Jacobi as neurotic chronic stomatitis, the cause will usually be found in some form of intoxication, usually chronic intestinal autointoxication (q. v.). Riga's disease and Bednar's aphthæ are treated like any other ulcer of the mouth.

STOMATITIS HYPHOMYCETICA (Thrush)

PROPHYLAXIS.—Two things are essential to prevent thrush: first, the methods laid down in the section on general prophylaxis in this chapter, and secondly, the early recognition and treatment of catarrhal stomatitis. These resolve themselves into the prevention of contact with the *Saccharomyces albicans* and the prevention of its growth upon the mucous membrane where it has come into contact therewith. In order that the plant-producing thrush may grow upon the mucous membrane it is necessary that its epithelial layer be altered in one way or another; it cannot grow upon a perfectly normal epithelial layer, whence the great importance of looking after the mouth in all wasting diseases; for wherever thrush may thrive, there some other local infection may also take place, which in its turn may become general. The relation of prophylaxis to treatment is the same in this disease as in all other diseases.

TREATMENT.—Early recognition is of the greatest importance; the earlier the disease is noticed the more quickly can it be cured. The treatment is

carried out in two directions—the removal of the plant and its destruction. As the *Saccharomyces albicans* grows around the epithelial cells and into the depths of the mucous membrane, it will be seen that a certain amount of force is required to remove it, and the applications of whatever remedy may be chosen must be frequent. In the beginning of the disease the attendants must be instructed to apply the remedy with a camel's-hair brush, between the times of nursing and immediately after, upon the spots affected. When the disease is well developed, remedies should be applied every two hours. If this does not avail, the physician himself must treat the case locally, using more force than is permitted to the attendants. In my own experience sodium bicarbonate (one teaspoonful to a tumblerful of water) is the best remedy that can be used; that it destroys the fungus is more than doubtful; that it helps to remove it is positive. All remedies used to destroy the *Saccharomyces albicans* are of doubtful value. The following have been recommended: potassium permanganate, borax, boric acid, the hyposulphites, silver nitrate, lactic acid, acetic acid, salol, and salicylic acid. Under no circumstances should any remedy be given internally, as this disease is purely local; the orthodox borax and honey mixture does harm because of the honey, which is an excellent culture medium for the saccharomyces, and potassium chlorate is too dangerous a remedy, even if valuable, when other methods give the same result. Ulcers are treated as in other conditions. The local treatment of esophageal thrush is very unsatisfactory; I once succeeded in pushing a plug of mycelium into the stomach with a catheter.

Much diversity of opinion exists as to the necessity of general treatment in thrush. My own view is that thrush is always a local infection which may produce remote infections; that this local infection has a local predisposing factor; and that in a majority of cases the latter is not due to general predisposition. This is certainly true in private practice; in hospitals, different conditions exist, as children are rarely brought in simply because they have thrush. The indiscriminate use of cathartics in children because they have thrush, or any other disease of the mouth, should be discouraged. That thrush is followed by gastrointestinal disturbances is not denied; these are due either to the presence of the saccharomyces in the intestine or to chemical changes in the food, the result of its biological activity. They are quickly relieved either by small doses of calomel or by frequent, small doses of corrosive sublimate. In all cases in which the general condition of the patient produces a serious disturbance of functional activity in the mouth the outlook for cure is hopeless until these functions are reëstablished. In these cases only can it be said that thrush gets well when the general condition is improved.

STOMATITIS ULCEROSA (Fetid Stomatitis, Putrid Sore Mouth)

Acute Form.—PROPHYLAXIS.—In this disease prophylaxis must be more specifically noted. There are in each case two causes—a general and a local cause. The general cause is an intoxication of some kind, and the intoxicating substance is eliminated by the mucous membrane lining the gums around the teeth; no teeth, then, no stomatitis ulcerosa. The local action of the poison upon the margin of the gum is of a twofold nature; it produces necro-

biotic changes, and it predisposes, because of the lack of vitality in this tissue, to the growth of bacteria, which in my experience are principally pus producers. The intoxications followed by this form of disease are very numerous: mercury, lead, phosphorus, iodine; measles, scarlatina, malaria, typhoid fever, pneumonia, and whooping cough; scurvy; all those conditions tending to reduce the general health of the individual—e. g., bad sanitation, poor hygiene, syphilis, rickets, and tuberculosis. With Hirsch, I believe the affection to be contagious, but only where there is a general predisposition. The special prophylaxis, then, must be applied to all the conditions referred to: cleanliness of the mouth, which will prevent the full development of the disease, and the prevention of the general condition that forms the basis of the disease. In reduced individuals, care must be taken to prevent infection of the mouth from those that have the disease.

Treatment.—This is most satisfactory, because we have in potassium chlorate a remedy which acts as a specific. There are two objections to its use: the first and most important is its toxicity; the other, that in this disease its administration produces great pain in the mouth. As stomatitis ulcerosa is a serious affection leading to necrosis of bone, sometimes to cancrum oris, and then to a fatal issue, the second objection need not be taken into consideration until we find some other remedy that gives us the same results without pain. The first objection, however, is serious; indeed, it is so serious that Marchand and Landerer insist that the internal use of this drug be given up in children. This should certainly be done in all other diseases of the mouth, but in stomatitis ulcerosa we have no substitute for it, and its internal use in this disease, when uncomplicated, renders all other medication unnecessary. It is given in a three-per-cent solution (℥ss. to ℥ij) with a little syrup, and of this one half to one teaspoonful is given every two hours during the daytime, according to the age of the patient. The results are usually as follows: after from twenty-four to thirty-six hours of administration the salivation is very much diminished, and with it the fetor, and after from five to seven days all the symptoms have disappeared. It should be the rule not to give potassium chlorate for longer than a week. Relapses are not uncommon, and unless some cause is found for the relapse the remedy must again be administered as before. If ulceration does not disappear the cause will usually be a carious tooth, which, if a deciduous tooth, should be removed or filled; a permanent tooth should always be filled when possible. When the process of ulceration has been so extensive that the teeth are very much loosened, the same means as are described in the next section (chronic stomatitis ulcerosa) may be tried. They are usually unsuccessful, as the loosened teeth act as foreign bodies which must be removed before the inflammatory process can be relieved. The discussion whether teeth should or should not be extracted is futile. Those who have had large experience in the treatment of this disease will admit that under these conditions the patient does not get well unless the loose teeth are removed, and notwithstanding suppuration the teeth must be extracted as the most positive method of cure. For suppuration, hydrogen peroxide (three-per-cent solution) may be used, either in the form of spray or by direct application. In order to facilitate the healing of ulcers or the ulcerative process, the surface should be touched with silver nitrate. Where no cause can be found for the continuance of ulceration, a

continued use of potassium permanganate, applied twice or three times daily in solution and with a brush, will often give good results. Where there is necrosis of bone, commonly causing the relapses, the sequestrum should be removed, when it will be astonishing how quickly the relapses cease; but the stomatitis may be merely controlled by potassium chlorate.

In *Mercurial Stomatitis*, prophylaxis is of very great importance. As soon as a patient is put under mercurial treatment certain prophylactic measures must immediately be instituted. The patient must be taught to keep his mouth, and especially his teeth, clean. The latter is done by frequent brushing of the teeth with a moderately hard brush dipped in cold water, and this should be done always after meals and before going to bed; if possible, oftener. One of the many mild liquid antiseptic tooth washes may be used, or a weak tannic-acid preparation may be applied twice daily. Sharp teeth should be filed and carious teeth filled; irritating stumps should be removed. In addition, the mouth should be rinsed every time the teeth are cleaned. The use of this method renders the prophylactic administration of potassium chlorate unnecessary. The gums should be examined frequently by the attending physician, and as soon as the red seam begins to make its appearance the mercury should be withdrawn. But even with all prophylactic measures, including the administration of potassium chlorate, mercurial stomatitis will occur, for it is almost incredible how small a quantity of mercury some individuals tolerate—an observation that is verified by all who have written upon the subject. When ptyalism occurs the potassium chlorate treatment should be immediately begun; it is best given as in the preceding form of stomatitis, although it may also be used as a mouth wash. In addition, the patient should rinse his mouth with ice-cold water; if this cannot be done on account of pain, the mouth can be sponged with cold or warm water. I have never been able to satisfy myself that the addition of any medicinal substances is of much value except for special indications. Occasionally it becomes necessary to add some form of tannic acid—tinct. catechu or tinct. rhataniæ—but even their value is doubtful. Belladonna and atropine have been used; theoretically they should be infallible, practically they are of little use. Of some value is the attempt to facilitate elimination of the drug by drinking large quantities of water, by taking hot baths, and by purgation. One or all may be tried, but only in suitable cases; where, as is frequently the case, the patient is debilitated, purgation or hot baths may do harm. In the latter kind of case everything should be done to keep up the patient's strength with plenty of good, nutritious food, usually liquid; good sanitary surroundings; if necessary, tonics, especially ferruginous, and stimulants. Rectal feeding must not be relied upon except that fluid may be added to the circulation (v. Gastric Ulcer). Other symptomatic treatment for pain, insomnia, and glandular swellings suggests itself.

In *Scorbutic Stomatitis*, potassium chlorate is not only unnecessary, but may do harm. It is unnecessary, because when the scurvy disappears, as the result of general treatment, the stomatitis also disappears unless too much damage has been done to the periodontal membrane, when the same rules hold good as for the ordinary form of stomatitis ulcerosa. The suppurative process should be treated locally with hydrogen peroxide or potassium permanganate.

In all forms of acute stomatitis ulcerosa the secretions from the mouth are very irritating to the skin; it must therefore be protected, otherwise a dermatitis follows, either very violent or tending to chronicity. For this purpose zinc salve, with or without ichthyol or washing the surface with alcohol and water and subsequent applications of unirritating powders, such as wheat starch, bismuth, or talcum, is valuable. The enlarged lymphatics must be watched, and if necessary treated as in Scarlatina (q. v.).

Chronic Stomatitis Ulcerosa.—The various forms due to lead, bismuth, arsenic, iodine, etc., do not require special directions; the removal of the cause with the ordinary local treatment already referred to is sufficient. In diabetes mellitus the same holds good. In Riggs's disease, called variously pyorrhœa alveolaris, gingivitis chronica, stomatitis ulcerosa chronica, etc., the conditions again call for local as well as general treatment. In the beginning of the disease (and the physician should always examine the gums in patients who are suffering from conditions that may produce Riggs's disease) the local treatment may be carried out by the physician; when, however, the process is well developed, so that the teeth are beginning to loosen or much pus is formed, the local treatment must be referred to the dentist, as few physicians are capable of undertaking the many delicate operations that are required for this purpose. In the onset the local treatment consists of cleanliness of the mouth; repeated brushing of the teeth; where the mouth secretion is very acid, the use of alkaline mouth washes—soda phénique is valuable in this form. When there is a tendency to pus formation, spraying the gums with hydrogen peroxide (three per cent) twice daily sometimes prevents the further development of infection. If prevention does not result the patient should be referred to the dentist for more accurate topical application. The teeth must be kept absolutely clean and the tartar must be removed mechanically. The pain that is produced by denudation of the tooth must be relieved by cauterization, either with zinc chloride or with silver nitrate. Even where the patient knows nothing of the condition of the gums, their appearance will indicate to the physician that the process has been going on for years. In all such cases the dentist should be consulted, for it has been shown that, even without loosening of the teeth, abnormal conditions may be going on about the root of the tooth which it is absolutely necessary to remove before progress can be made in the cure of this affection. The most common abnormal condition is the sanguinary calculus, which requires much dexterity in removal, as it may be found anywhere upon the surface of the root of the tooth. These calculi, according to my investigations, always contain uric acid. For the further treatment of the inflammatory process the dentists use mild or strong antiseptics or caustics, acid or alkaline.

The general treatment is that of the remote cause, which in the greater number of cases will be found in the intestine. The treatment, then, is that of chronic intestinal autointoxication or of gout (q. v.). In this disease, as in all conditions dependent upon chronic causes, the treatment must be continued for a long time—at least six months, better for one year. Chlorosis, neurasthenia, or other intoxications, besides those from the intestine, should also be treated (q. v.). With the combination of proper local and general treatment the results are most satisfactory. But even after the disease has been cured, relapses must be guarded against by care of the teeth and mouth,

and especially by a persistent effort to keep in abeyance the general cause without which stomatitis ulcerosa chronica cannot exist.

STOMATITIS GANGRÆNOSA (Cancrum Oris, Noma)

PROPHYLAXIS.—Very little can be done by way of prophylaxis. All cases of stomatitis ulcerosa should be rigorously treated; but it is exceptional for stomatitis ulcerosa to develop into this disease, which fortunately is very rare. In private practice I have seen only three cases. The disease occurs most frequently in hospital practice, and seldom now even there. As its development is the result of debilitating diseases in most instances, all has been done that can be done by way of prophylaxis—i. e., the patient has already been treated to increase his strength, to improve his blood, and to tone him up in all directions. The possibility of infection must always be taken into consideration, so that in a hospital a patient with cancrum oris should be isolated.

TREATMENT.—This unfortunately promises little. The patient should be fed by means of condensed or predigested foods; at times stimulants are indicated. Locally the only indication that has presented itself is the destruction of the tissues involved. Whatever is done in this direction should be done radically, regardless of local consequences, as we are trying to save life; cosmetic results, therefore, need not be taken into consideration.

For the purpose of destruction of the diseased tissue two methods have been recommended: the first by the use of caustics—hydrochloric acid, nitric acid (West), copper sulphate, six-per-cent solution (Evanson and Maunsell, J. Lewis Smith), silver nitrate in substance (Bohn), zinc chloride and pyroligneous acid (Gierke). Good results have been obtained by all these remedies. I had one patient recover on the application of potassium permanganate in substance. But for many reasons it is doubtful whether any of these remedies did much more than simply hasten the restorative process which might have proceeded without their use.

The second method is the use of the actual cautery, which with the introduction of the Paquelin and the galvanocautery has become a method accessible to every physician. It is of advantage that the disease should be recognized early, and under all circumstances the tissue must be destroyed, care being taken that cauterization is applied well into healthy tissue, always outside the waxy zone. General anæsthesia may be used, provided the patient is strong enough to bear it. One cauterization is usually insufficient, so that after the necrotic tissue has been carefully removed a second or a third one may become necessary, twenty-four hours being allowed to elapse between operations. After all gangrenous tissue has been destroyed some mild antiseptic dressing is applied and the process of granulation watched. In the operation, care must be taken thoroughly to cauterize the buccal surface. Loose teeth should be removed.

Because a bacillus has been found in cancrum oris which resembles in most respects the Klebs-Löffler bacillus, the diphtheria antitoxine has been used in a number of cases with good results. As the antitoxine can do no harm, it would seem that in every case of cancrum oris it should be given a fair trial in large doses. Since horrible cicatricial deformity always results

after cancrum oris, there is no reason for the present why cauterization should not be practiced.

The fetor accompanying cancrum oris is indescribable, and for the patient, as well as for his attendants, something should be done to mitigate it. Strips of muslin dipped in Platt's chlorides and hung up in the room and around the bed have in my experience done much to diminish the odor.

The after-treatment resolves itself into medication and feeding, so that the patient's strength may be regained. Plastic operations should be deferred for at least one year after the attack, as they are not very successful when performed earlier, and sometimes the process returns after an operation.

GEOGRAPHICAL TONGUE

The ÆTIOLOGY of this disease is unknown, and writers upon the subject have expressed different opinions regarding it. I believe the condition to be one not of disease, but due to some developmental fault in the upper layers of the mucous membrane of the tongue. Certainly the condition rarely produces symptoms except when some irritation, such as too much tobacco or alcohol, or some condition producing distinct furring of the tongue, is added. Several of my patients have had this trouble for ten years without their knowledge. Others have discovered it when they, for one reason or another, have acquired the habit of inspecting their tongues, and then have become nervous and consulted me on account of the trouble. The presence of symptoms depends upon the added condition, but more upon the individual. Whatever view the physician may take regarding the nature of the geographical tongue, he can and should state to the patient that the condition never does any harm. The patient should not be dieted unless there is some other indication besides the geographical tongue; laxatives do no good; the condition has no relation to gout or syphilis; in other words, no general treatment of any sort has any effect upon the patient's tongue.

If the patient complains of itching or pain application of silver nitrate, applied as in ulcers of the mouth, gives relief and does good. It is more than probable that a slight infection may have taken place which is controlled by the silver nitrate, or that by its use a protective layer is produced which covers over the imperfectly covered mucous membrane and gives the young epithelial cells time to become adult cells. All other remedies that I have tried have been without value.

LEUCOPLAKIA ORIS

TREATMENT.—All irritating causes should be removed; to these belong tobacco, the ingestion of food too hot or too highly seasoned or mechanically irritating; the teeth should be carefully examined, especially when small plates are worn; in one instance under my observation a combination of a badly fitting plate with acquired deformity of the teeth seemed to be the cause of the trouble. In all these cases the probability of a long-continued local irritation combined with syphilis must be taken into consideration; there is no doubt that leucoplakia does occur without preëxisting syphilis, but for practical purposes this should not be looked upon as a rule. In every case of

leucoplakia, then, the patient should be put on a course of iodine treatment. In addition to this, local treatment should be applied; this should not be too active, but should be continued for a long time. My favorite remedy is silver nitrate, applied in substance over the affected parts two or three times a week. It is only when fissures occur that the patient complains much of pain, and these are best relieved by the silver nitrate. Iodine dissolved in potassium iodide and glycerine, applied locally—iodine, 1 gm. (gr. xv); potassii iodidi, 2 gm. (gr. xxx); glycerini, 10 gm. (℥ijss.)—is sometimes of great value. Sublimate (one-half- to one-per-cent solution), chromic acid (one to five per cent), and lactic acid (twenty per cent) have also been recommended for topical application.

The fact must always be borne in mind that papillomata and epitheliomata develop on the basis of leucoplakia; no application, therefore, that is too irritating should be made, and these cases should be referred to the surgeon when anything suspicious develops.

II. DISEASES OF THE SALIVARY GLANDS

MUMPS (v. Infectious Diseases)

Symptomatic Parotiditis (Parotid Bubo).—This is always the result of infection, either through Steno's duct or from the blood; consequently, in the latter instance it is septic. In practice this disease occurs most frequently in connection with acute infectious diseases, such as typhoid fever, scarlatina, and variola.

The importance of PROPHYLACTIC MEASURES, already fully described in the chapters on infectious diseases, can only be emphasized here.

The TREATMENT consists in the external application of ice bags, unguentum Credé, mercurial ointment or plaster, the latter applied on strips of adhesive plaster (oxide of zinc, rubber adhesive plaster). If this gives no relief, although it is sometimes possible apparently to prevent suppuration by this method, hot applications should be made, such as poultices, and the gland should be incised as soon as there is evidence of tendency to pus formation. These incisions should be made parallel to the branches of the facial nerve. The importance of making early incisions lies in the fact that the burrowing of pus is thus prevented.

Chronic Parotiditis.—In most cases of this disease the local cause will be found in an irritation of the duct, due to foreign bodies, salivary calculi, chronic infections, or to the irritation produced by the elimination of some substance producing general intoxication—for instance, mercury, lead, or bismuth—or to chronic uræmia. This condition is not confined to the parotid gland, but may be found in any of the salivary glands.

The TREATMENT of the general cause is absolutely necessary. For the *local treatment* the opening of the ducts should be examined, and if there is any irritation this should be removed by means of frequent rinsing with some mild antiseptic solution. After this irritation has been relieved the duct should be examined with a filiform bougie or a very fine silver probe, to determine if a foreign body or a stricture is present. If a foreign body is

present, it must be removed by surgical means. A stricture should be treated by gradual dilatation. If neither of these is found, injections of a warm solution of some mild antiseptic or of one of the many silver preparations should be made into the duct. These manipulations require dexterity, which, however, can be acquired by practice. The enlargement of the gland itself is treated by hydropathic measures—lukewarm applications, the warm douche. Iodovasogen may be used externally with advantage in some cases. When no local cause can be found, only the gland itself can be treated, and when this is the case the outlook for cure is not very favorable.

PERIADENITIS

When this occurs in septic infections it is of importance, since it may be the cause of an angina Ludovici. The disease may be found developing around any one of the salivary glands.

TREATMENT consists in early surgical intervention, as described in connection with symptomatic parotiditis.

SALIVARY CALCULI

TREATMENT in this disease consists in the early removal of the calculi, an operation which may be sometimes difficult, while at others it may be accomplished with the greatest facility.

III. DISEASES OF THE PHARYNX

ACUTE PHARYNGITIS

This condition is most commonly due to "catching cold." For its PROPHYLAXIS the reader is referred to the prophylaxis of respiratory diseases.

TREATMENT.—This is abortive and symptomatic.

Abortive treatment is the same as that of acute coryza, with which it is frequently associated (q. v.).

Symptomatic Treatment.—The general symptoms require, as a rule, very little attention; occasionally there is fever, which is easily controlled by one of the antipyrine group of drugs; these at the same time give relief to the headache or pains in other parts of the body. When the tonsils are also involved, sodium salicylate (one- to two-per-cent solution, one teaspoonful every hour) may be given, or salol, 0.3 gm. (gr. v), every two hours for twenty-four hours. Cold compresses at the neck give relief, especially when there is enlargement of lymphatics. A mild alkaline gargle may be used, of sodium bicarbonate or biborate, either ice cold or warm, as the patient prefers. Medicaments dissolved in albolene and applied with a nebulizer may be used. Of these, menthol, camphor (1.5 per cent), eucalyptus oil (one per cent) are best adapted for this form of treatment. Cocaine should not be used, for it is not necessary and may do harm. For ordinary spraying, sodium bicarbonate, menthol, gaultheria, eucalyptol, thymol, sodium biborate, singly or combined, may be used. Any one of these combinations can be found in the market prepared for use in the form of a compressed tablet.

CHRONIC PHARYNGITIS

TREATMENT.—This condition is due to so many causes, both local and general, that its successful treatment becomes a matter that depends largely upon the care, skill, and acumen of the physician. Even with all this, a certain number of cases will be found in which only temporary relief can be given. In others the damage to the mucous membrane has already been done; here all that can be expected, frequently more than can be realized, is to prevent further progress of the process. In many cases the process begins in childhood, especially as children are prone to lymphatic disturbances with hypertrophic conditions in the nose, the nasopharyngeal tonsils, and faucial tonsils. The condition of the external lymphatic nodes is also of the utmost importance, because the lymphatic circulation is interfered with and a condition of the mucous membrane, fruitful for increased reaction to all kinds of local irritants, is produced. The importance of recognizing and treating chronic pharyngitis in children lies in the prevention of acute infections—diphtheria, pus-producer infections, and many others—and in the prevention of permanent damage to the mucous membrane, especially to the Eustachian tubes and the middle ear, the result of which may be more or less impairment of hearing. All such conditions in children as may contribute to the existence of chronic pharyngitis—hypertrophies of the nasal mucous membrane, the pharyngeal tonsil, the tonsil proper—should be removed. Chronic nasal catarrh in syphilitic or so-called scrofulous children should be treated; indeed, the principle of treatment under these conditions should be the establishment of normal respiration—i. e., respiration through the nose. In adults the condition may be the result of processes neglected in childhood. But even here all redundant tissues should be removed. We frequently find that form called granular pharyngitis, in which the removal of the granules—hypertrophied lymphatic tissue—by means of the galvanocautery and destruction of the enlarged veins by cutting gives great relief, and sometimes checks further progress of the disease.

But great stress must also be laid upon *general treatment.* I fully agree with W. Williams as to the toxic origin of a large number of these cases; especially is this the case in the atrophic forms, and the treatment of intestinal autointoxication or of gout, when carried out properly, will do more by way of cure than all local medication. The general condition, apart from this, must be carefully looked into for anæmia, debility from whatever cause, syphilis, or tuberculosis. In a certain number of cases, especially when there is enlargement of the lymphatics, iodide of iron is invaluable; in syphilis, or without it when there is pharyngitis sicca or pharyngitis atrophica, the iodides are of great importance. Excessive use of the vocal organs by singers, clergymen, military officers, speakers, hucksters, etc., is a prolific source of chronic inflammation of the whole vocal apparatus; few following these callings will be found who have not more or less chronic pharyngitis. In these cases, gargling with a warm normal saline solution, twice daily, does much good; or the Swedish method of gargling, with two tumblers of cold water morning and evening.

When the trouble is due to the abuse of tobacco and alcohol very little can

be done unless the cause is removed. The patient may treat himself by gargles or spraying, or by allowing lozenges to dissolve in the mouth. For gargles, sodium bicarbonate (one to two per cent), boric acid, listerine, hydrastis, or any mild antiseptic may be used. Astringent gargles are not so commonly used as formerly, but occasionally relief may be obtained by the use of tannin or alum. All these substances may also be used as sprays. Lozenges containing potassium chlorate, guaiacum, cubebs, menthol, ammonium chloride, krameria, catechu, and benzoic acid are of service. For topical application iodine, zinc sulphate, silver nitrate, carbolic acid, and a large number of other drugs have been recommended.

In some cases *balneotherapy* is important for the removal of the cause (v. Gout, Chlorosis, Syphilis); and also for its direct local effect upon the mucous membrane. Ems enjoys a reputation for being especially helpful in these cases; Kissingen, Homburg, and Carlsbad or Marienbad, when there are digestive disturbances present; also the sulphur waters of Aix-les-Bains, and of Martinsville and West Baden in this country, especially where there is a gouty basis.

Change of occupation sometimes becomes necessary in order to prevent inhalation of mechanical or chemical irritants. Some patients suffer so much (more mental than physical suffering, superinduced largely by the commercial exploitation of the term catarrh) that they remove permanently to a more suitable climate. This can be recommended especially to those who are in danger of permanent loss of hearing.

RETROPHARYNGEAL ABSCESS

Treatment.—The diagnosis is readily made and the indications for treatment are simple. In the beginning some inhalation should be made; also warm applications to the outside of the neck. Incision should be made as early as possible. Two routes are open for this purpose—viz., from within and from without. The first is easier and requires little or no after-treatment. It is performed with a small bistoury having a small cutting surface so as to avoid unnecessary risk of damaging surrounding tissues. The patient, if a child, is to be held with the head between the operator's knees and the body elevated, the latter to prevent the evacuated pus from gushing into the larynx. This operation is indicated in the so-called idiopathic form, due to suppuration of retropharyngeal lymphatics, in the phlegmonous form, and in vertebral caries when the abscess is small.

The second operation consists in dissecting down to the abscess by making an incision behind the sterno-cleido-mastoid muscle. It is indicated especially when the abscess points externally; when there are larger abscesses due to vertebral caries; when the abscess is in such a location that it cannot be reached from within; when the internal incision is not satisfactory, and when there is beginning cellulitis. After the early evacuation of the abscess no after-treatment is required except mouth cleanliness. When operation has been delayed, general tonic treatment, treatment of septicopyæmia (q. v.) and of anæmia (q. v.) are required. The treatment of the vertebral cases will be found in works on surgery.

DISEASES OF THE UVULA

All the forms that come within the scope of this work result in enlargement of the uvula. It is remarkable how much the uvula may become enlarged in some individuals without producing symptoms; on the other hand, it is quite as remarkable how, in some individuals, a slight enlargement produces very annoying symptoms. It is a safe rule not to interfere with the uvula unless it can be directly convicted of producing symptoms, as much indiscriminate and needless surgery has been wasted on this region of the mouth. In the acute forms of inflammation of the uvula, the ice bag at the outside of the neck, frequent sucking of small pieces of ice, and spraying with ice water are of value. When there is a tendency to œdema, and this is not removed within twenty-four hours by this treatment, or when the œdema is very great, the uvula should be fully incised. In other respects the treatment is the same as that of acute pharyngitis. In elongated uvula, if there is persistent cough, especially when the patient lies down, or vomiting, the uvula should be treated. The former condition is not uncommon in children and neurotic adults, and develops as the result of anything causing acute pharyngitis. In these cases two or three applications of silver nitrate to the uvula usually give complete relief. When the symptoms are not controlled by this measure uvulotomy should be performed. In professional singers it sometimes becomes necessary to remove the uvula when they complain of loss of singing voice without any other lesion in the vocal apparatus. Here there must be found a lesion in the uvula, thickening, or great elongation, as an indication for the operation, although I have often seen healthy uvulæ removed, and in these impressionable people the results were good.

HYPERTROPHY OF THE PHARYNGEAL TONSIL

(Adenoid Vegetations)

Adenoids occur at all ages, but are more common in children, because there is a process of involution of enlarged lymphoid tissues that goes on during the period of puberty. There is no excuse for error in diagnosis, of which the general practitioner is so frequently accused by the specialist. But the latter has, however, included too many symptoms in his clinical picture which the general practitioner cannot verify, for he observes the patient after the specialist has finished with him. In children's diseases, in some quarters, adenoids now take the ætiological place that was formerly occupied by worms or the prepuce; there is, however, more justification for the ætiological importance of adenoid vegetations than for the other two.

There can be no PROPHYLAXIS, because in by far the greater number of cases the condition is a congenital one.

TREATMENT.—It is doubtful whether local treatment by douches, topical applications, or caustics is of value, especially in children, where they are difficult to practice; for this reason they are apt to be more harmful than otherwise. There is but one thing to be done in these cases, and that is opertive removal of the adenoid vegetations; for the methods the reader is referred to the special works on this subject. It is best, upon the whole, to operate in every case of adenoids, the operation being rarely attended by risks

when properly performed. Death, when it has occurred, has been due to hemorrhage, to the anæsthetic, or to infection. Bleeders should never be operated on, although even here the use of modern hemostatics may change this view. But deaths from hemorrhage have occurred in the hands of most accomplished operators. Many, especially foreign operators, remove adenoids without anæsthesia; this does away with this risk, but may do great harm to a nervous child. As far as I know, nitrous oxide gas may be used with perfect safety, and, as it is given at the present time, anæsthesia can be prolonged sufficiently to give the operator ample time for the operation. All precautions should be taken to prevent sepsis, however difficult it may be. The proper age for the performance of the operation should be chosen by the general practitioner. He should make a careful general examination of the patient, with regard to heart, kidneys, blood, and general nutrition. I have found the operation necessary in a child three months old. The operation should be done if nursing or proper feeding is interfered with; if there are repeated attacks of middle-ear trouble; if there is very faulty hæmapoiesis; and if development is markedly impeded. In older children, when they are sufficiently robust, the operation may be done at any time. If the patient is not in good general condition or is anæmic or a bad feeder proper treatment should be instituted. This consists of the internal administration of creosote or syrup of iodide of iron, one or both, and results in diminution in size of the external lymphatics, possibly also of the adenoids; and, usually within forty-eight hours, of an increase in appetite, which renders the use of cod-liver oil unnecessary. The great improvement that usually follows upon this medication frequently acts as a temptation to postpone the operation; this should not be encouraged when all other external conditions are favorable, as the child now is in the best condition to stand an appreciable loss of blood always incident to the operation.

After the operation has been performed the physician may have to look after complications or infections; in some cases the anæmia (v. Secondary Anæmia) or the condition of the lymphatic glands (v. Scrofula) will have to be treated. To prevent mouth breathing, which in many has become a habit, it may be necessary to have a bandage applied which prevents the mouth from opening involuntarily. This should be applied only at night in those cases where the patient keeps his mouth closed during the daytime. Respiratory gymnastics and orthopedic measures are necessary in those cases in which the chest is not expanded properly or deformities of the chest are present.

ANGINA LUDOVICI (Cellulitis of the Neck)

This is an infectious process of the cellular tissue of the neck extending in all directions. As the disease in most of the cases has its origin in the mouth and pharynx in connection with the acute infections, the remedy consists in the prophylactic treatment of the mouth and pharynx. Usually the process begins as a periadenitis, wherefore the proper treatment of adenitis, the parotid, the submaxillary, the sublingual, and the lymph glands in the neck is of paramount importance. For the treatment of the disease the reader is referred to the chapters on Septicopyæmia and Scarlatina.

IV. DISEASES OF THE TONSILS

AMYGDALITIS (Tonsilitis, Angina Tonsillarum, Angina Follicularis)

Acute Amygdalitis. Angina (Tonsilitis) Catarrhalis Acuta. Angina (Tonsilitis) Follicularis.

PROPHYLAXIS.—This affection must be looked upon as an infectious disease; therefore, its prophylaxis is that of other infections. The local and the general predisposition, as well as the organisms producing the infection, must be taken into consideration. In those who are especially predisposed to this trouble most careful examination usually leads to a discovery of the cause and to a prevention of recurring attacks. For this purpose the measures recommended in pharyngitis should be used; but they should also be directed to the tonsils. Daily use of sprays applied to the tonsil of sodium biborate or potassium permanganate frequently results in prevention of attacks. But these measures must be continued for a long time. Inasmuch as the follicular form is not to be looked upon as a harmless process, on account of its producing remote infections, such as rheumatism, endocarditis, cholangeitis cholecystitis, skin troubles, scarlatina (Dowson), pneumonia (Menzer), and a number of other remote infections, this troublesome prophylaxis is necessary. It has also been repeatedly shown that in these subjects other infections, especially diphtheria, are more liable to occur than in those with healthy tonsils; indeed, among the worst forms of diphtheria that I have seen were those in which the process was a lacunar one. Excision of the tonsils becomes necessary in a large number of cases.

This disease is contagious and, therefore, direct contact with the patient, as by kissing, should be avoided. The excretions should also be disinfected. The general condition of the patient must be looked to; repeated attacks of this disease are followed by more or less injury to the general health, and so the food, the condition of the blood, and of the lymphatics should be considered. It has been my experience in a number of individuals with local predisposition that bad drainage has caused these sore throats. This is difficult of proof, but in one instance in which a family was suffering from repeated attacks of angina follicularis the attacks ceased after the leaking soil pipe was removed from within the furnace intake. For the prophylaxis of the causes dependent upon "catching cold" the reader is referred to the chapter on Respiratory Diseases.

TREATMENT.—The catarrhal form usually requires little attention, as the process runs its course in three or four days without producing any symptoms that require much attention. In cases that require treatment the following methods may be recommended: Attempts may be made at abortive treatment (v. Acute Coryza); aconite has also been highly recommended here. When the follicular form is developed, the following routine method has given me the best results: Internally the salicylic-acid preparations are given, salol, 0.3 gm. (gr. v), every two hours; in children the sodium salicylate, as recommended in scarlatina. The bowels should be moved, either by calomel or by a mild saline, care being taken not to do too much in this direction. The patient should be put to bed; the diet should be restricted to food that is

easily swallowed and easily digested, which is best given cold. It may become necessary to treat the fever; the milder antipyretics or hydrotherapy may be used for this purpose. An ice bag should be applied or Priessnitz application should be made to the neck; the former especially at the onset of the disease, the latter whenever the lymphatic glands become very painful, which usually occurs after the second or third day of the disease. For local treatment we should largely be guided by the amount of swelling of the tonsils. If this is great, ice should be sucked. All local medication should be of the blandest possible nature, and preferably applied cold in the form of gargles or sprays, never with a brush or swab; when respiration becomes very much embarrassed in children the tonsils should be removed during the attack. The remedies that may be used as local applications here are sodium bicarbonate (one- to two-per-cent solution), sodium biborate, boric acid, potassium bromide, potassium permanganate. When, as is usually the case, there is little swelling of the tonsils stronger local applications may be used, but care must be taken not to produce abrasions of the mucous membrane; here, as elsewhere, too much therapeutic enthusiasm does harm. For this purpose hydrogen peroxide (three per cent) may be used, or some form of iron perchloride, Löffler's solution (which is very painful), the liquor ferri chloridi, or dialyzed iron, or carbolic acid. Except the hydrogen peroxide, it is doubtful whether any of these shorten the course of the disease; but even the hydrogen peroxide may do harm if the preparation is too acid or if it is applied often. I have seen excoriations produced upon the tonsil when it was applied too industriously by means of a brush.

Following the attack of angina follicularis there is always a period of depression and weakness, more noticeable in adults than in children, which seems altogether out of proportion to the comparative insignificance of the local lesion. This requires attention; tonics, hæmic and nervine, should be prescribed. The patient should not be allowed to follow his usual occupation until his strength returns.

Acute Parenchymatous Amygdalitis (Tonsilitis).

PROPHYLAXIS.—Here, again, the prophylactic measures described in the previous chapter must be applied. This disease is not contagious, however. As every other form of amygdalitis may be followed by the suppurative form, the former should be carefully treated, especially in those who are predisposed to the latter. What follows applies equally well to any form of suppurative amygdalitis where pus is found within or around the tonsils, the so-called peritonsilitis. In such cases I have frequently been apparently able to prevent an attack of quinsy by giving salol, 0.3 gm. (gr. v), every two hours for forty-eight hours.

TREATMENT.—As soon as symptoms develop the ice bag should be applied externally and the tonsils should be sprayed with ice water. Strübing recommends parenchymatous injections of a three-per-cent solution of carbolic acid into the tonsil (v. Diphtheria). As a rule these procedures avail nothing, and more relief is given by warm applications, poultices, and gargling or spraying with warm fluids, gargling with demulcent fluids, like flaxseed tea, slippery elm tea, or warm milk. When gargling is impossible warm sprays may be used, consisting principally of antiseptic substances. For the pain sprays of cocaine (two to five per cent) or of menthol (ten to fifteen per cent)

may be tried. If the second or third day of the disease goes by without any apparent improvement the tonsil should be freely scarified. When there are evidences of pus an incision should be made from above downward, the bistoury being so introduced as to make the incision in the vertical axis of the body. In peritonsilitis the incision should be made through the anterior pillar of the fauces, in the most protruding part, usually above and slightly inward from the tonsil. Many authors recommend the washing out of these pus cavities with some antiseptic solution. After the pus has been discharged the patient recovers immediately. Theoretically, the surgical treatment of quinsy is most simple; practically, it is difficult in acute parenchymatous amygdalitis to find the pus. The physician or surgeon need, therefore, not be discouraged when after two or more attempts he does not succeed in evacuating the pus, for the local blood-letting does good under all circumstances.

There is considerable prejudice against the removal of tonsils subject to acute parenchymatous inflammation; the statement being properly made that the inflammation frequently recurs in the stump. But there can be no doubt of the fact that in most if not all cases, after the removal the attacks are rarer, and in some cases they do not appear at all.

Chronic Amygdalitis (Tonsilitis).

PROPHYLAXIS.—Apart from the prophylaxis of acute attacks there can be no other, because in a large number of cases Waldeyer's tonsilar ring in whole or in part is congenitally affected. In many cases, then, tonsilar hypertrophy means an unpreventable hypertrophy of the lymphoid tissue, and frequently the whole condition should be treated. We can in a measure prevent progressive development, but in the nature of the process even this is limited to a small number of cases. Here the emptying of lacunæ filled with caseous material by pressure, followed by cauterization of the walls of the cavity with the galvanocautery, silver nitrate, or carbolic acid, is valuable. If iodine or astringents are applied, they must be continued for a great length of time; they are very troublesome to the patient, and as a rule accomplish very little. When hypertrophy of the tonsil produces symptoms of any kind, when it can be held responsible for change in phonation or respiration, for frequent acute attacks of inflammation, chronically enlarged lymphatics, or damage to the ears, the tonsil should be reduced in size. This is done in various ways, by bistoury or tonsilotome, by enucleation, by the galvanocautery, the point or the snare, and by the cold snare. For the technical details of these operations the reader is referred to books on this subject.

The objections to this operation are many; dangerous hemorrhage, of which Sir Felix Semon says, "it occurs in a very small percentage of cases, however skillfully the operation is performed; yet so rarely in proportion to the number of operations that it can never be urged as a general objection to the practice." The statement is made that the tonsils atrophy during puberty, and therefore need not be reduced. This is true in a large number of cases, and a child may now and then be found in whom no symptoms are produced by the enlarged tonsils, and here the normal involution of the tonsil may be waited for. This is, however, a very exceptional occurrence and involves risks that are incomparably greater than those of the operation. Any other objections to the operation, such as impairment of the voice, the production of sterility, etc., are purely imaginary.

V. DISEASES OF THE ESOPHAGUS

ESOPHAGITIS

The diagnosis of esophagitis is very difficult, the therapy very unsatisfactory. In the catarrhal form its existence can only be surmised, and the treatment must be symptomatic.

TREATMENT.—The pain can be controlled by cold applications to the sternum or the vertebral column, by an ice bag, or by cold, moist applications around the chest. The patient should take cold food and demulcent liquids. When the dysphagia becomes very great it may be necessary to give morphine; if there is spasmodic contraction, atropine, or both combined. Rectal feeding may become necessary. Thrush of the esophagus should be treated locally by introducing a sound or elastic catheter, upon which medicaments may be spread. The taking of large quantities of sodium bicarbonate can also be recommended (v. Stomatitis Hyphomycetica).

Diphtheritic esophagitis, in connection with the acute exanthemata, variolous esophagitis, or pustulous esophagitis from tartar emetic, are recognized upon the post-mortem table.

Corrosive esophagitis is treated as to cause by removal of the stomach contents, the neutralization of the poison by acid or alkali, as the case requires, and the giving of demulcent liquids, oil, milk, etc. Ice water sometimes gives great relief. Collapse should be treated by stimulants; large doses of morphine may also be valuable in this direction. For the prevention of strictures, the frequent swallowing of small quantities of semisolid material, paps of various sorts, or finely scraped meat may be advised. Rectal feeding should be instituted early, if only for the purpose of supplying fluid to the blood. For the treatment of stricture see Stricture of the Esophagus below.

ESOPHAGISMUS (Spasm of the Esophagus)

TREATMENT.—The treatment of the condition producing this syndrone is of essential importance (v. Hysteria, Hypochondriasis, Hydrophobia, Tetanus, Epilepsy, Chorea). The general nutrition should always be looked to; since a large number of patients with hysterical spasm, and this is the most common form, can swallow liquids large quantities of milk may be given. Sometimes these patients are able to swallow solids better than liquids; in these cases frequent small meals should be ordered. Rectal feeding may be instituted; putting the patient to bed produces a good moral effect. Gavage is indicated, and to one of my patients three quarts of milk, with large quantities of carbohydrates, were given in this way with excellent effect. Sometimes the administration of antispasmodics gives great relief, especially the valerian preparations; ammonium valerianate, zinc valerianate, 0.15 gm. to 0.3 gm. (gr. ij to v, *ter die*), validol (15 to 20 drops every four hours) or camphor, either pure or as the monobromide. The administration of belladonna or atropine in ascending doses until physiological effects are produced gives good results in some instances.

The introduction of an esophageal bougie, which is usually arrested by

the spasmodic stricture, is followed by excellent results. In most of these patients the introduction of the bougie is followed by relaxation, so that any kind of food may be swallowed; one of my patients had the bougie introduced twice a day, after which she took a full meal; in this way her nutrition was kept almost normal. Before introducing any instrument into the esophagus the patient should be most carefully examined; I have seen an esophageal sound passed into an aneurismal sac, and others have seen it passed into the pleura, the lungs, etc.

STRICTURE OF THE ESOPHAGUS

TREATMENT.—The medical treatment of this form consists in preventing serious disturbances from failure of nutrition. Here the physician should see that the patient gets a sufficient quantity of albumins, fats, carbohydrates, salts, and water, which in some cases, try as we may, it is impossible to introduce. The possibility of the stricture being due to syphilis when no other cause can be found, must always be entertained, for in syphilitic strictures antisyphilitic treatment is followed by the most satisfactory results. Otherwise the treatment is surgical.

CANCER OF THE ESOPHAGUS

TREATMENT.—The object of treatment is to prolong life and to give relief to suffering; both indications are frequently carried out by the same means. As long as the patient can swallow he should be induced to take food *per os*. At first he is able to take large quantities at a time, but soon it will be found that, on account of the encroachment of the cancer upon the esophageal lumen, only small quantities can be taken. The food, then, should be restricted to fluids or semifluids, broths, meat jellies, milk, raw eggs, strained oatmeal, strained gruels of any sort. Now, also, the use of the esophageal sound or stomach tube, preferably the latter because of the possibility both of dilating the stricture and of introducing food into the stomach, may be begun. In some cases dilatation of the stricture is followed by the happiest results; in others the first experience is prohibitory of further attempts. The introduction of cannulæ has been successfully accomplished, and they have been allowed to remain for weeks; Leuret has used a permanent esophageal tube made of tanned sheep gut, introduced through the nose. In stricture from cancer the patient is usually intolerant of these methods. Upon the whole all these mechanical measures are very crude, and great chances are taken of doing harm to the patient. It would certainly be more advantageous and more scientific to do without them. In order to facilitate the passage of food Cramer recommends a liqueur glass full of sweet oil half an hour before taking food; he says he never uses the sound in these cases. Rühle recommends the taking of large quantities of sodium bicarbonate; this is of great value, as it dissolves the epithelial cells, fluidifies the mucus which collects above the stricture, and thus renders swallowing easier and gives relief to dysphagia. Stricker has seen relief follow the administration of a combination of papayotin and sodium bicarbonate (one part of papayotin to ten parts of sodium bicarbonate, of which mixture as much as will go on the point of

a knife is given at one dose). When the nutrition begins to fail rectal injections should be added, but they are of little value except in that fluids are added to the circulation.

The better the maintenance of nutrition the better the patient bears pain, and possibly he has less pain. Because of the progressive nature of the disorder there comes a time when pain must be relieved. The swallowing of ice and of a pill made by freezing a weak solution of cocaine with ethyl chloride are recommended by Fitz, especially before the introduction of the bougie. The remedies recommended in cancer of the stomach may be tried. Belladonna, Hoffmann's anodyne, chloroform, stramonium, and arsenic have been recommended. Sooner or later morphine must be used, which, however, not only gives relief from pain, but also shortens life. When there is much stagnation and putridity above the stricture or the cancer begins to break down, antiseptics, such as menthol, salicylic acid, salol, or camphor, may be given in powder form.

Surgical intervention, esophagotomy or gastrostomy, offers little; it does not prolong life, and it reduces patients to a pitiable condition, but occasionally suffering may be diminished by it. At present the outlook for surgery in this form of trouble is gloomy; when the time comes that the diagnosis can be made in the very beginning of the disease all this may be changed.

HEMORRHAGE OF THE ESOPHAGUS

TREATMENT.—This should be met by hemostatics and by removal of the cause. The hemostatics to be used are the same as for any other mucous membrane (v. Hemorrhage in Typhoid Fever). The patient should be fed by the rectum until the hemorrhage ceases; then fluid food is to be given, which after a week may be followed by solids. The causes, foreign bodies, ulcers, varicose veins, may or may not be relieved by their proper treatment.

VI. DISEASES OF THE STOMACH

ACUTE GASTRITIS (Acute Gastric Catarrh, Acute Dyspepsia)

PROPHYLAXIS.—This need be taken into consideration in only those who have "weak" or "delicate stomachs." But even in them care must be taken not to make them semi-invalids by putting them upon a rigid diet; it is better for a patient to have an occasional attack of dyspepsia than to have all his thoughts and actions governed by the condition of his stomach. Sometimes there is an evident cause for the "delicate stomach"—nervous influences, constipation, chlorosis, gout, or alcoholism—the removal of which alleviates the patient's condition. These delicate stomachs are frequently found in brain workers, the most distinguished one of our times being Darwin, whose life more than once was controlled by his stomach. Each case of "delicate stomach" furnishes to the careful physician an interesting study. So far as the stomach is immediately concerned no permanent diet should be prescribed, but this should be done if there is an underlying cause that requires diet. With the investigations of Pawlow and his pupils the rela-

tion of the nervous system to the stomach has been placed upon a scientific basis, though a great many of the facts found by experimentation have been known to practitioners for a long time. In many cases acute dyspepsia is due to changes in the stomach, the acute attacks being the expression of extraordinary demands made upon the organ already in a subnormal condition. Here changes in secretion or motility must especially be taken into consideration by treatment consisting of change of diet, of medicaments, and other means to be described hereafter.

In children, especially infants, the prophylaxis is of enormous importance, because it may prevent the production of intestinal derangements of a very serious nature. Briefly, it may be summed up in "proper food properly given"; this includes quantity, quality, and proper intervals of feeding. At the same time, however, the general condition of the child must not be neglected as regards the various so-called diatheses, its protection against great heat, and the insistence upon cleanliness in the care of the skin. Recurring attacks of acute dyspepsia in children are frequently due to constipation; indeed, toxæmias of various sorts should be taken into consideration for the prevention of recurrent attacks.

TREATMENT.—Mild cases in the adult require little if any attention; abstinence from food, or a diet confined to gruels, weak tea, and small quantities of water, for twenty-four hours will be sufficient. In the severer forms, when vomiting is present, it should be encouraged in those cases in which there is evidence that the contents of the stomach have not been removed. This can be done by giving the patient large quantities of lukewarm water. The stomach tube should not be used except in those who have already become accustomed to its use. When the stomach has been emptied the nausea and vomiting may be treated. For this purpose use ice pills, milk and lime water in equal parts, of which a teaspoonful is given every fifteen minutes, or small doses of calomel, 0.01 gm. (gr. $\frac{1}{6}$), taken dry upon the tongue every fifteen minutes until the proper dose required as a cathartic has been given. In most cases a cathartic is necessary to hasten the emptying of the bowels; in this way the cause of the trouble is removed, whether it be improper food or toxines which can be eliminated by the intestines. Calomel is the best remedy that can be used for this purpose, but the large doses (from eight to fifteen grains, as recommended by many authors) are unnecessary and may do harm; 0.15 to 0.30 gm. (gr. ijss. to v) is always sufficient, followed by a saline cathartic after eight or nine hours; in the meantime the bowels of the patient are to be cleaned out by high injections of large quantities of tepid water. For the fever hydropathic measures are best. When the stomach contents are very acid Apollinaris with sodium bicarbonate or equal parts of rhubarb, magnesia, and sodium bicarbonate, 1 to 2 gm. (gr. xv to xxx), every two or three hours, give great relief. Small doses of dilute hydrochloric acid (fifteen drops in a glass of water after meals) should be given when the food produces distress after eating. When pain requires attention codeine phosphate, belladonna, and (only in very exceptional cases) morphine should be used. In these cases the diet should be of the simplest kind; at first only fluid or semifluid food, gruels, tea, eggs (soft boiled); then toast or French bread, crackers, broiled meat; and after the third or fourth day the ordinary diet.

In *infants* the principles of treatment are the same as in the adult. Here lavage of the stomach may be used without hesitation. Emetics should never be used. The calomel is of the first importance; it should be administered in doses of gr. $\frac{1}{10}$ to $\frac{1}{20}$ every hour until the proper amount has been given. All food except barley water should be withdrawn for twenty-four hours. The symptoms that may arise from the fever or the intoxication should receive the proper treatment.

Phlegmonous Gastritis; Acute Suppurative Gastritis. — TREATMENT.— When the diagnosis can be made, which is extremely rare, the treatment can only be symptomatic—the treatment of pain, fever, collapse. The causal treatment is unsatisfactory (septicopyæmia). In a disease so fatal as this surgical intervention might be thought of.

Toxic Gastritis.—TREATMENT.—In poisoning with mineral acids dilution and neutralization of the acid with weak alkalies should be attempted; for this purpose calcined magnesia in milk, in egg albumen, or in some mucilaginous drink may be used. When caustic alkalies produce the disease dilute acids, citric, acetic, or hydrochloric, according to the nature of the combination formed, should be given. The use of the stomach tube in these cases is attended with much risk, as perforation of the stomach may follow. Emetics are for the same reason unsafe.

In poisoning with metals or alkalies the stomach tube should be freely used (v. sections on the Intoxications and the Appendix). The sequelæ of toxic gastritis are treated in their respective sections (Peritonitis, Stricture of Esophagus).

CHRONIC GASTRIC CATARRH

PROPHYLAXIS.—Much could be done here were it not for the fact that the physician is consulted only after the condition has been fully established. In primary chronic gastric catarrh the prophylaxis could, with the coöperation of the patient, be made perfectly effective. In the secondary form, due to changes in circulation or nutrition of the stomach, the prophylaxis depends upon the treatment of the cause (diseases of the lungs, heart, liver, kidneys, blood; diabetes, gout; tuberculosis; chronic intoxication with alcohol, morphine, and heavy metals, which are eliminated by the mucosa of the stomach; ulcer, cancer; retention of stomach contents). The primary form is always caused by some error in alimentation, and is therefore preventable. One of the most common causes is imperfect mastication; either the patient eats too rapidly, or the food cannot be subdivided on account of some trouble with the teeth; the teeth, whether natural or artificial, should be examined in every case of chronic gastric catarrh. The chemical processes going on within the mouth are *per se* of little physiological importance to digestion; but aside from the importance of prevention of gastric irritation by means of large mechanically undivided portions of food, the act of mastication stimulates both gastric and pancreatic secretion. The effort would be futile, at least in this country, to establish the allowance of sufficient time for every human being to take his meals in such a manner that, while he is eating, his brain should be permitted to give some attention to the meal. Experience has long ago taught, and Pawlow has proved the fact, that psychical processes are of great importance in digestion; when a man continues to carry out the mental

process of his occupation he gets both cerebral and gastric indigestion. The stomach requires a normal functional activity in order that abnormal activity or inactivity may not become a habit; it is necessary, therefore, that meals should be taken at regular intervals. The food should be regulated as to quantity; the habitual taking of very large quantities of food, either solid or fluid, or both combined, leads to atony and motoric insufficiency of the stomach. Food that is too hot or too cold frequently produces dyspepsia. Ice water is looked upon as a cause of chronic dyspepsia by Einhorn and others; the consumption of ice creams or ices, so common in hot climates, may act in the same way. Indigestible foods or incompatible mixtures of foods must be held accountable for a large number of cases of chronic gastritis. In the bustle of American life insufficient time is given to the preparation of food; especially is this the case in the preparation of cereal food—we now have breakfast foods that require no cooking. Because of the value of time breads are raised by substitutes for yeast, many of them unwholesome. Because of the existence of many and varied preconceptions, possibly also because there are so many constipated people, bread from whole meal, or meal containing large proportions of the indigestible parts of wheat, is preferred to white bread, though the latter is much more digestible than the former. Hot breads, pies, hot cakes do not a little to contribute to the large number of dyspeptics. In a great many sections of this country the farmer is badly nourished, sallow, dyspeptic; pies, hot breads, jellies, and preserves explain the reason for this condition; *pro* kilogramme of weight he and his family are the most expensively fed people on the earth. In a great number of cases the use of alcohol is the cause, especially the pernicious habit of taking cocktails or what not before meals; but chronic alcoholism is also a common producer of chronic dyspepsia. Inordinate use of tobacco, tea, or coffee may be followed by this disorder.

Treatment.—Too much stress cannot be laid upon the statement that every chronic dyspeptic should be treated as an individual; that the individual causes should be found and the individual peculiarities and idiosyncrasies be studied. Chronic dyspeptics frequently are neurasthenics or have a tendency to hypochondriasis; this fact must be taken into consideration both in the statements the physician makes to his patient and in the manner in which he gives his directions. Here, again, an impertinently scientific physician may do more harm than good. All causes should be removed if possible; these are covered in the section on Prophylaxis.

Dietetic Treatment.—The principal factor in treatment is the diet; in a great number of cases this is sufficient to effect a cure of the disease. In prescribing a diet for this class of patients many things must be taken into consideration; printed diet lists are of value only when they are changed to suit the individual. Feeding by calories gives us in this condition only an approximate guide, as digestibility cannot be reckoned with in the case of a diseased stomach. Fortunately, we do not have to depend upon the latter for the maintenance of nutrition, as intestinal digestion is fully able to maintain this. The diet should be so arranged that it contains sufficient quantities of albumin, fat, and carbohydrates; 100 gm. of albumin, 50 gm. of fat, 450 gm. of carbohydrates in twenty-four hours being, according to Voit, equal to 2,720 calories. But these are isodynamic, according to Rubner, in

the ratio of 4.1 (albumin, carbohydrates), 9.3 fat, so that either fat or carbohydrates may be used to prevent loss of tissue albumin.

In the diet consideration should be paid to the subjective symptoms of the patient. Trousseau always inquired into these first. When there is constipation, prescribe milk, cream, fats; when there is diarrhea, cocoa, eggs, meat; when there is flatulence, as few carbohydrates as possible. The articles of food should be chosen, at least at first, so as to recognize the likes and dislikes of the patient, and, as far as possible, to profit by his experience as to their digestibility in his particular case. A sufficient quantity of food should be given, approximately determined by the caloric value of foods, and the nutrition of the patient should be controlled by weighing him once a week. In many instances only the dyspepsia is taken into consideration, and is cured by the physician while the patient presents the clinical picture of starvation.

In the mild form of this disease the patient should take three meals a day; in the severe form, four or five smaller meals may be necessary. Only such articles should be prescribed as are easily digested, and they must be chosen so as to fulfill the previous indications; besides, the choice must be made of combinations that do not destroy the appetite. It is a good rule to give directions only as to those articles of food that are permitted, everything else being forbidden. Frequently the mode of cooking the food should be laid down.

For mild cases the patient is allowed as follows:

Meats—beef, lamb, mutton, chicken (broiled or roasted), cold ham, chipped beef, cold veal; fish—such as do not contain too much fat, salmon, cod, herring being avoided; game—quail, well-hung venison, pheasants; eggs—raw, soft boiled, poached, scrambled; oysters—raw; milk—buttermilk, kumyss, kefir, matzoon; vegetables, all except pickles, cucumbers, cabbage, onions; bread—whole wheat bread, to some patients Graham bread, never fresh, always twenty-four hours old or toasted, rusks, Zwieback, or crackers; butter may be allowed in suitable cases; carbohydrates in the form of rice, farina, hominy, barley, sago, oatmeal in the form of the soups or as breakfast food; cocoa, tea, coffee, the latter without cream or sugar; no rich sauces; the simpler form of desserts, provided the patient bears sugar well; baked apples or apple sauce; salads, cold salad with simple dressing only, no Mayonnaise sauce; no rich sauces of any sort.

For the severest forms of chronic dyspepsia the patient should be put on a milk diet, and should always remain in bed; two liters of milk, which represent about 1,300 calories when the milk is very good; the rest of the diet may be made up by fine carbohydrates; 200 gm. of farina or of rice boiled in milk, 440 calories; 60 gm. of crackers, 214 calories; these may be buttered with 20 gm. of butter, 163 calories; making in all 2,227 calories.

In *children* the question of diet is difficult to solve. In mild cases, the food which is adapted to a normal child, regulated as to quantity and quality, may be ordered. In severe cases, put the child upon a strict milk diet; then, after the child has begun to gain in weight and his appetite returns, a gradual return to normal diet is permitted. Care must be taken not to produce constipation, which is usually relieved by the milk diet. Therefore it is wise to continue the milk as an adjunct; in many instances it is even necessary

to add cream. For the treatment of cases between the mildest and severest Einhorn's bill of fare may be used:

	Calories.
Eight o'clock:	
Breakfast two eggs	160
Four ounces of French white bread	156
One half ounce of butter	107
One cup of tea (100 gm. of tea, 150 gm. of milk)	101
Sugar, 10 gm. (℥ijss.)	40
Half-past ten o'clock:	
Kumyss, matzoon, or milk, 250 gm. (℥8½)	168
Crackers, 30 gm. (℥j)	107
Butter, 20 gm. (℥v)	163
Half-past twelve o'clock:	
Two ounces of tenderloin steak or the white meat of chicken	72
Mashed potatoes, or thick rice, 100 gm	127
White bread, two ounces	153
Butter, half ounce	107
One cup of cocoa, 200 gm. (℥6⅔)	101
Half-past three o'clock:	
The same as half-past ten	438
Half-past six o'clock:	
Farina, hominy, or rice boiled in milk, one plate full, 250 gm	440
Two scrambled eggs	160
Two ounces of bread	156
One half ounce of butter	107
	2,863

Medicinal Treatment.—This consists in the use of remedies to aid digestion and to meet symptoms. When it has been shown that hydrochloric acid is deficient or absent its administration is indicated. While investigations have not established the value of this remedy in human beings, experience has stamped it as a very valuable agent. Aside from the possibility of supplying HCl to the stomach, a doubtful method on account of the small quantity that is used, research has shown that HCl causes proenzymes to be changed into enzymes, and, more important still, that the flow of pancreatic juice is stimulated by its presence, which alone establishes its value on account of the importance to intestinal digestion. Its antiseptic value, considered in regard to HCl, without the presence of the other constituents of the gastric juice, may be looked upon as very inconsiderable. It improves the motility of the stomach, and that it acts as a stomachic is admitted by those (Riegel) who have largely restricted its indications. As Pawlow has established a period of latency between the ingestion of food and the secretion of gastric juice (from four minutes and a half to ten minutes) HCl should not be given before meals except as a stomachic. In order to aid digestion it should be given during, or better after, meals; during meals, especially when the patient is on a diet consisting largely of albuminous food, as the maximum secretion of gastric juice occurs early, and this is then stimulated by the HCl. Otherwise it should be given from half an hour to an hour after meals. The dose need not be very large; as a rule 1 gm. (℥ xv) suffices, given in a tumblerful of water and sipped. Pepsin,

formerly so freely used, has been largely discarded for physiological reasons. That it does good in certain cases cannot be denied; it is indicated when pepsinogen is absent or markedly reduced. Care must be taken to get a good preparation; in this country this is not difficult, but it acts only in an acid medium. In chronic gastritis with subacid or antacid condition papayotin is of great value, from 0.1 to 1 gm. (gr. jss. to xv) several times daily. Artificial gastric juices containing pepsin in an acid medium are of limited value, and are indicated only when pepsin is absent; but as a rule their chemical composition militates against their activity, especially when there is an addition of larger quantities of alcohol. The research work of Pawlow has already borne fruit in the form of a preparation called gastereïn by Fremont; it is nothing more or less than the gastric juice of dogs; its efficacy in hypochylia and in bad forms of dyspepsia is testified to by such excellent observers as Huchard, Le Gendre, and Mathieu. This preparation may be given in very large quantities, as much as 500 c.c. in twenty-four hours.

Alkalies find their indication when there is hyperacidity due to increase in HCl. The time for administering this group of drugs is usually indicated by the patient himself—i. e., when he suffers most; as a rule this is after meals, but no hesitation need be felt in giving them before meals on an empty stomach. A combination of sodium bicarbonate and calcined magnesia in equal parts, of which from half a teaspoonful to one teaspoonful is given, may also be recommended here.

Bitters are given in order to stimulate the secretion of the gastric juice, they are contraindicated in hyperacidity; of these, quassia (infusion or fluid extract), gentian (the fluid extract or the tincture), cinchona (the compound tincture), condurango, very highly recommended by German authorities, and calumba (infusion or tincture) may be used; all these contain small quantities of tannic acid, therefore there is very little precipitation of pepsin. Nux vomica is one of the most valuable of this group, as it acts not only locally, but also generally. It has been recommended by Musser in ascending doses up to forty drops before each meal in hyperchlorhydria. These remedies should be given in water before meals when administered as tinctures or fluid extracts.

In order to increase the appetite any one of the following remedies may be used: Orexin basic or orexinum tannicum, 0.5 to 1 gm. (gr. vijss. to xv), twice daily, one to two hours before meals, in wafers, was introduced by Penzoldt to increase appetite. It has failed me in every instance in which I have tried it; that it may have an effect upon increasing secretion of HCl is possible. Creosote may be used in tuberculous patients; according to Klemperer its only effect upon the stomach is an increase in motility.

Constipation, which is found in the largest number of chronic dyspeptics, should be treated (v. Constipation). In a great many instances relief of this symptom is sufficient to cure the dyspepsia, especially is this the case in hyperacid forms.

The indiscriminate use of lavage should be deprecated, for the introduction of a stomach tube cannot be counted among the pleasures of life: indeed in not a few patients it is a cause of suffering. In former times every patient who had any stomach trouble had to have his stomach washed out. Even for diagnostic purposes it is not necessary in every case, as the diagnosis

can in many instances be made without it. In chronic dyspepsia it is indicated where there is great accumulation of mucus or loss of motion. In the first instance alkalies, sodium bicarbonate, or Carlsbad preparations may be added; in the latter water at the temperature of the body is sufficient.

Mineral Springs.—These are of special value in the treatment of this disease; saline and alkaline-saline springs are especially to be recommended. When possible, the patient should go to the springs, as the change of air, surroundings, occupation, and diet have a decided effect in increasing the value of the action of the waters. It must not be understood, however, that the action of the waters is to be underestimated, as excellent results may be obtained by the patient at home, if he will lend himself to their methodical use. Of the first group Carlsbad, Marienbad, Saratoga (Congress or Hathorn) should be used, especially in cases with hyperacidity. In the second group belong Kissingen, Homburg, Wiesbaden, which are useful in cases with subacidity. Alkaline waters may be recommended when there is hyperacidity; Gieshübler, Fachinger, Salzbrunn, Vichy (also Saratoga vichy). These indications are valuable only in a general way; for the individual many other things must be taken into consideration.

Hygiene.—General hygiene should be attended to. Sufficient exercise, plenty of fresh air day and night, care of the skin, cold baths or sponges, and above all a rational mode of living as to work, fatigue, and worry must be adopted.

DILATATION OF THE STOMACH

Prophylaxis.—This depends upon the treatment of chronic catarrh or ulcer of the stomach; also on the treatment of muscular atony or Glénard's disease. The latter two should especially be taken into consideration (v. Enteroptosis). For the prophylaxis of muscular atony careful dieting as to quantity and quality is indicated after acute infectious diseases, in chlorosis and diabetes. In many cases the condition is brought on by overeating, especially the combination of large quantities of solids and liquids, as seen in beer drinkers, is a fruitful cause of atony of the stomach. In children we find too frequent and too copious meals producing this trouble; in one of my cases a child aged eight months was receiving thirty-six ounces of milk at one feeding four times daily.

Treatment.—*Medical.*—In atony without mechanical obstruction the diet—and this is true for all forms of dilatation of the stomach—should be prescribed according to the following rules: The food should be taken slowly, not too hot or too cold; it should be taken in small quantities, consequently four or five meals a day should be given; it should be mechanically finely subdivided, so that it is easily digested; it should be regulated as to hyperacidity or anacidity; according to Pawlow, little meat, and in hyperacidity no meat extracts; the dilatation should not be increased by taking much fluid with the meal; above all, such foods should be chosen as enter the small intestine quickly.

In general the following should be avoided: Alcohol in any form; fat or anything prepared in or with fat; seasonings, except salt; legumina and other vegetables that are not easily digested; raw fruit, salads, smoked meats, all sweets, cheese.

The cause of the affection should receive attention; chlorosis (q. v.), general atony, from whatsoever cause. Strychnine, hydrotherapy, gymnastics should be used here. The treatment of *emaciation*, which increases the trouble and may lead to enteroptosis, is a difficult matter; in such cases conservation of energy by absolute rest and utilization of the functional activity of the diseased stomach to its utmost limitation should be tried. In many of these cases a supporting bandage should be applied (v. Enteroptosis). Electricity has been used both within and without. Einhorn's or Wegele's electrode may be tried for the intrastomachic application, the galvanic current being used. For extrastomachic application a large sponge electrode is put over the region of the stomach and a second, smaller one, over the seventh or eighth dorsal vertebra; here both faradic and galvanic currents may be used. In practice percutaneous electrization will always be preferred. Massage is very valuable in simple atony. Lavage is rarely indicated; when it is used care should be taken not to do harm by the introduction of too much fluid.

Even in dilatation from mechanical causes much good can be done by medical treatment. The diet is the same as in atony. The principal method is the systematic use of the stomach tube, and with this, when the obstruction becomes less on account of the lavage, many patients have been cured. Under all circumstances lavage is indicated whenever there is retention of the stomach contents or when there is foreign admixture, such as bile or mucus, which disturbs digestion. The time and frequency of lavage are decided upon as the result of individual indications. Most authors prefer to wash out the stomach before breakfast, but in individual cases before any of the other meals at any other time during the day may be the proper time, depending entirely upon subjective or objective symptoms. When in dilatation of the stomach motoric function is sufficiently developed to prevent stagnation in twenty-four hours it would obviously be unnecessary to use lavage within this time; so that here also the frequency of lavage must be decided by individual indications. Lavage is of permanent value only in benign obstructions at the pylorus. In chronic dyspepsia the mechanical removal of the stomach contents is the principal object of lavage, and this can be accomplished by washing with water; for the purpose of removing mucus, sodium bicarbonate may be added (one to five per cent); when there are well-developed fermentative processes, boric acid (one to three per cent), or salicylic acid (1 to 600). Kreolin (0.5 to one per cent) or any other of the antifermentive remedies may be used. Silver nitrate is still frequently used for its direct effect upon the mucosa.

In all forms of pyloric stenosis thiosinamine (allylsulphocarbamide) has been recommended; 0.2 to 0.5 c.c. of a fifteen-per-cent alcoholic solution injected hypodermically two or three times a week. Hartz, Hebra, Tousey, Schweninger, and Eisenberg have seen good results, even in malignant tumors. Baumstarck has negative results in stenosis, apparently good results in pericholecystitis and perigastritis; Strauss, negative results in organic pyloric stenosis. The remedy is still on trial, but, as it does no harm, further use is justified, especially as good results are reported by internal administration (0.1–0.2 gm. *ter die*).

For the treatment of malignant pyloric stenosis the reader is referred

to the chapter on Cancer of the Stomach; for that of benign stenosis reference may also be had to that on Ulcer of the Stomach.

Surgical.—When all medical methods fail to keep the patient in a proper state of nutrition, the case should be referred to the surgeon. The three operations that have been recommended in dilatation of the stomach due to benign stenosis of the pylorus are resection of the pylorus, gastroplication, and gastroenterostomy. The first operation has been largely given up on account of its high mortality; the second is indicated only in exceptional cases of gastric dilatation, because whenever there is pyloric stenosis there can be no guarantee that this is removed, and in a number of cases of this kind the patient has not been benefited by this operation. There remains, then, the last, gastroenterostomy, with the lowest mortality in benign affections (Kocher, three per cent; Mikulicz, 7.5 per cent; Bidwell, collected cases, 11.5 per cent); and, with its fulfillment of the principal indication, complete drainage of the stomach, therefore the best in results as to complete recovery. Statistics as to direct operative results are very misleading, for as a rule they are compiled from the reports of surgeons of the highest standing, who have performed the operations most frequently and who, therefore, have perfected themselves in technique and have met with all the possible complicating conditions. All this was demonstrated twenty-five years ago in the report of Sir Spencer Wells's series of one hundred successive cases of ovariotomy. Upon the whole it may be said, then, that the highest mortality reported represents a much lower mortality than that attained by the average operator, and, furthermore, that the present mortality is much higher than it will be in five or ten years hence. Moreover, surgeons have operative talent in certain directions and fail in others. Sir Jonathan Hutchinson, in his address at the London meeting of the British Medical Association (1895), said that long ago he had referred all his cases of ovariotomy to Sir Spencer Wells. Physicians should, therefore, be very careful in the choice of their surgeons, and surgeons should try to recognize their individual limitations.

In congenital stenosis of the pylorus the operative results are not very favorable, the mortality being nearly fifty per cent; in those that survive the operation and its sequelæ the final results are good.

ULCER OF THE STOMACH

Prophylaxis.—All that has been positively established in the ætiology of gastric ulcers is that they may be due to anæmia or chlorosis (q. v.) or to hyperacidity of the stomach (Riegel, Ewald, C. G. Stockton). Certain classes of workmen—e. g., tailors, shoemakers, and cooks—have been accused of being predisposed to this disease, but this has not been proved. Under certain favorable conditions trauma may produce ulcer, but very rarely. We can then only act prophylactically by the treatment of hyperacidity, anæmia, and chlorosis (q. v.).

Treatment.—Every case of ulcer of the stomach should be treated as an individual one; therefore classification of cases is almost impossible. For our purpose it may be well to divide the cases into mild and severe ones.

The general indications for the treatment of gastric ulcer are perfectly

plain; rest for the stomach, which is fulfilled by proper diet, and, when necessary, general rest; the maintenance or restoration of general nutrition, which is accomplished by fulfilling the first indication, as well as by medicines; and, lastly, the treatment of symptoms. Finally, when these means do not give complete relief, there remains the consideration of surgical intervention. When these indications are carried out from ninety to ninety-five per cent of these patients get well.

Mild Cases.—Among these are the cases in which the ulcer is chronic or the symptoms are not indicative of any impending danger and do not seriously reduce the general health. In these cases it is not necessary to put the patient to bed; in the beginning, for the first three or four days of the treatment, the patient should be kept at home; after the end of the week in the milder cases he may even begin to follow his occupation; in all these cases, unless nutrition has been seriously interfered with, occupation may be resumed after two weeks of treatment. The treatment is (*a*) dietetic, (*b*) medicinal.

Dietetic Treatment.—The food in all cases of gastric ulcer should be such as is most easily digested by the stomach and is unirritating mechanically or otherwise. In the first three days the patient should be kept on milk diet with beaten raw eggs. Not too much milk should be given at a time, never more than one quart in twenty-four hours; but if there is no danger of dilatation two quarts may be given. The number of eggs may be gradually increased, so that by the end of the week he takes eight or ten in the twenty-four hours. After the third day the patient should be given scraped raw meat; if pyrosis or pyloric spasm returns the meat should be withdrawn, but this is seldom necessary. In the second week carbohydrates are added; strained oatmeal, rice thoroughly boiled, farina, arrowroot, sago, mashed potatoes, racahout. Soups containing carbohydrates and meat jellies may also be given. Ice cream is frequently well borne at this time. In the third week meats may be given—white meat of chicken, fish, sweetbreads, prairie chicken, veal—at first mechanically subdivided or rendered soft by cooking. In the fourth week the patient goes on a mixed diet; sugar may now be tried, red meats may be taken, and then, with the addition of the unirritating vegetables, the patient has sufficient variety. Bread should never be eaten hot; white bread should be chosen, twenty-four hours old or toasted, and then soaked in milk or soup; crackers or zwieback may also be given. Under all circumstances the patient should be warned not to take food that is mechanically, chemically, or otherwise irritating. He should be furthermore warned that his trouble may relapse if he does not take great care, and that the directions should be carried out for from six to twelve months.

Medicinal Treatment.—Medically, I prefer the use of bismuth, given in doses of 1 to 2 gm. (gr. xv to xxx) before each meal. In some cases it is well, as recommended by Fleiner, to give 150 c.c. of Vichy or Carlsbad water one hour before giving the bismuth. By some silver nitrate is preferred (0.1-per-cent solution, one tablespoonful, in a wineglass of water before meals —solutions as strong as 0.8 per cent are used).

Severe Cases.—These are treated by rest in bed, which must be absolute; the length of time the patient is kept in bed varies with the time of

disappearance of symptoms. Authors differ very much in this respect. Ziemssen keeps his patients in bed not longer than four weeks; Fleiner four to six weeks; Leube ten days; Riegel fourteen days. I have never found it necessary to follow a strict method in the treatment of gastric ulcer, such as those recommended by Leube, Fleiner, Lenhartz, and others; by combining these and adapting them to the individual the best results are obtained.

Leube's method, as modified by Einhorn, is as follows: Rest in bed. Flaxseed poultice at the stomach during the day; Priessnitz applications at night, until the patient is allowed to get up. Half a pint of Carlsbad water or 5 to 10 gm. of Carlsbad salt, the latter in solution, at 122° F., in the morning and at bed time. Einhorn does not use this in a routine way. The diet is as follows: For the *first three days*, 7 A.M., 150 c.c. (℥v) of milk; 8 A.M., the same; 10 A.M., 150 c.c. of milk and strained barley water; 11 A.M., 150 c.c. of milk; 1 P.M., bouillon, with or without the addition of a peptone preparation, 150 c.c. *Fourth to eleventh day*, 7 and 9 A.M., milk, 300 c.c. (℥x); 11 A.M., milk with barley, rice, or oatmeal water, 300 c.c.; 1 P.M., one cup of bouillon, 200 c.c., with a beaten egg; 3 to 5 P.M., milk, 300 c.c., with barley water at 7 P.M.; milk alone at 9 P.M. *Eleventh to fourteenth day*, 7 and 9 A.M., milk, 300 c.c., two crackers softened; 11 A.M, milk with barley water, 300 c.c.; 1 P.M., one cup of bouillon, 200 c.c., one egg, and two crackers; 3 P.M., milk, 300 c.c., and one egg; 5 P.M., milk, 300 c.c., and two crackers; 7 P.M., milk and barley water; 9 P.M., milk, 300 c.c. *Fourteenth to seventeenth day*, at 7, 9, and 11 A.M., as in the preceding period; 1 P.M., scraped meat, 50 gm., two crackers, one cup of bouillon, 200 c.c.; 3 P.M., milk, 300 c.c.; 5 P.M., milk, 300 c.c.; one soft-boiled egg, two crackers; 7 P.M., milk, with farina, 300 c.c.; 9 P.M., milk, 300 c.c. *Seventeenth to twenty-fourth day*, 7 A.M., two soft-boiled eggs; butter, 1 gm.; toasted bread, 50 gm.; milk, 300 c.c.; 10 A.M., milk, 300 c.c.; crackers, 50 gm.; butter, 20 gm.; 1 P.M., broiled lamb chops, 50 gm.; mashed potatoes, 50 gm.; toasted bread, 50 gm.; butter, 10 gm.; one cup of bouillon, 200 c.c.; 4 P.M., the same as at 10 A.M.; 6.30 P.M., milk, with farina, 300 c.c.; crackers, 50 gm.; butter, 20 gm.; 9 P.M., milk, 300 c.c.

Fleiner uses bismuth, 3 to 5 gm., before meals; in order that this may have the best effects, the stomach should be contracted, the patient must be kept in bed, and, when possible, nothing should be put into his stomach for two to three days; during this time nutrient enemata are used—lukewarm water, 300 c.c.; bouillon, with or without 50 to 100 c.c. of white wine, 250 c.c.; in very debilitated patients bouillon with one or two eggs, or milk and glucose. When dilatation of the stomach occurs ice bags should be applied. When necessary, arrowroot, rice, racahout, one to two yolks of eggs, or Gaertner's fat milk may be added. Then, after having given from 100 to 150 c.c. of Vichy, oatmeal gruel or farinaceous gruels and meat jelly are gradually added. This represents the list of foods to be given until the fourth week. After the fourth week meats—white meat of chicken, squabs, pheasant, sweetbread, veal; also fish and mashed potatoes may be given. After the sixth week red meat, also vegetables, may be tried. With this and the symptomatic treatment he has successfully treated 300 cases, including twenty-seven operative ones. The bismuth must be continued for from three to four months, alternating with silver nitrate, 0.01 gm. (gr. $\frac{1}{6}$), every five days, both being given before meals. In his medication Fleiner has largely followed Trousseau, who was the first to use bismuth, silver nitrate, and iron in gastric ulcer.

Lenhartz does not give milk except in cases with hemorrhage and in very bad cases. Even then, after three to eight days, he gives 35 gm. of scraped raw meat a day, then 70 gm. with eggs; after about two weeks rice or farina or zwieback are given; after three to four weeks a mixed diet is allowed. He also gives bismuth in large doses only the first few days; then only 1 gm. (gr. xv) a day. In this respect he disagrees with Fleiner, who gives from 3 to 5 gm. three times daily; it is a remarkable fact that in ulcer of the stomach these large doses of bismuth do not produce constipation.

My own routine treatment has been as follows: In the severest cases the patient is put to bed and the stomach is given absolute rest—i. e., in so far as this is possible. The food is given by the rectum in the form of nutrient enemata. Nutrition cannot be maintained by means of nutrient enemata; whenever they are used the patient loses weight and strength; the reasons for this are obvious; therefore their use should be limited to cases in which there is hemorrhage or where the introduction of the food into the stomach produces unbearable pain or vomiting. One hour after the bowel has been cleansed by means of an ordinary enema, the nutrient enema is given, its nature depending upon the reaction in the individual, and it may be given three or four times daily. I have found that it is better borne when given by high enema, and for many years I have used it in this way with better results than when injected into the lower part of the rectum. The best nutrient enema is the one first recommended by Leube, a mixture of scraped meat and chopped raw pancreas, with which occasionally a patient may be kept in good condition for a long time. Between the other methods there is very little choice; my preference is for peptonized milk, with or without eggs, to which I add 30 gm. (℥j) of brandy when a stimulating effect is required—in giving the injection high up 250 gm. are required; this quantity, however, may be exceeded very frequently. The injections should always be given warm.

The following are the nutrient enemata that are especially recommended. Leube, besides the one already referred to, uses the following combinations: 60 gm. of peptone to 300 c.c. of milk; three eggs in 300 c.c. of milk, with 3 gm. of common salt; 60 gm. of starch and 300 c.c. of milk; or 300 c.c. milk, three eggs, 3 gm. of salt, and 40 gm. of starch. Boas recommends milk, 250 gm.; the yolks of two eggs, half a teaspoonful of a peculiar form of flour called Kraft-mehl. Ewald uses two tablespoonfuls of wheat flour in 150 c.c. of lukewarm water or milk, to which are added one to two eggs, 3 gm. of common salt, and 50 to 100 c.c. of a fifteen- to twenty-per-cent solution of glucose.

After a nutrient enema the patient should always be kept in bed for at least an hour. When there is great irritability of the bowel tincture of opium may be added to the injection. In ulcer of the stomach this method of feeding should not be continued longer than from three to five days, although Donkin has observed good results when continued for twenty-three days, Ratjen for ten days, and Boas for from ten to fourteen days.

After three to five days the diet recommended in the mild form is begun and carried out in the same way as there directed. Bismuth is given in doses of 1 to 2 gm. (gr. xv to xxx) three times daily; in order that it may be more efficacious some alkaline water is given before it is taken. This may

be Apollinaris, Vichy, or, in case of constipation, Giesshübler or Carlsbad. Improvement and cures are easily obtained by this method, provided it is conscientiously carried out. The great trouble is to convince the patient that he cannot take liberties with his stomach and that he must keep up his diet for a long time, not less than six months; longer if any symptom remains. The bismuth should also be continued for six months in the bad cases.

Treatment of the Symptoms.—(*a*) *Hyperacidity.* Alkalies may be given here: Vichy, Carlsbad, calcined magnesia, etc. (v. Hyperchlorhydria). (*b*) *Dilatation of the stomach.* The ice bag sometimes improves the condition very much. If necessary, lavage can be used carefully (but never when there is hemorrhage), 250 c.c. of water being used and introduced under very low pressure. (*c*) *Constipation.* As a rule, rectal means are to be preferred. If these are not sufficient, Carlsbad or rhubarb may be used. (*d*) *Pain.* With the bismuth treatment pain and pyloric spasm disappear very early. When this is not the case, codeine, antipyrine, sodium bicarbonate, anæsthesin Ritsert, 0.25 to 0.5 gm., should be tried. If necessary, morphine should be given, but only after the other remedies have been tried, on account of the danger of establishing morphinism. Poultices are also of value here. (*e*) *Hemorrhage.* Absolute rest in bed and rectal feeding. An ice bag should be placed over the epigastric region; lavage with adrenalin solution (1.5 c.c. of the 1 : 1,000 solution to from 250 c.c. to 500 c.c.) or hypodermic injections of adrenalin should be given; when necessary the extremities may be ligated; hypodermoclysis, or saline transfusions, may be used. In repeated uncontrollable hemorrhages surgical intervention is indicated. (*f*) *Perforation* should always be treated surgically. (*g*) *Collapse* should be treated by stimulants—ether, camphor hypodermically, saline transfusion—and by the other means that are in use in this condition. (*h*) *Anæmia.* Arsenic or iron should be used; the organic combinations of iron—bovinine, hæmogallol, hæmol, iron peptonate, ferratin—should be preferred.

Surgical Treatment.—When medical treatment has been carried out without results, then only should the patient be advised to turn to the surgeon. The view held in certain quarters, that gastric ulcer should always be treated surgically, cannot be accepted. The results of medical treatment are too favorable as to cure and mortality to submit to the risk of a surgical operation even in the hands of those most skilled and experienced.

The indications for performing an operation in ulcer of the stomach are as follows: In perforation the operation should be performed as soon as the diagnosis is made. In hemorrhage from the stomach the individual case should determine the necessity for operating; it becomes necessary to operate in repeated hemorrhages, but it is doubtful if a large single hemorrhage should lead to operation; for if the operation is done as soon as a large hemorrhage sets in it manifestly is improper, because the mortality is very small in these cases; and if the hemorrhage is so great as to imperil life there is greater chance of saving the patient by medical than by surgical measures. In dilatation due to stenosis of the pyloric end of the stomach the operation should be performed, provided always that medical measures do not suffice to keep up the nutrition of the patient. In a large number of these cases proper diet and lavage increase the lumen of the stenotic

portion by removal of mucus; whence dilatation follows and finally improvement in the patient's nutrition. A large number of these patients have been kept comfortable for years, and some of them cured, long before we dreamed of surgical intervention. The indication for an operation for a precancerous state is as yet without a scientific basis.

The objections to operative intervention are, first, the mortality, which varies from two per cent (Moynihan) to seven per cent (Mayo) under the most favorable conditions, inasmuch as it represents the mortality of operators distinguished for their special skill in this kind of operation. The average mortality, it is safe to say, would be very much higher than this and, conservatively estimated, much higher than that obtained by medical treatment alone (Fleiner, Lenhartz, Saundby). Secondly, not all cases are relieved by the operation; how great the percentage of failures is has not been shown, but it would of necessity be determined largely by the kind of cases operated on. Thirdly, a certain amount of mortality follows through the transference of the digestion from the stomach to the intestine, giving rise to duodenal or peptic ulcers. Fourthly, the surgical treatment must be looked upon as a purely symptomatic measure, in that by it the cause of the disease is not removed. Time alone can tell how far this objection will affect those surgeons who believe that every ulcer of the stomach should be operated on.

CANCER OF THE STOMACH

TREATMENT.—*Radical.*—This can be done only by surgical means, and then only by gastrectomy. The question whether cases are cured in this way must be answered affirmatively, just as an affirmative answer may be given for cancer of the breast where a relapse sometimes follows after twenty years. The difficulty in radically treating cancer of the stomach lies largely with the physician, not with the surgeon, who has succeeded in reducing the mortality of operations from 64.4 per cent (1881–87, Haberkant) to 20.8 per cent (Krönlein, 1901). It lies with the physician to make the diagnosis as early as possible; the difficulties of diagnosis are not underrated by me, but he must accept the fact that cancer of the stomach can be cured. The earlier the patient is operated on the less danger of metastasis, of lymphatic involvement, of adhesions, of general dyscrasia. As the mortality from exploratory laparotomy is very small, this should be resorted to early in the case of presumptive cancer of the stomach. Gastrectomy must be looked upon as a very dangerous operation, even the lowest rate of mortality being very large; but this will not be diminished by waiting and temporizing with palliative measures. An operation should be judged not only by its mortality, but also by the permanent results. Very few statistics have taken the latter into consideration; Mikulicz shows that in fifty-seven cases operated on twenty subjects lived from a half year to eight years and a quarter; ten longer than two years; four longer than three years; and a third (seventeen) could be considered as radically cured. Krönlein's statistics are even more instructive; they include 264 cases of gastric cancer, in 197 of which operation was performed; in thirteen cases the course of the disease could not be followed. The mortality from the operation was twenty-eight per cent; the average duration of life in those operated on

was 520 days; in those not operated on 114 days. Out of thirteen cases there was no relapse in the eighth year in one case, in the seventh year in one case, in the third year in two cases, in the second year in three cases, in the first year in six cases. Murphy has collected 189 cases, in which the operative mortality was 13.2 per cent; of the remainder seventeen survived three years; after three years only five per cent survived. Mayo has forty-three cases, with a mortality from the operation of twenty to twenty-five per cent; all but two of those who survived the operation lived beyond the year; one lived three years and seven months.

Palliative.—(*a*) Surgical.—The operation of gastroenterostomy is regarded as the palliative operation, and to a certain extent this is true. An analysis of Krönlein's results will show that the patient lives 193 days after the operation; Mikulicz's cases only five months and a half, and that the mortality is nearly as great as in gastrectomy (24.3 : 28 per cent); they furthermore show that life is prolonged ninety-one days as compared with no operation. As far as palliation of symptoms is concerned, this is complete when they are due to pyloric obstruction, but the symptoms inevitably return, their cause not having been removed. It would seem, then, that this operation should not be done in cancer of the stomach, except in those cases in which it is found during the operation that gastrectomy is impossible on account of inoperable conditions of metastasis. Gastrostomy should be resorted to when the obstruction is found at the cardiac extremity of the stomach. The results obtained are at times very good, especially when the operation is done early.

(*b*) Medical.—1. Nutrition.—The greater the quantity of food taken the longer will the patient retain a good condition, the longer will he live. When there is pyloric obstruction the diet of dilatation of the stomach (q. v.) may be looked upon as a foundation to be built upon according to the nature of the case and the individual peculiarities. But even here Trousseau's rule, to allow the patient to eat that which seems best to him, should be considered. Mechanically irritating food should not be taken under any circumstances; it causes pain and may produce hemorrhage. As the disease progresses it will be found that the patient eliminates a great number of articles of food on account of loss of appetite. Then recourse may be had to condensed or predigested foods, Valentin's beef juice, bovinine, somatose, and the various peptones. Rectal alimentation may, in most cases, now be added as a means of introducing fluids into the circulation.

2. Medicinal measures are used at times for an effect upon the carcinoma itself. To this class belongs potassium iodide, in doses of 2 to 3 gm. (gr. xxx to xlv) *pro die* (Boas), used with good results in esophageal cancer. Condurango was supposed to have a specific effect upon cancer; this view has been given up, but the use of the drug has been advised by a large number of authors as a stomachic; it may be administered as a decoction, ℥ss. of the drug boiled in a pint of water until the water is reduced to a half pint. A tablespoonful of this is given three or four times daily; or the fluid extract, 2 gm. (ɱ xxx), *ter in die*, may be given. Methyl blue, 0.2 gm. (gr. iij), has been recommended by Einhorn, who states that it gives relief to pain, and sometimes causes the tumor to remain stationary, the patient not losing in weight. Thiosinamine has been referred to in con-

nection with dilatation of the stomach (q. v.). *Lavage* may be used when there is much retention; it gives relief for distention, for vomiting, and for pain. Ewald has recommended chloral hydrate very highly in fermentative processes and for the symptoms produced by these (one tablespoonful of a three-per-cent solution every two to three hours). For *pain* large doses of bismuth, chloral hydrate, orthoform, or anæsthesin may be tried, but in most instances the use of opium or morphine is inevitable. Here care must be taken not to exceed doses that give relief, for sooner or later morphinism will be induced, and then enormous doses will be required to afford only moderate relief. *Constipation* may be treated by rectal measures or rhubarb; aloes, senna, or cascara sagrada may be given.

SECRETORY DISTURBANCES

Hyperchlorhydria.—Prophylaxis.—As this is considered a neurosis, the prophylaxis must take into consideration all that removes this cause (v. Neurasthenia). In addition to this, however, constipation should be treated. Constipation is present in nearly all these cases; frequently not only relief but also the prevention of relapses is obtained by taking this fact into consideration. It is very probable that this disease is one of the manifestations of acidosis due to intestinal autointoxication; as such the prophylaxis of the autointoxication (q. v.) must be taken into consideration for hyperchlorhydria.

Treatment.—In the milder cases the administration of an alkali with some purgative is all that is required. (Pulv. rad. rhei, 5 gm.; magnesiæ ustæ, sodii bicarbonat., āā 10 gm. One half to one teaspoonful two hours after meals.) In those cases in which nervous symptoms are most prominent the bromides (sodium, ammonium, potassium, strontium) are of great value.

Dietetic Treatment.—Unless absolutely necessary, nervous patients should not be dieted; the mental effect is bad and it is apt to be followed by bad nutrition; when diet becomes necessary the quantity of food to be taken should be indicated by the physician. The diet in such cases should be unirritating so far as secretion of the stomach is concerned; no acids, no spices, no alcohol, no strong tea or coffee; in a given number of my cases mineral water containing lithia has brought on attacks. The diet should be mixed, always suited to the individual. We know from experience that as a rule meats are well borne by these patients; carbohydrates are well borne by some, not by others, but all sweets should be forbidden; butter and fats are especially indicated, on account of their inhibitory action on the gastric juice. Among meats, broiled or roasted beef, chicken, game, veal, lamb, and mutton, preferably without sauces, and oysters and all easily digested fish may be recommended. Eggs and milk are usually thoroughly well adapted to these cases. Of the carbohydrates the best are wheaten bread, crackers, which may be taken with each meal; in addition, potatoes (mashed or baked), rice, farina, vermicelli, spaghetti, macaroni, sago may be taken. Here the utmost limit of digestibility should be attained in quantity given, as the carbohydrates are highly important for general nutrition. The fats are best given as cream, butter, or fine salad oils, but very large quantities

can be given only in rare cases; and here again should be noted the importance of fat producers. Vegetables should be recommended; in some cases vegetarianism, always including milk and eggs, gives good results, especially when there is no motoric insufficiency; this is due largely to the fact that this form of diet relieves the constipation. In some individuals, on the other hand, vegetables can be taken only to a very moderate degree; here spinach, green peas, asparagus tips, and young carrots may be tried. Fruits are not well borne by these patients. The use of tobacco should be limited.

Medicinal Treatment.—The alkalies come first; to be given one to two hours after meals in the form of magnesia usta, magnesium ammoniophosphate, or sodium bicarbonate; as a rule combined. Alkaline mineral waters, Carlsbad or Vichy, may be prescribed. When there is hypersecretion, atropine or belladonna is valuable. For the pain belladonna in small doses, frequently repeated; occasionally small doses of nux vomica give relief. As a rule nothing besides the alkalies is required. Morphine is recommended, but should never be used; it is the most dangerous remedy to put into the hands of neurotics. In a number of cases when the alkalies fail large doses of bismuth, given as in gastric ulcer, are invaluable. My experience has proved that in a limited number of cases anæsthesin Ritsert acts very well.

Mechanical Treatment.—The introduction of large stomach tubes can be recommended; this should be done daily. The routine use of lavage of the stomach in these cases should not be encouraged. Lavage may be used as a symptomatic measure; it in no way removes the cause, but simply acts by suggestion. It is a common observation to find patients who have been dieted, and have had their stomachs washed out once or twice daily, recover promptly when the dietary restrictions are removed and the lavage is given up. All who see many cases of hyperchlorhydria will concur in this observation. In such cases the use of the bromides is especially indicated. The diet should then be liquid or semisolid. When there is dilatation of the esophagus the tube should be introduced and lavage of the esophagus used.

Symptomatic Treatment.—(*a*) *Eructation* occurs in nervous people or as the result of habit. Its treatment is indicated by the ætiology. Dieting is of no benefit and frequently does harm.

(*b*) *Regurgitation and Rumination.*—The best method is to educate the patients to suppress the act. When there is regurgitation only, the patient should be told to swallow the food that comes up into the pharynx. Many measures have been tried; acids, alkalies, narcotics, symptomatic treatment as to the condition of the stomach contents, lavage, electricity—any one or all may do good; the treatment of the temporary stomach condition is probably the best, as it is the best suggestive measure.

(*c*) *Nervous Vomiting.*—This is one of the most difficult conditions to treat. Above all, a careful diagnosis should be made as to the cause; abnormal reflexes should be excluded; organic disease eliminated; even in their presence, vomiting, in most instances, is an evidence of instability of nerve function. When so-called idiopathic nervous vomiting exists the physician will be forced to study the individual and his peculiarities, for, after all, psychical treatment is most successful in these cases. What else can be done with a man who when his wife is pregnant takes it upon himself to vomit for her every morning? This I have seen three times in my experience.

In the milder cases, in those without nutritive disturbance, all those means that make an impression upon the patient should be used; electricity, locally or generally, galvanism, faradism, frictional, the more imposing the apparatus the better; massage, especially when some particular indication for its use is insisted upon; the same for hydrotherapy; counterirritation, sinapisms, or better by the galvanocautery, although it should be used only as the potential cautery, applied along the spine. Whatever is done in this direction should at first be used daily, and sufficient weight should be laid upon the necessity of its systematic use. Of medicines there is an unlimited supply. In general, such should be chosen as have some positive effect, even if it be only on the nerve of taste. The following may be mentioned: Bromides in some bitter, such as quassia or gentian; menthol, creosote, cerium oxalate, ipecac, arsenic, iron, tincture of iodine, and many more. No narcotics or cocaine should be used.

In the severe form, when nutrition has suffered, the patient should be removed to a hospital. The Weir Mitchell cure, overfeeding by the stomach with foods best adapted to the individual, should be used. Gavage and rectal feeding should be held over the patient as psychical persuaders, and finally, if necessary, carried out; then no food should be given by the mouth. In returning to normal feeding the patient should be weaned, as it were, from the abnormal method; therefore the latter is to be discontinued gradually; should the patient again vomit, the abnormal method is again to be returned to with all vigor. In not a few of these cases, when the general condition does not permit of gavage, rectal feeding not having fulfilled its object, it becomes necessary to give morphine hypodermically. This is done once or twice daily and after four hours a full meal is given. I have been able to tide over a number of desperate cases in this way. The treatment of these patients requires judgment, insight, knowledge, force, dogmatism on the part of the physician; but above all endurance, patience, and a certain amount of sympathy.

Cyclical Vomiting of Children.—This does not really belong in this section, but its treatment will be described here, as its actual cause has not been discovered and because nearly all children affected belong to the neurotic type. Between the attacks the child should be treated as all other nervous children; constipation should especially be looked after. During the attack all food by the mouth should be withdrawn; the essential in feeding is to see that the patient gets enough fluid; this should be done by high rectal injections of water; if necessary, hypodermoclysis or (rarely) saline transfusion. In the beginning the bowels should be moved by small doses of calomel; later on by glycerine suppositories or rectal injections. In some cases I have given large or small quantities of water by the mouth, depending upon the peculiarity of the individual. Elimination should be stimulated, as it has been noted that whenever the kidneys return to their normal function the attack usually ceases. Besides the supply of fluid, warm baths may be used; pilocarpine should be administered with great caution, but in several instances it has seemed to me that the attack was abated by its use.

Peristaltic Unrest (Kussmaul).—The general treatment of neurasthenia (q. v.) must be carried out. Sedatives should not be used by the patient except when directed by the physician; thus, when a patient suffering with

this condition has to undergo some unusual nerve exertion (a trip from home, the attendance at some necessary function, etc.) a minute dose of morphine is sufficient to control the symptoms and give relief to the general condition. Complete daily evacuation of the bowel is one of the best means of giving relief; this can be effected by slight assistance by rectal means, by irritating diet, by massage and electricity in suitable cases. Hydrotherapy is very valuable.

SENSORY NEUROSES

Hyperæsthesia.—In mild cases the removal of the cause is sufficient—food that is too cold, too hot, too acid, too sweet, etc.; but, as in all neuroses, the treatment of the general condition—neurasthenia, hysteria, chlorosis—is paramount. Rosenheim has recommended silver nitrate—0.2–0.3 gm. (gr. ij–iij) in 100 gm. (℥ij) of distilled water, of which half a tablespoonful is taken half an hour after the principal meal of the day. Rest after meals and hot or warm applications applied to the epigastrium frequently give relief. If there is an abnormal condition of the stomach, it should be treated. The continuous use of sodium bromide for a month or more sometimes cures the condition. In the severe cases the treatment should be that of nervous vomiting.

Gastralgia, Gastrodynia.—The prevention of the attack is a matter of causal therapy; this requires a careful diagnosis, as this symptom may be due to many causes: to the stomach, to the central nervous system as the result of disease in remote organs, to infections (malaria) and intoxications, and to neurotic conditions. In the latter, arsenic, in small doses before meals and continued for a long time, frequently prevents recurrence of attack. During the attack hot applications to the epigastrium, counterirritants, the valerian preparations, tincture of belladonna in small doses well diluted and given every ten minutes; Hoffmann's anodyne or chloroform water may be tried. But cases will be found in which the hypodermic use of morphine may be necessary.

General Abnormal Sensations: *Bulimia.*—The condition of the stomach should be taken into consideration and treated. Otherwise the general causes must be looked into. Akoria and anorexia nervosa are commonly manifestations of neurasthenia or hysteria (q. v.).

Gastroxynsis (*Periodic Continuous Secretion of Gastric Juice*).—The therapy here is largely that of hyperchlorhydria. The attacks resemble migraine, and may be treated as such. In the beginning the attack may sometimes be aborted by antipyrine, the bromides, or both combined. Between attacks the individual peculiarities of the patient, usually neurotic, must be treated.

Chronic Continuous Gastrosuccorrhœa (*Hypersecretion*).—TREATMENT.—This form of trouble occurs as the result of intoxications—morphine, alcohol, nicotine—in combination with organic nervous diseases (locomotor ataxia), and in neurotics, so that causal therapy may be of great importance (v. Hyperchlorhydria). The regimen of hyperchlorhydria should be instituted. Atropine or belladonna may be given. Morphine has also been recommended. Lavage is used by Reichmann, also by Riegel. Einhorn sprays the stomach

with 1 or 2: 1,000 silver nitrate solution. The latter author also recommends his method of direct galvanization of the stomach.

Achylia Gastrica.—TREATMENT.—As causal, that of cancer, hysteria, neurasthenia, tabes, and sclerosis of the stomach (q. v.). In all these cases such diet should be prescribed as can be easily digested by the small intestine, and enter the latter in the shortest possible time. For the latter object the food should be finely subdivided, either before administration or by careful mastication, or by both. Liquids and semisolids are of great value in this form. Occasionally stimulation of gastric secretion is obtained by the administration of beef extracts. In detail, the diet may consist of scraped, chopped raw meat, or meat thoroughly boiled; milk, eggs, cream, butter, cocoa, wheaten bread, either toasted or twenty-four hours old; crackers; gruels of various sorts made of the finer carbohydrates; vegetables given in purée form; potatoes baked or mashed; sweetbreads thoroughly boiled; raw oysters, fish. Buttermilk, cottage cheese, butter, bonnyclabber are valuable additions. When improvement begins to take place other articles of diet may be tried—meats prepared in different ways, carbohydrates in the form of puddings, macaroni; even baked or stewed fruits, or uncooked fruits (grapes, ripe peaches, and pears). In very severe cases the physician must feel his way by first using the simplest form of food.

Medicinally little can be accomplished for the local indication; the bitters have been recommended—nux vomica, strychnine in dilute hydrochloric acid, condurango. Local galvanism has also been employed. The general treatment in most of these patients is of more importance than the local.

MOTOR NEUROSES

In all these disturbances there are no anatomical lesions. The cause, then, is a nervous one, and the results of treatment are due to all those means hereafter to be described—psychical, medicinal, hygienic, etc.—that are indicated in these cases.

Cardiospasm.—The acute form may be controlled by having the patient take deep inspirations and restrain expiration; pressure upon the lower end of the sternum also sometimes gives relief; when the attacks do not come too frequently, a small dose of codeine or antipyrine gives relief. In the chronic cases the physician should see that the mental effect which produces the motoric disturbance of the stomach is eliminated. One of my patients gets an attack of cardiospasm after he has eaten something which he considers indigestible; if that particular article of food is concealed by flavors used in the food, no attack follows. Suggestive therapy is of the greatest importance. In a number of these cases malnutrition is present, frequently due to fear of cancer; fortunately, this phobia can usually be easily removed.

In bad cases of cardiospasm, which eventually leads to idiopathic dilatation of the esophagus, many things have been tried. The principle here is forcible stretching of the muscular fibers at the seat of spasm. Gradual dilatation by bougies or by the introduction of esophageal probes has been useless. Mikulicz conceived the idea of forcibly dilating the fibers by opening the stomach and then stretching them. B. W. Sippy has invented an instrument consisting of an inflatable rubber bag, surrounded by a cloth bag, the whole

being covered by a condom in order to prevent friction when it is introduced. The whole is introduced into the esophagus by means of a bougie which fits into a central tubing compartment attached to the bag. By means of this instrument, which can be inflated *in situ*, a number of cases have already been cured.

VII. DISEASES OF THE INTESTINES

CATARRHAL ENTERITIS

Acute Catarrhal Enteritis.—PROPHYLAXIS.—For the adult, in primary catarrhal enteritis, it is especially in summer that prophylaxis is important. Improper food, combined with general diminution of glandular activity or lessened resistance to infectious agents, may be looked upon here as the mechanism of its production. During the great heat, such general precautions as are recommended in insolation (q. v.) should be taken. The food problem is the same in winter as in summer: easily digested, well prepared food in normal quantities should be the rule. All excesses in feeding should be avoided; drinking large quantities of carbonated waters, fruit juices, and the eating of unripe fruits frequently cause this condition. In a certain number of individuals temporary constipation is frequently followed by attacks of enteritis as the result of intestinal elimination. For the prophylaxis of food intoxications the reader is referred to the proper chapters. The production of secondary enteritis is part of the treatment of infectious diseases.

TREATMENT.—For our purpose this disease may be divided into the small (enteritis) and the large intestinal (colitis) form, although it is freely admitted that this is only a clinical subdivision. The treatment of the large intestinal form is the same as that of dysentery (q. v.). Mild attacks of enteritis require little attention other than dieting. In the severer forms the question always comes up whether or not the patient should be given a laxative (calomel, castor oil). The condition of the stools and the fullness of the colon are the indications for the use of these drugs: if the stools have the small intestinal character—i. e., are watery, odorless passages—and the colon is empty, no laxative need be given. For the pains, opium should be given, when necessary combined with calomel. Warm applications may be made. When there is vomiting, it should be treated as heretofore indicated. No further medication is required in these cases, as they are self-limited. Their course may be shortened by the use of astringents, or bismuth in its various forms. The diet must be regulated according to the presence or absence of vomiting. Without it the patient is at first put upon food that is more or less binding, everything being given warm; tea, cocoa, toast, rice, eggs, claret or brandy, when necessary. After the first twenty-four hours the patient is allowed to go back to ordinary mixed diet, avoiding fruits and vegetables, the latter to be added when all the symptoms have disappeared. The severest forms should be treated like cholera asiatica (q. v.); they seem to be clinically identical except as to the cause, and are followed by a certain percentage of mortality, especially in old people.

Chronic Enteritis: *Chronic Enteritis of the Small Intestine.*—Here ulcers, chronic intoxications, chronic nephritis, amyloid disease, neoplasms, tuberculosis, including tuberculous peritonitis and neuroses, must be included. This form of trouble is sometimes called intestinal dyspepsia, and many errors of diagnosis can be ascribed to the use of this term.

TREATMENT.—The two indications to be fulfilled by treatment are cure of the disease and maintenance of nutrition. For the treatment of the disease it is primarily necessary to keep the bowels clean and empty; this is accomplished by the use of saline cathartics (the various laxative mineral waters, magnesium citrate, Seidlitz powders), for as a rule constipation, not diarrhea, is the dominant symptom in the adult; the diarrhea is usually an effort of nature, when the peristalsis is adequate, to get rid of harmful substances. The benefit of Carlsbad cures in these cases is to be found in the fulfillment of this indication. When the colon is filled, local means must be employed (v. Constipation). In addition to this, and for the same indication, intestinal antiseptics should be given—salol, menthol, β-naphthol, benzosol, copper arsenite. When diarrhea is the dominant symptom, tannalbin (0.5–1 gm.—gr. vijss.–xv, twice daily), tannigen (the same dose, although much larger doses may be used), and tannoform (0.25–1 gm., three times daily, which combines astringent and antiseptic properties [formaldehyde]) are of value. Bismuth, bismuth subgallate, also in combination with salol or β-naphthol, may also be administered in these cases, and is indicated especially in those cases where there is a suspicion of ulceration. In a great many of these patients the appetite is very much reduced and stomachics should be tried—gentian, rhubarb, nux vomica, cinchona; one of my favorite prescriptions in these cases is an unpharmaceutical combination of Fowler's solution with tincture of nux vomica (equal parts, of which ℥ iv to vi are given, well diluted, before meals). In a certain number of cases the stomach is also affected, and should be treated. For the maintenance of nutrition the diet is of paramount importance; it should be ordered in such form that it is sufficiently nutritious and unirritating to the bowels—i. e., most quickly digested there, and neither chemically nor mechanically irritant. Food should be given at regular intervals, and the following articles should be avoided: All those containing much organic acid; too much fat and those meats which contain connective tissue, which is digested with difficulty. The food should be mechanically subdivided, consequently the sufficiency of the teeth should be assured. Among the articles that produce diarrhea are carbonated waters, lemonade, fruits, salts, vegetables, and all coarse breads. The diet, then, may include meats, when necessary scraped before being broiled—beef, lamb, young chicken; fish that do not contain too much fat—no salmon, trout, mackerel, herring, or shad; oysters are permitted; eggs; milk where it agrees with the patient; cocoa; white bread, twenty-four hours old or toasted; soups, cream with vermicelli; macaroni, rice, farina, sago; potatoes mashed, baked, or boiled. When there is constipation some concession may be made in order to try to remove this symptom; here fruit juices and vegetables in the form of purées may be added. All articles producing fermentation should be withdrawn; beer belongs to this class. It should be the care of the physician that not too much albumin is introduced at the expense of the carbohydrates; the fact must always be borne in mind that the digestion of carbohydrates

is the simplest of all the digestive processes. When the carbohydrates do harm the administration of diastase or taka-diastase is indicated. Those patients who are in the habit of taking alcoholics should be warned against their excessive use; when there is constipation, malt liquors or light wines or whisky are indicated; in diarrhea, claret, brandy, or port may be taken. For the pain, codeine, belladonna, or, last and most sparingly, opium or morphine, should be given.

In the very severe forms the patient should be kept in bed and have the predigested foods; peptones, somatose; bovinine, beef juices of various sorts, are valuable adjuncts when the appetite is reduced. In some cases, especially in children, I have found that an exclusive diet of cocoa prepared in milk fulfills all indications.

In proper cases a change of scene is very beneficial, combined with some mineral water cure, such as Saratoga or Rockbridge alum, and in this way much can be accomplished in certain individuals.

The treatment of chronic ileocolitis has been described in the chapter on Dysentery.

Enteritis in Children.—PROPHYLAXIS.—In the first year of life the mortality in children varies from 19.5 per cent to thirty-nine per cent; of these, from sixty to seventy per cent die of gastrointestinal disease (Biedert). The importance of prophylaxis cannot be overestimated. The general hygienic surroundings contribute not a little to this great morbidity; some of these conditions can be changed; others, however, cannot be reached in any way. As physicians it is not our province to discuss the prevention of poverty, which is so important a factor in the production of this disease, but we can take our share of the burden in the education of the people here as elsewhere. Unfortunately, poverty and ignorance are frequently combined; but when this is not so, the former is an insurmountable obstacle to physicians, even without the latter. As this form of disease is frequently due to an infectious process, the importance of general hygiene cannot be too insistently pressed. In the bringing up of children many sins are committed against hygienic laws through tradition and disregard of physiological rules. It is in summer that we find the greatest number of cases, but it is erroneous to suppose that these various forms of enteritis are confined to the summer; the ingenuity of man succeeds in producing unhygienic conditions quite adequate to produce the same disease in winter. It should be the duty of the physician to impress his patients with the necessity of fresh air, proper clothing, and cleanliness. The rooms in which the children sleep should be thoroughly ventilated; in summer the children should be kept out of doors as much as possible. The idea still prevails that night air is bad; as a matter of fact, it is better than day air from a chemical point of view; the children should therefore be kept in the open air day and night. For the poor, fresh-air homes, floating hospitals should be found; in most places in this country every children's hospital should have a branch house in the country. The well-to-do should take their children from the city into the country. In regard to clothing, it is difficult to convince mothers that in summer it is easier to catch heat than to catch cold. Flannels are still recommended for the clothing of children in hot weather; the retention of heat within the infantile body is what we most fear. Let the child be clothed then in such material as will not prevent radiation. My

rule as to clothing in children in the very hot weather, such as we have in the Mississippi Valley, is a slip and a diaper. I have never found it necessary, with our temperature, to use artificial means—e. g., the flannel bellyband—in order to keep the bowels warm. On the other hand, children should be protected against sudden drops in the temperature, because these throw more work of elimination upon the bowels and, whether there are bacteria or not, enteritis may be set up. Cleanliness is a condition *sine qua non* in prophylaxis. It should be directed to the food itself, the utensils used for feeding, the dejections—indeed, to everything that comes directly or indirectly into contact with the child. It is a well-recognized fact that the bacteria may be carried in the same way as in all other infections—by the mouth. The child should therefore be protected almost in the same manner as in typhoid fever. The body should be bathed once a day in cool or tepid water; in very hot weather, twice a day is not too often.

The food is of the greatest importance, although by no means the only important factor in prophylaxis. The mortality in breast-fed infants is very small, and no artificial food has as yet been found that can in any way supplant it. But even in breast-fed infants certain directions should be given, especially to prevent overfeeding. With some the idea still prevails that when a child cries it is hungry; the result is dyspepsia or, in hot weather, enteritis. In summer the child, like every human being, becomes thirsty; therefore to all children, however they may be fed, boiled cool water should be given, and an extra burden should not be placed upon the gastrointestinal tract with food. In artificially fed children the food must be proper for the individual in every respect. The quantity should not be too great or too small. The intervals of feeding should be those indicated for the age and individual properties of the child. The quality is of the greatest importance; here two things must be especially taken into consideration—the presence of bacteria and the chemical structure of the food. The presence of bacteria and of toxines is determined by the methods of the dairy, by the methods of transportation, and of preservation in the home. In the dairy, the cows and their hygiene, the cleanliness of the milkers, of the utensils, and the mode of collection of the milk come into consideration; in the methods of transportation, the handling of milk by unskilled labor is frequently a cause of disease. As to the preservation of the milk at home, in summer it should be pasteurized or boiled, and left in properly closed vessels upon ice. In my opinion too much stress has been laid in this country upon the chemical structure of the milk; in most instances, especially in healthy children, the chemical cause of this disease is a toxine which escapes our detection. In children whose digestion is not normal disease is set up by too much fat, too much albumin, or too much carbohydrate. As no method of artificial feeding is a preventive of summer diarrhea, so the same can be said of the various methods of preserving milk. When the milk is bad to begin with, on account of the presence of toxines, neither modification nor preservation can make it good.

Diminution in resistance and of digestion should be prevented. When the latter is permanent as the result of organic disease of the gastrointestinal tract, it is a difficult problem to act prophylactically. Children with syphilis, rickets, tuberculosis, badly nourished, premature children, should always be treated for the underlying troubles. The most common temporary predispositions are

found in external heat and in ordinary attacks of dyspepsia. On account of the chance of producing the latter, no child should be weaned in hot weather. In addition, the physician should direct his clients to send for him in summer whenever anything is wrong with the gastrointestinal tract in the baby. When the baby is constipated, no cathartics but mild laxatives—calomel, castor oil—should be given; the latter should not be administered to young infants on account of the difficulty in fat digestion at that age.

TREATMENT.—(*a*) *Dyspepsia.*—Whenever there is disturbance in the stomach the first principle is to give rest to this organ by proper diet. If the child is breast-fed, either the intervals of the feeding should be prolonged or the child should not be permitted to be kept at the breast so long as usual. Under all circumstances the cause should be sought, in either the child or the mother, and when possible removed. In the artificially fed, it is a good rule in all acute gastrointestinal troubles to withdraw food altogether for from twelve to twenty-four hours. During this time water may be given, or small doses of brandy in plenty of water. In the next twenty-four hours albumen water and barley water may be tried. Then the food which the child has been taking, but very much diluted and, when necessary, reduced in quantity, should be returned to. If the symptoms now disappear, rapid diminution in dilution should be ordered, as under all circumstances the loss in weight by the child is quite marked. In the beginning, as it can be taken for granted that the same cause which has produced the dyspepsia has already entered the small intestine and there may produce enteritis, the bowels should be moved. For this purpose calomel and high injections into the bowel should be used. When the symptoms do not disappear or when they reappear, even although the food is still diluted, hydrochloric acid and pepsin may be prescribed: Pepsin., 0.1–0.5 gm. (gr. j–v); acid. hydrochloric. dil., 0.2–0.5 gm. (℥ ij–v); aquæ, 100–200 gm. (℥ij–jv), according to age; one half to one teaspoonful to be given after feeding. Vomiting, when persistent, is best treated by lavage; colic by the introduction of the rectal tube. For the diarrhea, when it develops or is already present, the following remedies have been used: (*a*) Antiseptics; (*b*) salol, copper arsenite, bismuth subnitrate, bismuth subgallate are valuable; (*c*) astringents—which are all probably antiseptics as well—tinct. catechu, tinct. rhatania, tannigen, tannalbin, tannoform, are valuable; (*d*) opium, which should not, however, be used until sufficient evidence exists that the cause of the trouble has been removed, though it is an exaggerated statement, so frequently repeated, that its use in the affection does more harm than good. Opium restricts the secretion from the small intestine, which in the great majority of the cases when the physician is called is no longer required for eliminative processes, but does harm by depletion. Opium quiets the peristalsis, thus increasing the absorptive function, prevents the development of lesions, and acts on the involution of the disease, to mention only effects which seem to be sufficient indications for its use. If by indiscriminate use is meant indiscriminate dosage, then the statement may be subscribed to. Many physicians use opium to produce its full physiological effects; this is not only unnecessary, but dangerous, in the enteritis of children; the dose should be the minimum one that will produce the effect upon the intestines; constant drowsiness should never be produced, and contraction of the pupil should be looked upon as a danger signal in infants. Opium

may be given in the form of Dover's powder or as tincture. In an infant, gr. $\frac{1}{10}$ of Dover's powder every four hours will be sufficient. For the dosage of opium, it is a good rule to take one half of the ordinary dose as obtained by the usual posological calculation (either age divided by age plus twelve, or better age divided by twenty).

Convalescence is frequently accompanied by relapse. Here the feeding problem is paramount. The best food is milk; in certain cases a wet nurse must be taken, if neither the mother's nor the cow's milk agrees with the child. In case the digestive capacity of the child is not large, foods containing large quantities of carbohydrates, diluted milk with carbohydrates, sugar of milk, barley water; in the mildest cases, condensed milk or Nestlé's food may be tried. In some of these cases the addition of cream to the diluted milk, according to Biedert, Rotch, or Gaertner, is very serviceable. There is one condition in which the use of proprietary foods is absolutely necessary; that is when good cow's milk cannot be obtained. In principle, the prescribing of condensed milk, Nestlé's food, etc., is wrong; in practice, they are absolutely indispensable until the time arrives when human milk can be made artificially. I have saved many lives by their use, and I shall continue to use them until something better is found. After the danger of relapse is over and the stomach and nutrition have become approximately normal, the ordinary method of feeding may again be adopted.

(*b*) *Cholera Infantum.*—Whatever is done here must be done quickly, for the constitutional disturbances follow so rapidly and are so dangerous that no time must be lost. With some exceptions, the treatment as to diet and medication is the same as that of dyspepsia. There are two conditions here that require special consideration—the toxæmia and loss of fluid by the bowels. For the toxæmia, stomach lavage, especially if there is vomiting, should be used. For the loss of fluid, large quantities of water should be given, high enemata of normal salt-water solution or hypodermoclysis (in an infant, 30 gm. [℥j] a day—i. e., 6 gm. [℥jss.] five or six times daily; in older children more). This also controls to an extent the toxæmia. In most cases opium is indicated from the beginning of the attack—i. e., after the bowels have been thoroughly emptied; it is unnecessary only in the mildest cases in which neither toxæmia nor loss of fluid is well marked, for it controls both the bowels and the symptoms produced by toxæmia. In very bad cases, when decisive and very quick action is required, even a hypodermic injection of morphine may be given. Here the greatest care must be taken as to dosage; it is always wise to combine the morphine with atropine, the latter drug having an inhibitory effect upon intestinal secretion and at the same time stimulating the inhibitory centers which are depressed by the action of morphine. If the physician is not thoroughly familiar with the action of opium in infants and children he should never use morphine hypodermically in them. By the use of opium the vomiting and purging are stopped, the pains and restlessness cease, and the general condition of the child improves. In a long experience I have never seen harm done by the use of opium in the way just described; indeed, the loss of a patient with cholera infantum in private practice has been a very rare occurrence. High fever should be treated by hydrotherapy: the patient should be bathed every two to four hours, the temperature of the water being determined for the individual condition. Very low temperatures must be avoided,

as they are followed by collapse; the nearer the temperature of the body the bath is given the less danger of this very serious accident. The injection of ice-cold water into the bowels or the giving of ice-cold baths, although they have been recommended, should not be attempted in children; besides their danger, they are unnecessary. Stimulants should be given during the course of the disease whenever they are indicated—port wine, brandy, claret, never to be given, however, in the stage of collapse; tea and coffee have also been recommended; I have no experience with them. In collapse, hypodermoclysis should be used, the addition of caffeine—0.01–0.02 gm. (gr. $\frac{1}{6}$–$\frac{1}{3}$)—as recommended by Marfan, is valuable for its effect upon the splanchnic circulation (v. Diseases of the Heart). The patient should be kept warm by being wrapped in warm blankets and surrounded by hot bottles; the effect of great loss of heat is incalculable, as is demonstrated by experiments upon young animals in the physiological laboratory. When stimulants are used, ether, camphor, or the caffeine preparations should be administered; no alcohol. The food should be given very warm; if nothing else can be given, small quantities of hot water will be tolerated, and do good. One of the best stimulants is the warm mustard bath, which is given in the following way: English mustard (one to two tablespoonfuls) is put into a bag made of cheese-cloth; the child and the mustard are put into the water at the same time. In order to prevent trouble, cotton is put into the child's ears and the mustard bag must be kept at the foot end of the bath. The child is kept in the bath until reaction sets in upon the arm of the person holding it. The result frequently is astonishing, in that the whole condition of the patient—skin, breathing, circulation, condition of nervous system—is improved by it. Upon the whole, the rule put down by older pediatric writers, that when no reaction follows the use of the mustard bath the prognosis is fatal, is correct. When nutritive and vasomotor changes have set in, extraordinary care must be taken to prevent infection through the mouth, skin, or respiratory passages. The eyes should be kept clean by dropping normal salt solution, if necessary with boric acid solution, into the conjunctival sac; when, as is usually the case, the lids are open the eyes should be kept constantly covered with moistened lint in order to prevent ulcer of the cornea. Marshall Hall's hydrocephaloid should be treated on general principles; it is due to loss of fluid. Acute hydrocephaloid is supposed to be due to high temperature and toxæmia, and is met by the measures indicated for these conditions. Hemorrhages, abscesses, and gangrene of the skin or thrombosis of cerebral sinuses usually mark the termination of the disease, and little or nothing can be done for them. In convalescence we sometimes meet with the so-called cholera typhoid, which requires treatment by stimulants, food, hydrotherapy, and here we frequently have nephritis, which requires special attention (v. Acute Nephritis).

Sequelæ: Chronic enterocolitis and chronic enteritis are treated by the various measures already mentioned. Acute or chronic enterocolitis is treated as dysentery (q. v.).

APPENDICITIS

Prophylaxis.—The members of a family in which there is a decided hereditary tendency to this disease should especially avoid those things to be recommended in the relapsing form. A number of cases of this kind have

been reported by Talamon, Sahli, myself, and others. In this country, at least, there is little fear that mild attacks will be overlooked by patients, as few subjects have been so diligently exploited by the daily press as appendicitis. After the patient has had one attack much can be done by prophylaxis; the treatment of constipation is of prime importance here. Digestive disorders of all sorts should be guarded against, especially the eating of certain indigestible articles—nuts, bananas, raisins, mushrooms, cabbage, pickles, sweets, cheese, the use of which I have known to be followed by attacks of appendicitis. The fear of foreign bodies has been greatly lessened, but the fact must not be lost sight of that the percentage in which foreign bodies are found within the appendix varies from three (Treves) to twenty (Murphy), and it is by no means settled that they must get into the appendix to produce inflammation. Traumatism is of great importance—external injuries to the abdominal region from without or from undue muscular exertion; I have seen a number of relapses produced in this way by blows, contusions, in one case by dancing.

TREATMENT.—If there is any disease which belongs to the "border line" of surgery and medicine it is this. While I am not ready to turn over all my cases of appendicitis to the surgeon—indeed, I have found that many conservative surgeons would object to this—yet in any case of appendicitis of any moment the surgeon should be called in as consultant. I believe this to be fair to all parties. When the case goes on to operation, then the physician should be the consultant. In general practice it will be found that as a rule the physician is more eager for an operation than the surgeon. There will be found many physicians who are absolutely opposed to operation, or believe in putting it off as long as possible; their bad results are about equalized by those of the surgeon who operates on sight. The medical treatment I believe to be of much importance, even if we can do no more than simply hasten the recovery of the patient and make him more comfortable during the disease. Besides this, there will be found a number of cases in which, since operation is refused, the medicinal treatment is the only one that can be used.

Medical.—Every patient with appendicitis should be put to bed and kept absolutely quiet. The diet should be very much restricted; indeed, the best plan is to give nothing at all for the first twenty-four hours; at the most, small quantities of hot water or of hot tea, frequently repeated. While peristalsis cannot be absolutely prevented in this way, it is certainly very much lessened, and rest of the bowels is of as much importance as rest of the body. On the second day warm milk may be given; this with broths or beef juice should be the principal diet until the symptoms disappear. When there is vomiting, abstinence from food especially is valuable; if this alone does not suffice, warm applications may be made to the stomach, cocaine (0.002 gm. —gr. $\frac{1}{30}$) may be given internally, or morphine may be given (v. *infra*). The pain is best controlled by ice bags; as a rule, one large one suffices, but if there is fever or evidence of extensive peritoneal involvement two or more should be applied. When the ice bag is used, especially more than one, the fact must not be lost sight of that some symptoms become "masked"; thus the pulse, which is of enormous value as far as operation is concerned, becomes very much reduced, as does also the temperature. I have seen two ice bags upon the abdomen bring the pulse down from one hundred to sixty-five beats a minute. When

the pain is not relieved by the ice bags, opium or morphine should be given. When administered in the proper dose in combination with the ice bag, it does not "mask" the symptoms; it is certainly wonderful how small a dose will give relief. I have seen an adult get sufficient relief from thirty drops of paregoric to allow him to sleep part of the night, notwithstanding the fact that he knew he was to be operated on for perforative appendicitis the next morning. Small doses of opium not only blunt the pain, which is all that is requisite, they also control peristalsis better than can be done with anything else, and they act as stimulants. For morphine the dose should not exceed 0.004–0.005 gm. (gr. $\frac{1}{15}$–$\frac{1}{12}$), repeated after two to four hours, if necessary; for opium, about one third to one fourth the medicinal dose. Occasionally it becomes necessary to give hypodermic injections of morphine; these should not exceed 0.01 gm. (gr. $\frac{1}{6}$), which will control the vomiting besides fulfilling the before-mentioned indications. In the beginning of an attack no laxatives of any sort should be given, for the simple reason that we do not know whether we shall do good or harm by their administration. We may be able to remove the cause of the attack, but in so doing more harm may be done to the appendix and the peritoneum than will compensate for the removal of the cause. In order to insure perfect rest, rectal means for evacuation should not be used at this time, certainly no high enemata. In the presence of a mild form of appendicitis a saline or calomel may be given after subsidence of the severe symptoms. Unfortunately, the diagnosis of the form is exceedingly unreliable. Rectal examinations should be made to find whether there is great retention of fæces or packing; when this is the case, an injection of sweet oil, to be followed after ten hours by an enema (rectal) of warm water, should be used. This will give relief to flatulence, which is to be avoided as much as possible. When necessary, a soft elastic catheter may be introduced into the bowel. Under these circumstances, warm applications are frequently of more service than the ice bag; indeed, even for the relief of pain in the beginning of the attack, in some individuals they are more beneficial. When warm applications are used care must be taken not to irritate the skin. All rectal manipulations are contraindicated when there is an abscess or much inflammation about the descending colon.

The treatment of convalescence consists in rest and diet. The patient should not be allowed to get up before all the symptoms have subsided; many patients have lost their lives through disregard of this rule. In the perforative case before mentioned the patient, who was recovering from a mild attack, notwithstanding strict injunctions on my part went downstairs to see his children's Christmas tree; four hours afterwards I found him with the symptoms of perforation; eleven hours afterwards the perforated appendix had been removed; the man fortunately recovered. The diet should consist only of unirritating food (v. Gastric Ulcer). At first the bowels should be emptied only from below; a week or ten days later, after subsidence of all the symptoms, saline cathartics may be prescribed.

Surgical.—A number of surgeons advise immediate operation in all cases of appendicitis as soon as the diagnosis is made. This is a most radical position, and is open to objections in many directions. It is justly stated that the form of appendicitis cannot be diagnosticated with certainty; therefore every case should be looked upon as being dangerous, or likely to become so. We

might add that in a certain number of cases the diagnosis of appendicitis itself is impossible. But the fact is thoroughly understood for private practice that the mortality from appendicitis in all forms combined should not exceed five per cent without operation; in hospital practice it is manifestly much larger (Hawkins, fourteen per cent, at St. Louis Hospital; Pribrâm, at Prague, 12.3 per cent; Fowler, at New York, fifteen per cent; Fürbringer, in Berlin, ten per cent). I have no hesitation in saying that, with proper medical treatment, the mortality in private practice is less than five per cent; now the best result heretofore obtained by removal of the appendix during the attack is five per cent (Deaver), so that as a general proposition the nonoperative and operative results are equal. But aside from statistics, which can seldom be considered absolutely conclusive, there are many other objections to this method. The patient usually objects to an immediate operation; in a number of cases it is impossible to determine how long the condition has lasted and external difficulties exist. Finally, the untoward results of any peritoneal operation should be taken into consideration (v. Convalescence), the principal one being mortality, which at a low estimate is from one to two per cent; this in a disease whose normal mortality does not exceed five per cent. The immediate operation should then be confined to certain cases —always in perforative cases, the sooner the operation is done here the better; the same holds good for septic cases, with or without general involvement of the peritoneum, as well as for abscess. Here again the difficulty in diagnosis comes into consideration; if there is doubt, give the patient the benefit of it and operate.

The view held by the majority at present is to decide the time of operation by the demands of the individual case. The fact must be taken into consideration that interval operations—*à froid*, as the French call them—give much lower mortality than operations done during the attack. The time for operation is to be decided upon by the symptoms: a case in which improvement occurs need not be subjected to immediate operation; in one that gets worse—and this is decided by the general condition, the facies, the pulse, the skin, the tongue, the respiration, and the local symptoms—operation should be performed early ("by the third day"—Osler); and, finally, in those cases in which there is an acute relapse after subsidence of symptoms or any evidences of septicopyæmia, operation should be prompt. The presence of an exudate, unless it is pus, need not mean immediate operation, as a large number of exudates diminish in size, some disappear, and it is always well under such conditions to give the *vis medicatrix naturæ* proper time.

The relapsing form should be operated on during the relapse for the same indications as mentioned above. Here again we find differences of opinion as to when these patients should be operated on. With some one attack of appendicitis always means an operation as soon as the patient has completely recovered from his first attack. A large number of cases, however, do not relapse—statistics are not very valuable, as they have been drawn from hospital experience; thus, in Sahli's collection of 4,953, only 958 relapsing cases are reported (twenty-one per cent); Rotter has twenty per cent; Fitz, forty-four per cent; Hawkins, twenty-three per cent plus. If anything, the forty-four per cent of Fitz would probably represent the correct condition when the patient can be kept under observation. But from this statistical view, operation after the first attack

is more positively indicated than immediate operation during the first attack. But here again we must individualize; if a patient has had a mild attack without sequelæ, it is proper to wait for a second attack; if this one is mild, operation can again be deferred; indeed, when the attacks are very mild and do not interfere with the patient's occupation, his chances of recovery or the possibility of severer attacks must be put before the patient, and he should be allowed to decide. When there are sequelæ so that the general health is involved or occupation interfered with, the operation should be performed. When, as the result of one attack, the patient gets appendicitophobia or becomes hypochondriacal, the operation may have to be done when reassuring, suggestion, and other methods fail. The occurrence of a case of appendicitis, especially if it results fatally, always brings to the physician a number of patients who have made their own diagnosis in themselves of appendicitis. Curiously enough, this form of trouble is frequently found in physicians when they treat a case of appendicitis, or even without this. Sooner or later nearly all these cases fall into the hands of some one who never finds anything in the right iliac region except appendicitis, with the usual result in such hands.

When the attacks are severe, then, and recur frequently, the patient should be operated on, if possible, during the interval. Under all circumstances, it should be understood that the chances are in favor of each successive attack becoming milder, especially when the first attack has been very severe; not so much so when the first attacks have been mild; this is due to the nature of the process. In the relapsing form, in young subjects, it is always wise to operate in the interval, as the mortality is practically *nil*.

In chronic cases the individual case again finds its indications for operation; they are usually cases that should be operated on on account of the effects of this state upon the general condition, although I have seen patients who have recovered completely—in one case, it is true, only after two years of suffering.

The operation is contraindicated during the collapse that exists when perforation has occurred; the collapse should be treated as under other circumstances. Pregnancy does not form a contraindication; neither do acute infectious diseases. On the other hand, the general condition of the patient may preclude the possibility of surgical intervention, especially when due to the appendicitis itself. Here the chances must be thoroughly estimated; if at all favorable, the operation may be done. The question of operation in all cases, however desperate, as recommended by some, is one that must be settled by surgery.

Sequelæ.—In deciding on an operation, not only the mortality but the remote consequences should be taken into consideration. Some of these, with advanced methods, are becoming rarer and rarer, but in given cases, fortunately most frequently in those in which there is no choice as to operation, discomfort remains. Surgical neurasthenia, hypochondriasis leading to suicide, occur. In a number of cases a bandage or a truss must be worn on account of abdominal hernia. Again, a certain number do not get relief from pain, while in others pain is made worse by adhesions. The wise surgeon takes into consideration not only the operation, but all the results, good and bad.

Convalescence should be watched; except when a small incision was made, every patient should wear an abdominal bandage. His attention should be called to the possibility of a hernia, and precise directions should be given as to exercise, exertion, and occupation. In the great majority of cases the general health improves rapidly, the constipation disappears, as the cæcum is a sort of nodal point for peristalsis which has been interfered with by the diseases at the base of the appendix.

INTESTINAL OBSTRUCTION

Acute Intestinal Obstruction.—Medical Treatment.—For the collapse stimulants should be used; the patient should be kept warm by hot bottles and warm covering. The best method, as the trouble is due to vasomotor dilatation in the vessels supplied by the splanchnic nerves, is the use of hypodermoclysis or saline transfusion to prevent cessation of the heart's action from exsanguination; and of hypodermic injection of caffeine and adrenalin to contract the blood vessels. For the pain: hot or warm applications externally, morphine given by the mouth or hypodermically. The vomiting may be controlled by the ordinary means described before; when this is of no effect, lavage of the stomach, as first recommended by Kussmaul, should be used. A number of cases have been cured by this alone—I have seen two in which the obstruction disappeared after lavage; but aside from this, the patient experiences great relief, notably in fecal vomiting. Constipation can be treated with safety only by rectal means. When the obstruction is due to fecal impaction this method removes the cause; oil in injections should be used, followed by copious injections of water. Purgatives should not be given; when the patient has had a movement of the bowels one or two days before the attack, purgatives are unnecessary; when he has not, they do harm. As in appendicitis, we wish to keep the bowel as quiet as possible. For the tympanites the method recommended in typhoid fever (q. v.) should be tried. Puncture of the bowel with the aspirator needle should never be used, as it is an uncertain method, not infrequently doing the greatest amount of damage. The diet should be the same as in the beginning of an attack of appendicitis; instead of hot water some authors recommend hot tea. The means to remove obstruction that have been used by physicians are many. The one to be recommended in every case is the hypodermic injection of atropine—the dose should be large enough to produce its physiological effects. One advantage in the use of this drug is that it can do no harm; another is that in a number of cases the obstruction, especially in the beginning, is removed. I have made it a practice to use this drug in the early stage of the disease after the collapse has been somewhat controlled, with the happiest results in some cases. The methods applied at the lower bowel are lavage and inflation. In order to get the best results the patient should be anæsthetized (Sir Jonathan Hutchinson, Treves) and be put into the proper position, trunk low, hips high; and large quantities, from three to six pints, of water should be used. The manipulations recommended by Jonathan Hutchinson are accompanied by too much risk, and it is better, therefore, not to make them. When injections are to be made a fountain syringe should be used and the water should not be

injected under great pressure; a good rule is to hold the bag about a foot higher than the most elevated part of the patient. For the inflation of the bowels ordinary air, carbonic acid gas, and hydrogen have been employed. Both inflation and lavage produce the same results; in either there is danger of producing rupture of the bowel, but good results have been obtained. Metallic mercury is still used, a tablespoonful given by the mouth; Bettelheim has reported seventy such cases, in six of which cure resulted. In the present state of our knowledge this method should never be used; in the only instance conceivable in which it may do good better results and safer are obtained by rectal means. Massage and electricity have been highly recommended. The former should never be used when there are any organic changes; it may be valuable in paralytic obstruction. Electricity, both the faradic and galvanic currents, has been recommended in long and frequent sittings, and has the advantage of being harmless; on the other hand, its effects are very uncertain. Eserine salicylate (physostigminæ salicylas) is very valuable in paralytic obstruction, especially after operations upon the peritoneum. The dose is 0.003 gm. (gr. $\frac{1}{20}$).

All the methods enumerated, except the rectal ones, and these in well selected cases, are valuable only to a more or less indefinite degree. The mortality of this affection is variously estimated as from sixty-six to seventy per cent; outside of fecal obstruction, then, and possibly also intussusception, something more accurate and more reliable must be considered than medical treatment. When the medical treatment has been unsuccessfully carried out for from twelve to twenty-four hours at the utmost from the beginning of the attack the obstruction must be removed by surgical methods.

Surgical Treatment.—Every case of intestinal obstruction should be attended by both a physician and a surgeon; when both are combined in one person, rarely the case nowadays, so much the better. No patient, except *in extremis*, should be allowed to die without resorting to surgical means. The earlier an operation is performed the better the results. The example for this ought to have been the results obtained in our experience of obstruction from hernia, but in internal obstruction the operative mortality from laparotomy has exercised somewhat of a restraining influence. With this fear removed, the surgical aspect of treatment in acute obstruction has become perfectly clear. The attitude to be taken in regard to surgery is that expressed by Treves: "The sooner the operation is carried out the better; and it should be done as soon as the diagnosis is established and as soon as the first symptoms of shock have passed off a little. The operation of opening the abdomen is in itself a small matter; delay is a fatal matter. To temporize is useless." When these rules are followed the mortality, already comparatively low in competent hands (in Naunyn's table twenty-five per cent; Wiggin, twenty-two per cent), will be still more reduced. The best results are obtained when it is unnecessary to open the bowel, rather than by the performance of enterotomy.

Chronic Intestinal Obstruction.—The most important indication is the removal of the cause; this includes the treatment of chronic fecal impaction and, in the majority of cases, surgical treatment. The contraindication for radical operation will be found in the general condition of the patient and in the nature of the trouble, inoperable tumors, disseminated malignant

tumors, etc. Otherwise, when the disease is above the sigmoid flexure, it is best, in order to determine the cause, to make an exploratory laparotomy, for in this form the mortality is even greater than in the acute form. In a large number of these cases radical measures are out of the question; it then becomes the duty of the physician to prevent suffering, to relieve this when it exists, and to prolong life.

For this purpose the *diet* should be so arranged that a small residue is left in the bowel after the completion of digestion. The food should be given in sufficient quantity, but more frequently, at regular intervals. When possible, the food should be laxative, not by the addition of substances that irritate the bowel, especially cellulose, but by giving larger quantities of fruit juices (orange, lemon), or baked or stewed fruit after it has been passed through a sieve. Purées of vegetables may also be used. Buttermilk in some instances is very valuable. Under all circumstances the secondary object of feeding should be to keep the chyme as fluid as possible above the obstruction. The introduction of a sufficient quantity of fluid, water especially, is very important for osmotic purposes, and it is absolutely necessary for normal metabolism. To relieve the constipation, salines are especially indicated; unfortunately, in most cases they cease to act sooner or later; then castor oil, rhubarb, or tamar Indien may be used. The administration of very strong cathartics, especially those that act solely by producing violent peristalsis, should be avoided. Rectal means are useful only when the obstruction is in the rectum; here injections of glycerine or sweet oil are very useful. When the obstruction is due to chronic infiltrative thickening of the walls of the intestine the best results may be obtained by persistent use of massage, either manual or electric, and by vibratory treatment; the same can be said for obstruction due to complete atony of sections of the colon; here Calabar bean may also be tried.

To give relief from pain it may become necessary to use narcotics, especially during the attacks; their administration must be determined by the characteristics of the individual case. It is always best to try to give relief by external applications, hot or warm, or even by mild counterirritation in the form of a sinapism. When these do not give relief such narcotics should be preferred as do not produce constipation—belladonna, atropine, codeine. In a certain number of patients hypodermic injections of antipyrine will give relief. In most cases, however, opium or morphine will have to be used, the usual precautions attendant upon their administration being observed.

CONSTIPATION (Habitual)

The PROPHYLAXIS here is included in the TREATMENT. Constipation is usually due to one cause, that the propelling force is not sufficiently great to expel the fæces. This cause may be due to two conditions; either muscular contraction is diminished, or, even though normal or excessive, it may be insufficient to overcome some resisting obstacle. In by far the greater number of cases it is due to diminished muscular activity, including here the whole muscular mechanism of defecation. In most cases belonging to this class the trouble will be found in the colon; in some in the rectum itself. Conditions have been so altered by civilization that the mechanism of defeca-

tion has been much changed from the physiological form as seen in children. For this reason we often find fæces in the rectum, and, what is more important for us, in the colon as well. In the colon not infrequently only a part of the fecal mass is removed by the daily evacuation of the bowel; indeed, fecal matter may pass by or through the fecal mass that is left and the patient have a daily stool without suspecting that he does not empty his bowels completely. Then there remains fecal matter, old, inodorous, changed as to its color and its chemical and biological properties; which, by its constant presence, prevents the normal reflex that results in peristalsis and eventually produces anatomical lesions. It is only by careful examination that the diagnosis is made. The trouble is found at the flexures, most commonly at the sigmoid flexure. Its treatment is most satisfactory. The bowels should be first thoroughly cleaned out; this can be done when the masses are low down by high injections of sweet oil or, better under all circumstances, by the internal administration of castor oil. The castor oil should be given daily until examination of the stools, combined with examination of the intestines, shows that all old material has been removed. After that mechanicotherapy should be used; massage, at first very mild, but increasing daily (effleurage, friction, tapotement); when it is not possible to carry out massage proper the massage-ball may be used. Electric massage or vibratory massage is also of equal value. Care must be taken to apply these measures to the affected part only, so that it is important for the physician to give his directions to the operator by marking out the places to be treated. If the normal parts are treated the dilatation, greater or less as the case may be, which exists above the partly obstructed section of the bowel will be increased.

At the same time the diet must be regulated; plenty of water, raw milk, cream, meats, fruit juices—in one word, nothing that leaves much or irritating residue. During the first week or two of the treatment defecation must be induced by artificial means—such as enemata, glycerine suppositories, cascara sagrada, or compound licorice powder. Then comes a time when normal defecation goes on, possibly for two or three weeks; as soon as this begins to flag, it will be found that a complete change in diet will have to be made, for we are now dealing with the primary condition, atony of the colon, which gave rise to the localized condition that has been removed. The diet must now be coarse, containing much residue, especially cellulose—i. e., fruit three times daily, oatmeal, cornmeal, Graham flour; the bread should be made of rye, the so-called black bread or pumpernickel, Boston brown bread, Graham bread, or bran bread; vegetables should be eaten in abundance twice daily, but not potatoes or rice; plenty of butter and cream; when adapted to the individual, milk also; fat meats, fish, chicken, ducks; eggs, especially fried and scrambled; salads, especially vegetable salads; cheese, desserts made of nonconstipating meals, sweetened, with or without cream or fruit sauces; soups, especially those containing vegetables. When the patient is in the habit of taking stimulants with his meals, light white wines, with or without carbonated waters; coffee, but no tea or cocoa. Upon the whole, a modified vegetarianism is indicated. Massage of the whole abdomen should now be used, special attention being given to massage of the whole colon. No drugs are now necessary. If the patient adheres to direc-

tions, the massage being discontinued after from four to six weeks in all, the constipation is removed. The only additional advice required is that he exercise judiciously. Exercise is not good for all patients with constipation; Lauder Brunton calls special attention to constipation being increased by it in "delicate women, especially those who have some sort of ovarian or uterine irritation," which he explains by reflex inhibition of peristalsis from the local irritation.

It is doubtful whether general muscular atony plays a very great rôle in habitual constipation, unless it is accompanied by general disturbance of health. On the other hand, a pendulous abdomen in fat persons or after repeated pregnancies does cause it; so also a number of diseases that prevent sufficient contraction of the abdominal muscles, painful conditions in the abdomen or of the diaphragm, diseases of the lungs, the heart—in which last condition we see digitalis curing either constipation or diarrhea. In the pendulous abdomen a properly fitted bandage will usually be sufficient. The accessory muscles may be weak on account of lack of exercise, sedentary habits, occupation, indolence; here active or passive movements, as the case requires, are indicated; "the outside of a horse, which is the best for the inside of a man," out-of-door sports of any kind, depending again upon the tastes and requirements of the individual. But, aside from other harm that may be done, the fact must be borne in mind that excessive exercise, by producing hard fæces as the result of loss of water by the skin, will produce constipation.

Next in importance to the cases before described, but eventually leading up to them, are those in which peristalsis is diminished by nervous causes. Foremost among these is habit; this consists of continuous inhibition of impulses coming from the bowel to the cord and brain, until afferent impulses no longer produce an efferent one except upon increased irritation. Such is the case in the patients who must catch a train every morning, who take a newspaper to the closet, the reading of which causes them to neglect the nervous impulses coming from the bowels, or are otherwise "too busy" to attend to such trifling events of nature as evacuation of the bowels. These are, furthermore, the persons who must take drugs daily. But in many of this class the nervous mechanism is still in such a condition that the least thing restores the normal condition—a glass of water, or salt water, for instance. In the absence of all organic changes these patients can cure themselves by going to stool regularly at the same time every day, preferably after a meal, because the full stomach presses upon the colon, then concentrating their attention upon the work to be performed and not taking too much time at it. Constipation from psychical causes, neurasthenia, melancholia, hysteria, is by no means uncommon; but in others it occurs without any appreciable cause; in these cases suggestion frequently cures, especially when it can be applied as autosuggestion. Some of the small aids are a whiff of a cigar or a pipe, the taking of a tablespoonful of orange juice, of one fig at bedtime, and many other practices just as trifling in their nature.

The reflex inhibition from local causes, already referred to, must also be taken into consideration; painful conditions at the anus or in the lower part of the rectum should be removed, as also should hemorrhoids, fissures,

fistulæ. It is also possible that in some general conditions, such as anæmia and chlorosis, the nervous mechanism is interfered with either by diminished nutrition or by changes in the quality of blood supplied to the plexuses of Auerbach and Meissner.

The contents of the intestine act in three ways to produce a normal stool; by their irritation of the automatic centers within the bowel, by the secretion and the production of osmotic conditions, hypertonic or hypotonic. In the first instance the patient may take too little food or food too finely subdivided, food that does not irritate sufficiently or leaves too little residue.

In the second instance it is more than probable, although not yet completely established, because the secretory nerve has not been found, that digestion increases the flow of succus entericus. If we are to judge by the condition in the duodenum, as indicated by the pancreatic secretion, secretion in upper parts of the intestine increases secretion in the lower ones; it is likely, then, that certain articles of food act, not only upon peristalsis, but upon secretion as well. Thus we find a number of drugs acting directly upon secretion, and it is more than likely that food may also act by its chemical as well as by its mechanical structure. For the osmotic conditions it is necessary that sufficient water be taken, but artificially we may produce an osmotic flow of water from the blood to the bowels by producing hypertonicity of the former. The action of drugs depends largely, as far as we can understand it, upon the production of effects in one of the three modes before mentioned; thus morphine and atropine diminish motion and also secretion; physostigmine and pilocarpine increase both motion and secretion; the saline cathartics produce favorable osmotic conditions. The application of osmology is therapeutically of great importance, but not to the extent that was expected, for the functions of the bowel are not solely due to physical, but largely to biological, conditions. In the summer constipation, due to loss of fluid from the skin, small doses of pilocarpine usually give relief.

Diet.—As a rule all these causes of constipation just mentioned may be removed by proper diet. The routine diet which I prescribe is as follows:

Breakfast. A cup of coffee, with milk and cream; Graham, corn, or Boston brown bread, with plenty of butter; oatmeal with cream and sugar, hominy, grits; eggs, fried or scrambled, or an omelet with bacon; fruit.

Luncheon. Fish, halibut, cod, salmon, herring, mackerel, or any other fish containing much fat; or some fat meat or fowl; bread as for breakfast; vegetables and fruit.

Dinner. Vegetable soups; fish and meat as for luncheon; bread as for breakfast; the sauces should contain fat; vegetables; desserts made of coarse meals or fruit; salads with plenty of oil in the dressing; fruits.

If the patient is in the habit of taking stimulants, only white wine or champagne should be taken. Some form of carbonated drinking-water is also recommended. No potatoes, no rice is permitted. At night before going to bed the patient should eat a dish of stewed prunes, seedless raisins, or several figs. In the morning he should drink a glass of cold water.

For the details of chemical composition of foods the reader is referred to the Appendix.

All obstructions of the bowel should be removed when possible, whether

the cause is inside or outside the bowel. Here we find peritoneal changes, stricture or ulcers, hemorrhoids, malignant disease; pressure from without by tumors of adjacent organs or organs misplaced pressing especially upon the rectum. Good results have been obtained by incision of the hypertrophied rectal valve (Martin). Fecal impaction in the rectum should be treated, when necessary, by mechanical removal of the hardened, old fecal masses; otherwise the fæces may be softened by oil or glycerine enemata, which are beneficial only in the milder forms. Spasmodic conditions of the bowel are found, which may have to be relieved by the introduction of rectal bougies, besides the removal of the general neurotic cause. In neurotics we not infrequently find spasmodic contraction of sections of the bowel producing constipation; here the persistent use of atropine, beginning with very small doses, 0.001 gm. (gr. $\frac{1}{64}$ *ter die*), gradually increasing until physiological effects are produced, usually cures the constipation.

Medicinal Treatment.—The modern method of treating constipation consists in the restriction of drugs; but in a number of cases they must be used as aids to other methods; notwithstanding all efforts at causal therapy drugs must be taken more or less continuously in a small number of cases. For causal therapy nux vomica, strychnine, hyoscyamus, in addition to those already recommended, may be useful. The vegetable oils cannot be used for the treatment of chronic constipation; croton oil need never be used and castor oil only occasionally. The vegetable group is the one that is usually employed. Of these aloes is the most common because it affects the rectum especially; but for this very reason it should not be used when there is much irritation about the rectum; it is given in pill form (pil. aloes, gr. iv to viij; extract of aloes, gr. j to iv; pil. aloes et myrrhæ, gr. iv to viij; pil. aloes et ferri, gr. iv to viij); it also forms one of the component parts of many of the compound pills of the Pharmacopœia. Aloin is not so efficient as aloes itself, but because it lends itself to the production of elegant pharmaceutical preparations it is frequently used (dose gr. ss. to ij); it may also be used subcutaneously. Rhubarb is especially valuable in constipation due to stomach troubles; it should not be used daily for any great length of time because its after-effects are constipating. It may be given in powder form, 1 to 2 gm. (gr. xv to xxx), as fluid extract to produce stomachic effects; also as extract in the form of pil. rhei composita (gr. iv to viij), or in children, syrup. rhei, 4 to 10 gm. (℥j to ℥ij), or the syrup. rhei aromatic.; senna is very valuable, but objectionable on account of the griping it produces; it may be given in the form of the leaves, which some patients chew with admirable results, or as compound licorice powder, or in combination with various other drugs. The advantage of senna consists in there being few contraindications for its use; therefore it can be freely used and on account of its cheapness it is probably the most common cathartic in the form of the various laxative teas, with stewed prunes, and in many other ways. In its stead cascara sagrada is administered very often; it has the advantages of not producing pain, that the passages are more consistent, and that we have more elegant preparations. It can be used daily for years, although the dose must be increased, and sometimes it temporarily loses its effects. The most agreeable fluid preparation is the aromatic syrup (℥j to ℥ij); in pill or tablet form it may

be given in doses of gr. ij to x. In a number of cases I have noted an unpleasant after-effect, the production of nausea. Podophyllin is supposed to possess cholagogue properties; it acts upon the upper segment of the bowel, its action is slow, it does not lose its effects by use, and in proper doses its use is followed by stools of proper consistency. It may be given in doses of gr. $\frac{1}{6}$ to gr. $\frac{1}{2}$; the small dose three times daily frequently being sufficient when one large dose fails. A favorite pill producing excellent effects and frequently curing constipation, because the habit is removed, may be extemporized by combining aloes with podophyllin, belladonna, or hyoscyamus.

Eunonymin, which is frequently used by French authors, has the same effects as podophyllin, but in large doses it has depressing cardiac properties, and its action is not so certain.

The *saline cathartics* may be used in the form of mineral waters, which may be taken for a long time, but frequently they lose their effects and changes must be made. Most of them act better when taken warm. The principal ones are Carlsbad, Marienbad, Friedrichshall, Kissingen, Hunyadi János, Rubinat Condal, Apenta, Rakóczy, Congress and Hathorn (Saratoga), Crab Orchard, Ky. Instead of the water the salts may be used; in many instances the artificial salts are to be preferred. Sulphur waters are very valuable; indeed, the administration of sulphur itself in combination with salines is followed by great benefit, especially in fermentative and rectal constipation. The waters that may be used are Aix-les-Bains in France; Neundorf, Aldenau, in Germany; in this country, West Baden, French Lick, Richfield, or Sharon Springs, some of the sulphur springs in West Virginia; in England, Harrogate. Some patients succeed in giving themselves relief by an annual visit to one or another spring.

The rectal means employed have all been referred to. Injections into the rectum should not be used for any great length of time; the quantity of the injections will have to be increased; and finally an atony of the rectum with dilatation will be produced, such as I have not seen under any other circumstances. The evidences that fluid can be introduced beyond the sigmoid flexure are sufficiently convincing, but, aside from this, in introducing the fluid high up there is less chance of producing dilatation of the lower part of the rectum.

Constipation in Children.—TREATMENT.—Here the causes can be arranged under three headings: (*a*) *Contents of the Intestine.* Insufficient quantity of food always produces constipation in infants, unless the food itself has decidedly laxative qualities or the bowel is diseased; the first symptom of inadequate feeding is constipation; improper food, too many carbohydrates, too little fat, and changes in albumin also may be followed by constipation. Nothing produces constipation so frequently as the various methods employed to preserve milk; whether this is due to destruction of bacteria, which otherwise would produce changes in the intestine that stimulate peristalsis (Cheadle), or to the fact that albumin is converted into less stimulating products is immaterial. The best method of treatment in these cases is to give raw milk, which in and of itself is a normal stimulant to peristalsis. As this is impossible under many circumstances, cream may be added to the preserved milk as a laxative—oatmeal water, sometimes malt prepara-

tions, beef juice. Feeding with starches should be avoided. For the treatment of this class of patients the proper quantity of food should also be sought.

(*b*) The *muscular wall* of the intestine is frequently insufficiently developed, so that normal peristalsis becomes impossible. Here gentle massage may be tried; as a rule rectal measures are indicated.

(*c*) *Increased Resistance to Evacuation.*—Here the anomalies found in the colon, and so well described by Jacobi, must especially be taken into consideration. They are much more common than is accepted by the profession at large. The only remedy is to empty the bowels by rectal means. Hernia in children, without becoming incarcerated, frequently produces constipation; a well-fitting truss or the radical hernia operation will cure it. In dilatation of the colon the attempt may be made to cure the condition by electricity or massage; but when there is danger to life, surgical procedure (resection of the colon) should be attempted; in children every case of constipation should be examined for *changes about the anus.* Fissures very trifling in extent are frequently found; these should be treated by aristol powder or silver nitrate; I have never found it necessary to tear the fissure by stretching the sphincter. *Prolapse* of the anus is best treated by reposition after careful cleansing, by the injection of astringents or, when necessary, by cauterization. In some cases worms (oxyurides) produce constipation.

Medicinal Treatment.—Drugs should be used even more rarely in children than in adults. When these are necessary the most unirritating should be given. Cascara in malt preparations, senna, rhubarb, and salines will usually suffice. In infants the habitual use of medicines should never be countenanced, for the cause should always be treated.

ENTEROPTOSIS (Glenard's Disease)

TREATMENT.—Some ten years ago I heard one of our most prominent surgeons say, it seemed to me with some degree of satisfaction, that the treatment of enteroptosis opened a new channel for surgical activity. Nephroptosis was first operated upon by Hahn in 1881; the operation of nephrectomy had been done as early as 1878 by Martin, of Berlin. Glénard published his observations in 1889. It will be seen, then, that enough time has elapsed for us to estimate the importance of surgical measures.

We know that in a large number of cases no symptoms are produced by dislocation of the abdominal organs. It would be manifestly wrong to operate in such cases. Anyone who has been able to watch his patients for a long time has seen a number who, even if they have not been previously told about a dislocated organ, show symptoms after a nervous breakdown. Here, again, the prime object of treatment must be not to operate, but to remove the general cause, although in a certain number of these cases operation may finally become necessary, as the symptoms from the local condition increase the symptoms on the part of the nervous system, and *vice versa.* One thing, however, should always be borne in mind, that unless there are symptoms the patient's attention should not be called to a dislocated organ, hypochondriasis frequently being the result. Moreover, I have seen several

patients in whom there was present a floating kidney, who, although broken down nervously, never complained of nephroptosis; in one of these cases when the patient was told of the condition by another physician, symptoms immediately developed. But there is left a certain number of cases in which operation should be performed—e. g., when the enteroptosis assumes a form dangerous to life and when the patient is incapacitated from work or enjoyment of life. The first occurs especially in the floating kidney, hydronephrosis; the second in any dislocation of one or more organs. But the rule should always be laid down that operation should not be performed until all other measures have been tried. In every case a properly fitting bandage should be worn; this under certain circumstances is a very difficult problem. The principal requirements for a good bandage are that it be supported by the most rigid base that can be found; in this condition the ribs and the pelvis; that it be sufficiently rigid itself, so as to form a good support for the pads that must be added to hold up the organs; and finally, that it move not too much or too little—too much in that insufficient support is given; too little in that respiratory movements or the necessary movements of the body are interfered with. Treves mentions a patient wearing a "very formidable-looking apparatus," which when in position altered the pulse in the lower limbs. The patient should be carefully taught how to apply the bandage; this is best done by a demonstration by the physician. Before the bandage is applied the organ should be put into its normal place by posture and manipulation. When the dislocated organ is fixed by adhesions, only general support should be given; a pad to hold it up will do more harm than good.

The normal internal support, outside of the ligaments, is the intra-abdominal fat; all patients with Glénard's disease should be dieted in the direction of fat production; plenty of carbohydrates, fats, fluid, and rest. Every functional digestive disturbance in the stomach or intestines should receive proper attention. The nervous condition should be met by appropriate treatment. The results of the nonoperative treatment are excellent, although, try as we may, a certain number of cases will require operative treatment.

MUCOUS COLITIS

Prophylaxis.—As this form of disease occurs only in neurotics the prophylaxis is that of the underlying cause; it seems to me that in this condition the existence of the neurosis must be looked upon as a coincidence in many cases, in that both the neurosis and the membranous colitis are the result of the same cause. In a large number of cases the condition is the same as that found in membranous dysmenorrhea and in the mild cases of membranous bronchitis. Mucous colitis can be produced artificially by the internal administration of drugs, especially by mercurials. And when the intoxication is mild the local symptoms do not differ from those seen in mucous colitis. In my estimation there is in all the conditions before mentioned a general intoxication, the poison being eliminated by the colon; this is its local effect, its general effect being to produce nervousness. On the other hand, when a predisposed individual suffers for a long time from any painful condition he becomes nervous.

TREATMENT.—It is necessary, then, in such cases to lay great stress upon the general treatment. Here the *diet* is of enormous importance. I cannot agree that every case should be treated as recommended by Von Noorden and Dapper, who always prescribe the irritating diet of constipation (q. v.). My experience and that of others has shown me that here, as elsewhere, all cases cannot be treated alike. The constipation should be treated as recommended in the appropriate section; saline cathartics are the best. But in these cases there are not infrequently special indications for diet, such as gout, loss of weight, anæmia, dyspeptic conditions, which frequently are of more importance. Otherwise the general treatment should be the same as that recommended for neurotic individuals in order to effect a cure.

For the local treatment all that is required is to keep the colon clean and clear. This is best accomplished by high enemata of lukewarm water or of a normal saline solution. In the beginning these injections should be used twice daily; as the process subsides, only once, and best after the stool. Colotomy has been tried by Keith, Walter Smith, Mayo Robson, and others; an artificial anus is produced which is left open for a long time, as long as seven months, with good results. These good results are probably due to the fact that the rectum can be flushed more thoroughly through the artificial than the natural anus, just as we find it in chronic dysentery; in the large number of cases that have come under my observation I have never found this operation indicated.

The treatment during the attack is that of ordinary colic. Morphine is rarely required; its use is very much restricted here, because individuals with this disease have very little resistance to drug habits. In addition, it may be stated that mucous colitis occurs in morphinism.

While the results from this treatment are by no means unfavorable whatever is done must be done persistently, as we are dealing with a chronic condition; when this is not the case very little treatment is required.

VIII. DISEASES OF THE LIVER

DISEASES OF THE BILE PASSAGES AND GALL BLADDER

Catarrhal Jaundice.

ACUTE CATARRHAL JAUNDICE.—*Treatment.*—Under ordinary circumstances the patient may be allowed to follow his occupation. In the outset the treatment is that of acute gastroduodenitis. When jaundice has developed, the patient should be put on a diet which must consist of mechanically unirritating articles of food, and fats especially must be excluded, unless given in a form easily digested, as in milk; alcohol should be avoided. The rules laid down in other sections hold good here also; the intelligent physician will diet not the disease, but the patient. After preventing increased irritation of the duodenum it is evident that the next indication is to remove the mucus which obstructs the opening of the common duct.

The consideration of drugs is important here; they may manifestly act in two ways; either by increasing pressure from behind the plug or by facilitating its removal from the opening of the duct by direct or indirect action

upon it. In the first case the class of drugs known as cholagogues must be considered. In order that they may be effective in this disease, it is necessary that the pressure within the gall bladder should be enormously increased, for the normal pressure is only 200 mm. of water. Unfortunately for our purpose, if we increase this pressure bile is absorbed, so that even if there are many cholagogues they are contraindicated, except in those cases in which the obstruction is very slight.

Besides the use of drugs, mechanical means have been recommended. Gerhardt has recommended expression of the gall bladder, and this I formerly did repeatedly, generally with good results, but as in several cases rupture of the gall bladder was reported I immediately gave up the method in a disease usually harmless, as risky at best on account of difficulties in absolute diagnosis. The same author also recommended faradization of the gall bladder. I have never used it because I conceive it to be wrong in principle. Lauder Brunton recommends increased activity of the diaphragm, forced inspiration, riding, rowing, sports, to increase expression of the bile from the liver.

The second way is brought about by increasing peristalsis; this may be accomplished by medicaments which experience has proved to be especially useful in these cases, such as calomel, podophyllin, sodium phosphate, and some of the mineral waters, especially Carlsbad. Under no circumstances should an irritating cathartic be given. For continuous use the saline cathartics are to be preferred; whether their action is due to their chemical structure or to their physicochemical nature is uncertain. Injections into the rectum increase peristalsis; as also, according to Pawlow, does the secretion of the succus entericus. These injections need not be given in any peculiar way, as has been suggested by some; it is sufficient that they be given with a long tube. Under all circumstances the patient's bowels should be evacuated daily by those means that are the most efficient and best adapted to the individual. When this is done the use of intestinal antiseptics is unnecessary. When it is impossible to do this salol or β-naphthol may be given.

As the bile leaves the system by the kidneys, their functional activity should be kept a little above the normal. This is done by the administration of large quantities of fluid; water is the best. The addition of water to the contents of the intestine is otherwise valuable in many directions.

Occasionally relief must be given to *symptoms,* the most annoying being the itching of the skin, sometimes resisting all treatment. Alcohol and water, menthol in alcohol, chloroform applied externally; baths, warm or cold, with or without sodium bicarbonate, may be tried. Occasionally in bad cases bromides, chloral, paraldehyde, or other narcotics, even opium, are necessary to give relief.

Chronic Catarrhal Jaundice.—The *treatment* is the same as that of the acute form, except that sometimes special symptomatic treatment must be added. On account of the absence of bile in the intestine and its presence in the blood the patient is reduced in strength and his nutrition is in a miserable condition. In order to increase the absorption of fats and to stimulate peristalsis, bile or bile preparations may be given; a pill containing fel bovis purificatum, 0.3 gm. (gr. v), after meals does much good in these cases, besides modifying the horrible odor of the stools; indeed,

the general odor from the mouth and the skin of the patient is very much changed by this remedy. Intestinal antiseptics have also been recommended; there is none better than bile; next to this in importance are salol or the other salicylic acid preparations. Dilute nitrohydrochloric acid is frequently used in this disease; it is given by the mouth, but has been successfully used in the form of baths; its action has not been explained, but there can be no doubt that it is valuable. When there are debility and marked loss of appetite I combine it with strychnine. The mouth and skin should be looked to; in both instances those measures should be recommended that belong to general hygiene. The pain may require special treatment (v. Gallstones).

Surgical Treatment.—When no relief can be given by medical means, which may be persisted in for a long time when the patient's general condition warrants it, surgical procedures must be resorted to. One of my patients recovered after two years of medical treatment, including a visit to Carlsbad, and is alive and well to-day, without any recurrence eighteen years after her recovery. But this was before the days of liver surgery, so that to-day a case of this kind would not be treated medically unless the patient refused operation. The operation recommended is, especially, cholecystotomy and drainage, to which must be added that for the removal of obstructions by stricture in the common or hepatic ducts or a modification directed to the infectious processes.

Suppurative and Ulcerative Angiocholitis.—The treatment is that of cholelithiasis.

Acute Infectious Cholecystitis.—The *prophylaxis* of this condition consists in some cases in the prevention of entrance of pus-producers into the blood, an impossible feat in certain diseases, as pneumonia and typhoid fever; in other cases the treatment of local infection, as of the tonsil or the bronchial tubes, may be valuable to this end. This disease is frequently the result of gallstones as the predisposing cause. The medical treatment should be directed toward the general condition (septicopyæmia) and toward the symptoms, pain, tenderness, obstruction symptoms; frequently all this is only temporizing; the sooner laparotomy is performed when the symptoms are urgent the better the results.

Cholelithiasis.

Prophylaxis.—This presents itself as the treatment between attacks, for it is only after an attack that the existence of biliary calculi can be taken into consideration. I am fully persuaded that much can be done in this direction; whether the disease can be cured in this way is a matter still subject to lively discussion. As the prevention of formation of gallstones depends largely upon two factors—stagnation within the gall bladder and infection of it—everything should be done to prevent these. For the first, especially in women, no lacing—support of clothing from the shoulders; for both men and women an ample amount of exercise, normal diet, no excesses, regular evacuation of the bowels. Large quantities of fluid may be taken, on the questionable principle that the bile is prevented from becoming too inspissated. Alkaline cathartics may be used, my favorite being sodium phosphate—a teaspoonful of the salt dissolved in a tumblerful of hot water, given

once, twice, or three times daily. In one of my patients the attacks ceased for three years, then he discontinued the phosphate and they returned again; after the relapse, neither the phosphate, nor indeed anything, seemed to avail, and the patient was cured by an operation. Sodium phosphate acts in some way as a liquefier of the bile; this has been proved to my satisfaction in the case of one of my patients, who has a permanent biliary fistula.

TREATMENT.—(*a*) *Between the Attacks of Biliary Colic.*—The principles involved in the removal of a plug of mucus in catarrhal jaundice (q. v.) are the same here, except that their application is accompanied by even greater obstacles. We are then limited to empirical measures, and all who have had large experience in the treatment of this disease will testify to their value. First and foremost I rank the Carlsbad treatment; where possible, this should be taken at the springs themselves; when this is not possible, it can be taken at home, but my experience coincides with that of Naunyn, that the results are not so good. In order to carry out this treatment the course at Carlsbad itself is imitated; I prefer the use of the natural Carlsbad water, which is obtainable usually in bottles; but when it cannot be obtained, artificial Carlsbad water, then the artificial salts, or finally the natural salts, may be used. The water should be taken hot, in large quantities, before breakfast, and if necessary during the day; Naunyn recommends 800 c.c., which in some cases is too much.

The meals should be taken regularly at 8 A.M., 12.30 to 1 P.M., and 7 P.M., the principal meal being in the middle of the day. The diet should exclude fat food, raw fruit, salads, legumina, an excess of carbohydrates and alcoholics. All those articles that might produce dyspepsia should be avoided, especially as individual indications may be found. This course is continued for from four to six weeks, and in my own patients this diet is continued and the sodium phosphate substituted for a much longer time. It has been my experience that the Carlsbad water loses its efficacy much more quickly than the sodium phosphate. The results of the Carlsbad treatment are still looked upon by many as *post hoc ergo propter hoc,* but the *post hoc* occurs so frequently that we are justified in saying *propter hoc ergo post hoc.*

Another method of removing the gallstones consists in the administration of solvents; several are recommended, but sweet oil is the one most commonly employed. To say that it acts as a solvent is just as absurd as to deny its value in some instances; how it acts no one knows.

Turpentine and sodium salicylate have been recommended as disinfectants of the biliary passages, and good results sometimes follow their prolonged administration.

Massage or the other means for mechanical removal should never be used.

(*b*) *During the Attack.*—By the mouth hot water, sweet oil, or a tablespoonful of glycerine may be given. Belladonna, hyoscyamus, ether, and chloroform are also recommended. Externally hot applications, hot-water bag, poultices give some relief. When the pains are very violent hypodermic injections of morphine must be given; sometimes even a whiff of chloroform or ether is required.

SURGICAL TREATMENT.—The indications for this method are to be found after medical treatment has failed, or when there is an *indicatio vitalis.* These indications and their contraindications are put forth by Kehr as follows:

1. When the attacks are mild and entire absence of sensitiveness occurs during latent intervals, operation should not be done.

2. In acute obstructions of the ductus choledochus, when accompanied by cholecystitis or by severe general symptoms, operation should take place.

3. When the attacks are sufficiently frequent to interfere with occupation or the pleasure of living, or when they produce marked disturbance of general health, the operation is indicated.

4. Operations are indicated in dropsy, empyema of the gall bladder, and pericholecystic abscesses.

5. Gallstone patients who are morphinists must under all circumstances be operated on.

6. The sequelæ of cholelithiasis, purulent cholecystitis, abscess of the liver, perforation, subphrenic abscess, severe pyloric and duodenal stenosis, and often gallstone ileus, must all be treated surgically.

Diabetics and patients with arteriosclerosis or chronic diseases of the lungs and heart should not be operated on, if it can be avoided. Fat men do not bear the operation well.

To these indications may be added one that is imperative: when there are symptoms indicative of danger to life, operation should be performed, if it be only an exploratory one to determine the cause. Delay here is inexcusable.

It may be well to give Kehr's statistical table as to mortality, as it includes the nature of the operations in gallstones:

	Per cent.
237 conservative operations (cystotomies, cystendyces, cysticotomies), 5 deaths	2.1
161 cystectomies with 5 deaths	3.1
137 choledochotomies, with hepaticus drainages, 9 deaths	6.5
114 simultaneous operations on the stomach, intestines, pancreas, liver, kidney, etc., 24 deaths	21.0
71 simultaneous operations in inoperable carcinoma of the gall bladder, the ductus choledochus, the liver, diffuse suppurative cholangitis, diffuse suppurative peritonitis, sepsis, 69 deaths	97.0
In 535 uncomplicated laparotomies for gallstones, 19 deaths	3.5

I have taken the above results as representing the best; results that are equaled by many of the best operators in this country and elsewhere. That they will be improved upon it is not necessary to state; that they are not equaled by most operators goes without saying.

As to the permanent results of operations, the reports differ very much; my own experience is limited, but I have seen two cases with recurrence. Kehr has never had a recurrence in 900 cases, although he has seen four cases of recurrence. Riedel has also never had a recurrence; Toeplitz has had recurrence in 14.2 per cent. As the result of Carlsbad treatment, Fink, in 375 cases, had good results in 291 = 72.8 per cent, of which 20 cases, or 4.95 per cent, had relapse. In 34 operative cases, one third had subsequent trouble

In addition, fistulæ, hernia, colic, from adhesions and inflammatory conditions, sometimes result.

CIRRHOSES OF THE LIVER

Alcoholic Cirrhosis.—PROPHYLAXIS consists in that of chronic alcoholism (q. v.), but it is not said that every alcoholic suffers, or will suffer, from cirrhosis of the liver.

TREATMENT.—This should begin, in alcoholics, when the slightest evidences of this disease are manifested, either as the result of physical examination or on account of symptoms. An enlarged liver is sufficient to cause us to suspect the beginning of the process; symptoms on the part of the gastrointestinal canal, especially hemorrhages, should always be looked upon with suspicion. The removal of the cause is the principal indication—viz., total abstinence from alcohol. Next comes that of preventing the further development of the process and the removal of the slight amount of fibrous tissue deposited in the interlobular space. According to my experience, this is best accomplished by diet, which should be principally of milk, eggs, and carbohydrates; no meat of any sort, nothing made from meat, such as soups, broths, extracts. Furthermore, the persistent use of iodine preparations is indicated; how they act has not been determined; that they do act well in this disease can be attested by all who have had large experience in the treatment of alcoholics in private practice, where the gradual development can be studied. Apart from the general indication for iodine, no one ever knows definitely whether the individual alcoholic has or has not had syphilis. I have for years been following these indications, and while the objections can be raised that diagnosis is very insecure and that the removal of the cause (syphilis) must be looked upon as a source of error in my therapeutic conclusions, I feel certain that this is not the case. In one of my patients, although he has relapsed into alcoholism after three years of abstinence, the liver condition has not returned.

In advanced cases the treatment is *symptomatic*, the symptoms being due to parenchymatous changes in the liver or to circulatory disturbances. For the toxic symptoms very little can be done; free purgation with calomel and jalap may be resorted to; hypodermoclysis may be done; hot baths may be tried; the nervous symptoms may require special treatment.

For the *circulatory symptoms*, on the other hand, much may be done; this includes the proper treatment of the gastrointestinal symptoms, epistaxis, and a general tendency to hemorrhage. The most important symptom is ascites. The medical treatment here consists in the use of saline cathartics, elaterium, compound jalap powder, calomel (recommended very highly by the Germans, 0.1 gm. [gr. jss.] being given three times daily, to which is added opium, 0.03 gm. [gr. ss.] of the extract, for as long as two weeks). The hot-air bath, or any means that can produce copious sweating, may also be used.

None of these measures should be employed for any great length of time, certainly not to the detriment of the already debilitated patient, for in SURGICAL TREATMENT we have a safe and efficient method. This may be done with the usual instruments employed for the withdrawal of fluids from any serous sac, but under all circumstances with absolute asepsis. The operation should be performed early; when the fluid again accumulates the operation should be repeated, so that there may be three or four repetitions. The advan-

tages of this treatment are that sometimes a compensatory circulation for the liver is established, shown by the fact that many cures follow this method of procedure, and that peritonitis is not apt to occur in the cases so treated.

The best method for establishing a compensatory circulation for the liver is that first recommended by Talma. This operation has for its purpose the establishment of an anastomosis between the circulation of the portal vein and one of its principal collateral veins, and consists in the performance of a laparotomy, with suture of the omentum and the abdominal walls; this operation has been modified by Morrison, Clementi, and Pasquale. The operation does very well for the removal of ascites, and in so far as this, combined with establishment of circulation, is concerned, a certain number of cases has been cured by it; probably a greater number than by the simple operation of repeated tapping. As far as the question of cure is concerned, a patient must be considered cured when he is restored to health, whether this be done by symptomatic or causal measures. As for permanent cure in these cases, that is a different matter; Greenough has shown that in 105 cases, in only 9 was there improvement after two years. While this operation is very important for the relief of symptoms and for prolongation of life, it is questionable whether it can often be followed by a permanent cure. Again, in many cases no permanent beneficial results can be effected by it—viz., in those in which the hepatic alterations are so great that functional activity is seriously impaired. But even in these cases temporary results are obtained.

Hypertrophic Cirrhosis.—TREATMENT.—Hypertrophic cirrhosis is an incurable disease, and can only be treated symptomatically. The diet should be the same as in the preceding form; the iodides are also very valuable. Calomel is more important in this than in the former condition. Intestinal antiseptics may be used. Semmola speaks very highly of the alkaline hyposulphites. Besides this, the condition of the gastrointestinal tract must be considered, and the general condition treated by the various tonics in use. In every other respect the treatment is the same as that of alcoholic cirrhosis.

Syphilitic Cirrhosis.—TREATMENT.—When the diagnosis is made early enough, the usual antisyphilitic measures give remarkably favorable results. An exception to this rule is the syphilitic cirrhosis of infants.

ABSCESS OF THE LIVER

The PROPHYLAXIS consists in the early recognition and treatment of amœbic dysentery, appendicitis, cholelithiasis, septicopyæmia.

The TREATMENT is that of septicopyæmia. Surgically the abscess should be operated on, especially if it is unilocular. The operation is usually done in two stages, and the results vary largely as to the cause and nature of the abscesses; for amœbic abscesses, Lafleur says, "that notwithstanding the slender hope of recovery, the treatment must be surgical." In the large tropical abscess the results are much better, as well as in traumatic abscess. In the septicopyæmic abscess the outcome of surgical intervention is not favorable; in most of these patients the general and local conditions preclude the possibility of operative interference.

NEW GROWTHS OF THE LIVER

The TREATMENT of tumors of the liver is surgical. Whenever the diagnosis of tumor of the liver is made, there should follow an exploratory laparotomy. The exceptions to the rule are the suspicion that syphilis exists, the case of secondary carcinomata, and possibly hydatid disease (q. v.). In solid tumors it is a good rule to put the patient upon the iodides for a few weeks before operating; cases are on record in which, after laparotomy, the iodides produced a cure. The adherence to the rule of early laparotomy may save life very frequently; without it the disease may progress until the condition becomes hopeless, or at least very much more serious in regard to operative intervention. When it is possible, the tumor should be excised. Here, as elsewhere, the advance in surgical methods has given encouraging results.

In *cancer of the liver*, the medical treatment consists in an endeavor to prolong life and to give relief to symptoms. In the first instance the diet should be so arranged as to be nutritious and easily digested; on account of loss of appetite, this question is difficult of solution; upon the whole it will be found that concentrated and predigested foods, given frequently, will be required. But with all the dietary resources at one's command, the patient, in the nature of the process, goes from bad to worse. These patients frequently complain of the condition of the mouth and tongue; frequent rinsing with alkaline waters, listerine, menthol, sometimes acidulated liquids, gives some relief. The condition of the intestinal tract usually requires attention; for the relief of this I have found Hathorn water very valuable; the patient is allowed to drink this instead of ordinary water; when cooled it is grateful to the taste, and produces the desired effect upon the bowels. For the relief of pain opium should be used *per os*; when this no longer gives relief, hypodermic injections of morphine should be given. In this disease morphine is a gift of the gods.

AMYLOID LIVER

Here PROPHYLAXIS is all that can be attended to; the proper treatment of suppurative, tuberculous, rachitic, or syphilitic processes. There is no treatment except the giving of relief for symptoms.

IX. DISEASES OF THE PANCREAS

The TREATMENT of cholelithiasis is of importance for prophylactic purposes, and in chronic pancreatitis for the treatment also of the disease; the treatment of a possible cause—intoxications or autointoxications (alcoholism, chronic uræmia), especially syphilis, possibly arteriosclerosis—should receive attention. Otherwise the treatment by medical means is confined to the giving of relief to the symptoms. In all diseases of the pancreas, as just indicated, the surgical treatment is the only one that can promise much. When the diagnosis is made, laparotomy should be performed. In acute cases, depending upon the condition of the patient, the sooner the operation is done the better the results.

X. DISEASES OF THE PERITONEUM

ACUTE GENERAL PERITONITIS

PROPHYLAXIS.—The prevention and proper treatment of the causal diseases do much in the prophylaxis of diffuse peritonitis. In the beginning of my practice general peritonitis was thought not an uncommon occurrence, for at that time we were still preoccupied with the "idiopathic" form. At present, both primary acute general and idiopathic peritonitis are very rare. Advance in knowledge has been especially marked in ætiology, but not less in prophylaxis. If we provide against infection of the peritoneum by means of bacteria, we make the existence of general peritonitis practically impossible. The principal source, that from childbed, has been removed by aseptic obstetrics. But other infections from the female genital tract should also be guarded against. Next to this in importance, as reducing morbidity, is the knowledge of the fact that a very large number of cases of general peritonitis have their origin in appendicitis. This being accepted on every side, the frequency of general peritonitis has been greatly reduced by the proper treatment of appendicitis. The surgical treatment of ulcerative and suppurative processes of the abdominal organs does not a little for prevention. But with all this advance, there remains a certain number of cases in which there can be no prophylaxis, just as is the case with a certain number of cases of septicopyæmia. Here the primary infection may have been insignificant—tonsilitis, for instance—and we cannot suspect for a moment that it might be followed by peritonitis or any other remote lesion.

TREATMENT.—*Medical Treatment.*—The causal treatment would consist in the removal or destruction of the bacteria producing the disease. This is impossible, as we have no drugs that would in this case destroy bacteria and not destroy the patient. We are then limited to symptomatic treatment. The treatment of Alonzo Clark was, in a sense, considered a specific method by him, and those of us who heard him describe it almost as precisely as one would go through with the steps of a mathematical demonstration were very much impressed by it. It consisted in the administration of one preparation of opium in increasing doses until toxic effects were produced; in one case he told us of having reduced the respirations to six per minute, and yet the patient recovered. In the days of Alonzo Clark this method may have been justified; as I look back on his lectures upon this subject, I find that he proved to us that it was not only warranted, but that it was the only method in puerperal peritonitis. At the present day it is unjustifiable because it is unnecessary.

The patient should be kept absolutely quiet, all pressure being removed from the abdomen and all unnecessary examinations being avoided. Removal of the patient from his home to a hospital is fraught with great danger. It is always best to perform surgical operations at home unless the increased chance of recovery in a hospital outweighs the harm done by removal. The diet should be that recommended in appendicitis. Leeching is unnecessary; formerly I applied leeches quite frequently; as I found them of very little benefit, either in affecting the course of the disease or in allaying pain, I

have discarded them altogether. For external applications, either the poultice or the ice bag may be used, the one or the other method should be chosen according to the patient's preference; when there are evidences of peritoneal shock a number of ice bags should be applied. Opium or morphine should be given to relieve pain; when there is vomiting, morphine should be given hypodermically, the vomiting itself is usually checked by it, but if not these remedies may be given by the mouth. The administration of purgatives is no longer so commonly recommended as a routine method of treatment as formerly, yet I have frequently seen the best results follow their use. Their use is indicated where there has been obstinate constipation before the attack or where there is anything that points to an infective process in the intestines. But the diagnosis must be clear as to perforation or obstructive processes before any laxative is prescribed. Calomel, the salines, and senna are the preparations that have been especially recommended. In this country the salines have been used especially on account of a depleting effect upon the peritoneum, which however has never been proved to exist. It is always my rule, when the indications exist for moving the bowels, first to use rectal means, the best of which is the oil injection, followed by a copious high injection of warm water. When they are indicated, the relief given by these measures is very great, especially for meteorism, but more than once I have seen a peritonitic process apparently cured by saline cathartics. Vomiting is usually controlled by abstinence from food (v. Appendicitis, Obstruction of the Bowels, as well as for the treatment of the other symptoms).

Surgical Treatment.—This is always indicated when it is possible to remove the cause; that is to say, in the greatest number of cases. Even when this is not the case, the acute purulent cases should be operated on, and the sooner this is done the better will be the results, for here, at least, the local cause can be removed, and often this is enough to save the patient's life.

ACUTE PERITONITIS IN CHILDREN

This differs only as to causation from that of adults, and for the same reasons as to treatment. The prevention of septic infection of the newly born from the umbilicus is always essential. As the infection of the peritoneum frequently arises from the intestine in children, laxatives are more commonly indicated than in adults. Gonococcus peritonitis must also be taken into consideration (Francis Huber); therefore the prophylaxis and treatment of vulvovaginitis should be carried out strictly. Filatow called attention to traumatic peritonitis in children; the treatment is that of appendicitis and peritonitis in the adult.

LOCALIZED PERITONITIS

Subphrenic Abscess.—The TREATMENT here, as in all other forms of acute localized peritonitis, is surgical. When the operation is performed early, with resection of ribs—that is to say, by the transpleural method—the results are very good, and the mortality does not exceed twenty to twenty-five per cent. The longer the operation is delayed the greater the mortality.

CHRONIC PERITONITIS

TREATMENT.—So far as the removal of the cause is concerned, recourse must be had to surgical means; sometimes to medical means in relieving abnormal conditions in the portal circulation or in the treatment of toxic conditions, such as alcoholism or uræmia. The surgical treatment consists in those measures that give relief to ascites or adhesions. The great number of operations performed nowadays on the peritoneum naturally gives rise to a large number of cases with adhesions, so that secondary operations become necessary. But adhesions that can be recognized by the symptoms should always be relieved by operative measures.

In chronic peritonitis the patient should be kept in bed. External applications, in the form of the Priessnitz application, are useful. Attempts at obtaining absorption should certainly be undertaken; iodovasogen has given me the best results. Creosote vasogen, especially valuable in the tuberculous form; guaiacol, Unguent. hydrargyri, the external use of other iodine preparations, are all recommended. Under no circumstances should anything be done to injure the general health of the patient, either in this or in any other way.

The DIET should be so arranged as not to produce marked peristalsis resulting in more or less irritation of the bowels; but it must be highly nutritious and leave little residue, and should therefore be free from mechanically irritating substances.

As a rule, such a patient is anæmic; or his general tone is deficient, for which condition the organic iron preparations, nux vomica, strychnine, or the bitter tonics, especially cinchona, may be given. The condition of the gastrointestinal tract requires special consideration. Symptoms on the part of the stomach should be treated as recommended in the proper section. Generally there is constipation; this may be best met by the administration of the saline cathartics, by castor oil, senna, or cascara. The rules laid down for acute peritonitis also hold good here. For the pain everything else should be tried before resorting to opium or morphine; codeine, antipyrine, belladonna, hyoscyamus, or small doses of sulphonal sometimes give relief; finally opium. Fever is treated according to the general rules. At last, laparotomy must be considered when all these medicaments have failed, for even in the nontuberculous form it may do good.

TUBERCULOUS PERITONITIS

TREATMENT.—For the general treatment the reader is referred to the proper chapter. Every case should receive the benefit of the method of treatment described in the previous chapter, for in a large percentage of cases it is followed by good results. An exception to this rule should be made in cases in which there is a great collection of ascitic fluid.

Surgical Treatment.—All cases of tuberculous peritonitis should be operated on when medical treatment fails. The operation is contraindicated in ulcerative tuberculosis of the peritoneum and when the patient's condition precludes the advisability of any operative intervention. But even in advanced tuberculosis of the lungs laparotomy may still be of benefit

to prolong life. The benefit of laparotomy in tuberculous peritonitis was first discovered accidentally by Sir Spencer Wells (1862), and since that time the operation has gained in favor with the profession until its place in the therapy of this disease has been universally established. No satisfactory explanation has been offered as to how the simple procedure of opening the abdomen, letting out the fluid, if any is found, and then sewing up the wound, cures this disease. As substitutes there have been proposed puncture and injection of fluids and permanent drainage, but both have to be rejected on account of inherent dangers in the procedure; also the injection of sterilized air into the peritoneal cavity (Duran, v. Moosetig-Moorhof). None has, however, been accepted as a substitute. There is a difference of opinion as to the time when the operation should be performed. I always believe it proper to give the patient the benefit of medical measures when good results may be expected from their use before resorting to operative measures, which are attended by some risk to life. A large number of patients get well without being treated, so that medical statistics, if such could be obtained, would be of little value. It must be freely admitted that by looking upon operation as the first measure in this disease Rotch has obtained most excellent results.

SECTION VI

DISEASES OF THE RESPIRATORY APPARATUS

GENERAL PROPHYLAXIS

Here those conditions will be considered that can be regarded as producing disease in the respiratory tract in a *general* way, as a number of *general* ætiological factors are accepted. Whenever necessary, special prophylaxis will be treated in connection with special diseases. The principal one to be considered is that indefinite process which is summed up in the term "catching cold." There is a large literature upon this subject. The present status of the question can be best illustrated by a quotation from Penzoldt: "If catching cold (as an ætiological factor) has lost so much ground in the last fifty years, it is very likely that it will also lose the little which is still conceded to it." At present we look upon catching cold as a predisposing factor to infection, and as bacteria are always found in the respiratory tract the frequency of invasion of this tract is explained. How the act of change in external temperature produces local predisposition—whether by general lowering of temperature, by local changes in circulation, by reflex processes from the skin, or by changes in circulation there (vasomotoric)—has not been demonstrated. Under all circumstances the act of catching cold goes on through some irritation of the skin, and the logical consequence, so far as prophylaxis is concerned, is that the skin should be hardened in such a way that it will not react in an abnormal manner, or that when increased demands are made upon it an increased resistive reaction occurs. This requires good general health, as in the prevention of all infective diseases, but also the treatment of general conditions such as gout, rickets, anæmia, autointoxications. A certain training of the skin, summed up in the processes called hardening, is also required. For this purpose many things have been proposed. Fresh air and plenty of it is one of the approved methods carried out by fresh-air baths, by the proper ventilation of rooms, by being in the open air as much as possible, and, when necessary, by living altogether in the fresh air. Draughts play so important a rôle in the production of colds that they should be especially provided against, not, as is usually done, by avoiding them, but by trained exposure to them. According to my own observation, a draught never produces an inflammation of a mucous membrane. Ever since I witnessed Hebra's experiments upon human beings, exposing them to cold-air draughts in the depth of winter without producing inflammations or disease of any sort,

all the reported experiments upon lower animals, some very ingenious, could not shake my belief. But even if this were not true, anyone can so educate his skin that the nervous reaction from a draught does not follow. In order to accomplish this the psychical reaction to draughts must first be removed; patients must be told that sneezing alone is not an indication of catching cold, and if they will but reflect, the chances of catching cold from draught must be very small, as it is practically impossible to keep out of draughts and changes in temperature while going through the ordinary daily occupations of life. But this training is best begun with children, and these I allow to live in draughts whenever this can be done.

Hydrotherapy is the best means of hardening against catching cold. This is done by cold sponges and cold plunges; as one or the other of these processes belongs to the daily routine of life in English-speaking countries, among people so situated that they can be used, detailed description such as we find in Continental works is unnecessary. In a certain number of cases these methods cannot be carried out at all; in very nervous subjects, for instance, in convalescents from various diseases, in those suffering from various circulatory disturbances, and in reduced subjects. In some little or no reaction occurs; in these the mildest form of sponging, the patient standing in warm water, should be tried, beginning with cool sponges and then finally reducing the temperature of the water in which the patient stands. Upon the whole, the best contraindication is found in the patient's subjective condition, and we should always be guided by it in our recommendations.

The selection of proper clothing works in two ways upon the skin, hardening it or protecting it. The skin is hardened when the clothing is so arranged that the skin and the air can come into direct contact, as long as the outer air is not warmer than the temperature of the body. It is protected when the air is directly excluded by clothing, provided the outer temperature is lower than the skin temperature. In addition to this, evaporation or perspiration must be taken into consideration as producing a lowering of skin temperature, and under ordinary circumstances this evaporation is effected by means of clothing adapted to the hardening process. In order to harden the skin, light underwear made of wool should usually be worn. Here again the psychical impression plays so important a rôle that individual peculiarities and reaction must be taken into consideration. An individual who feels that he is catching cold every time he feels cold cannot be expected to wear thin linen underclothing in winter and be comfortable. On the other hand, we see many going about with abbreviated underwear of linen, low shoes, and insufficient outer clothing without taking harm, even in weather which, according to our notions, especially produces the "catching-cold" disease. The psychical effects of clothing are well illustrated in those who wear red or "medicated" flannel with good results and always catch cold when they wear ordinary flannel. With all these hardening processes should be combined some form of gymnastics.

From both a scientific and a practical point of view, the direct cause of most respiratory diseases is of more importance. This cause is bacterial, principally the pus-producers, streptococcus, staphylococcus, the *Diplococcus*

pneumoniæ, and the influenza bacillus. It follows, then, that the prophylaxis of respiratory diseases should be the same as that of infectious diseases, especially in those subjects offering feeble resistance, such as children and aged or debilitated people. Patients who suffer from certain forms of respiratory troubles, all the acute troubles of the mucous membrane and a good many of the chronic forms, must be told that their disease can be communicated to others by means of direct or indirect contact with the secretions from the mucous membranes, and that they must take the proper precautions against this. Extensive epidemics of pneumonia, such as we have had in this country, have taught this lesson. It is always easier to collect bacteria and to destroy them near their origin than when they have been disseminated and have been allowed to propagate in unknown places.

Individual Prophylaxis.—The upper part of the respiratory tract, the nose and pharynx especially, should be kept in a healthy condition. The filtering function of nose-breathing should be maintained at its highest efficiency, and this in the presence of a normal mucous membrane is the best protection against acute respiratory troubles. When the nose-breathing is not normal attempts should be made to render it so by the removal of hypertrophied mucous membrane or of any other obstruction in the nose or the pharynx. But care must be taken not to remove too much from the nose, otherwise the filtering function is destroyed. Beyond this there should be daily cleansing of the mucous membrane; of the nose, through the introduction of a mildly alkaline fluid by snuffing up or by spray; of the pharynx, through gargling with large quantities of fluid, twice daily. When these means are conscientiously used for a long time acute attacks or exacerbations frequently cease. These measures are especially valuable when there is danger of entrance and deposit of foreign bodies by insufficient functional activity of the nose and pharynx; only, however, for finely divided particles. It is doubtful whether any larger foreign body can do harm in any other way than by obstruction unless it carries bacteria with it or favors their development. For the inhalation of dust the importance of preventive measures has already been considered in the section on Pneumonia. But this is also important for the prevention of acute coryza, which, in its turn, frequently leads to more serious conditions. In cities the prevention of dust presents a very formidable problem which should be solved at any cost. The dust diseases that occur in the various trades should be controlled by hygiene of the workshop; when this is not possible the workmen should be advised to wear masks containing substances that filter the air before it is inspired.

With children in cities special precautions should be taken against dust inhalation. The attention of parents and nurses should be called to the dangers arising from it. When there is much wind infants especially should not be sent out unless their faces are carefully protected by a veil.

In the respiratory organs violent inspirations or expirations may do harm, by causing the secretion to be deposited in healthy portions or by causing dilatations in the bronchial tubes or the air vesicles. In order to prevent this it is frequently necessary to teach the patient how to inhibit coughing or, when necessary, to administer some remedy which helps to reduce the cough.

The prevention of secondary respiratory troubles in infections or circulatory diseases is considered in their proper chapters.

I. DISEASES OF THE NOSE

ACUTE CORYZA

TREATMENT.—For attempts at abortion of the process one of the following plans may be tried: Diaphoretics are used; either the patient is put to bed and drinks large quantities of some form of hot drink or he takes a hot bath of some kind and then goes to bed drinking large quantities of water and being covered with blankets. Dover's powder—0.6 gm. (gr. x)—divided into three powders, to be taken every half hour, given at bedtime and followed by a cathartic the next morning, also acts in this way. A number of drugs have been used; a combination of sodium bromide, camphor, and atropine, when given very early, sometimes seems to abort the attack. The most agreeable treatment to some is the one referred to by Alonzo Clark in his lectures, viz., to hang up one's hat on the bed post and drink whisky and water in the proportion of one to two until one sees two hats. Quinine in large doses is sometimes valuable in certain forms of infection.

In the majority of cases little treatment is required. When necessary this is local and may be applied directly to the mucous membrane by sprays or the douche, or by instillation, insufflation, or snuffing. Various remedies are used—camphor, menthol, boric acid, carbolic acid, iodine, eucalyptus, chloretone, the sozozol salts, and others. When there is much trouble in the accessory sinuses, surgical procedures must be resorted to.

In *infants* every acute coryza should be carefully attended to, as it interferes with nose breathing, and consequently with nursing, and may lead to troubles in the lower sections of the respiratory apparatus. The indication here is to keep the nose clean; this can be done by dropping into the nose as frequently as is necessary a 1 to 30 solution of boric acid in liquid albolene. When necessary, cotton wrapped upon a probe and dipped in this solution or in boroglycerin should be introduced. Injections, under low pressure, of sodium biborate or bicarbonate may be tried as the next step when the two others are unavailing. The nasal douche is also recommended, but must be used with great care. Adrenalin would suggest itself in the very bad cases, as it does in adults, but I have had no experience with it in children.

CHRONIC NASAL CATARRH

Rhinitis Chronica Hypertrophica.—In this form the treatment is largely surgical, or at all events of such a nature as cannot be carried out by the general practitioner unless he has had special training for it. The prime indication is to reduce the hypertrophy of the mucous membrane, either by removal of large masses of tissue or by local cauterization, as the case may require. Local applications, astringents, antiseptics, and other such procedures never cure this trouble, which is refractory under all circum-

stances, although not impossible to cure. The physician who temporizes by using only such treatment is responsible for much damage to his patient. The sooner the condition is recognized and properly treated the better will be the results in regard to nose breathing, deafness, and remote respiratory troubles. What blunders have been made in the treatment of this disease no one can estimate. For myself I prefer the operative zeal of some specialists to the apathy of some general practitioners.

Rhinitis Chronica Atrophica.—Here medical treatment may do much good by the removal of remote causes. In every instance the patient should be carefully studied as to his general condition—gout, anæmia, autoinfection, syphilis, all those conditions leading to arteriosclerosis. Combined with local treatment, general treatment gives the best results, which, unfortunately, are not brilliant. When there is fetor, producing that form called ozena, the internal administration of potassium iodide acts temporarily in a marvelous manner. For local application antiseptics should be used, of which the best in my experience is potassium permanganate.

EPISTAXIS

Treatment.—In the treatment of epistaxis it is essential to determine the exact location of the hemorrhage. It is strange how seldom the interior of the nose is examined in epistaxis. When this is done it will be found that simple measures will control the condition in most cases. Under all circumstances an examination is required, for even when not satisfactory at the time certain things can be excluded, and we are aided in preventing the recurrence of bleeding. Taken as a whole, chronic rhinitis with accompanying ulcers is the most common local cause for epistaxis; these ulcers are usually found in the anterior portion of the nose and most commonly upon the septum. The treatment of the epistaxis consists here simply of pressure upon the bleeding part by compression of the nares, and never fails. In order to prevent relapses which characterize this form the chronic rhinitis must be treated, but, in addition, the ulcer should be cauterized. The patient should be warned not to blow his nose too violently, not to try to remove the crust, and to avoid external injury to the nose. If the lesion is not upon the septum or cannot be reached by pressure from without, it should be cauterized with chromic acid or the galvanic cautery.

In a large number of cases no lesion can be found, and then the epistaxis must be treated as a symptom. For the milder cases rest, quiet, deep breathing, cold to the back of the neck may be used. If the hemorrhage does not stop, a douche with hot water may be used. When everything fails, the nares, if possible only the anterior nares, should be plugged, using iodoform or dermatol gauze. If absolutely necessary, the posterior nares must be plugged; the plug should not be allowed to remain longer than forty-eight hours, so as to prevent infectious processes, which are apt to occur after this operation. The local use of adrenalin makes all other remedial agents unnecessary; the solution (1:1,000 in adults, 1:10,000 in children) is dropped into the nose and, as a rule, the bleeding stops. It may become necessary to repeat the dose once or twice, but as no harm is done when the proper dose is used, this is no hardship.

The causal treatment can usually be applied only in the intervals of bleeding; it is that of the local trouble; of venous stasis, because of difficulty of return of blood to the right heart; of arteriosclerosis; of hypertrophy of the left heart; of chlorosis and the anæmias; of the hemorrhagic diathesis; sometimes of vicarious menstruation. In a number of patients frequent attacks of epistaxis, especially in children, cause anæmia; this should be treated.

II. DISEASES OF THE LARYNX

ACUTE LARYNGITIS

The possibility of aborting the attack must be taken into consideration, just as in acute rhinitis, with which this disease is commonly associated. The patient should refrain from all things that tend to increase irritation of the larynx; there should be no excessive use of the larynx in talking or singing; air that is free from dust or smoke should be breathed; no smoking; very little alcohol. The breathing in of cold air as long as it is pure does no harm in the mild cases; in children it should always be avoided. In the latter special attention must be given to laryngitis, because it produces spasmodic croup (the subglottic form of which is dangerous in infants), and by extension, bronchitis or lobular pneumonia. Children should always be kept in an even temperature in acute laryngitis; if necessary, in one room in which the air should be kept moist. In severe forms both adults and children should be kept in bed.

In the milder forms a Priessnitz application may be used at night; it gives great relief to the tickling and the irritation. In cases with a great deal of intralaryngeal swelling the ice bag should be used; care must be taken not to freeze the skin, as I have often seen done. Sometimes, especially when resolution begins, poultices or the hot-water bag gives great relief.

For local treatment only the mildest, least irritating substances should be used. Aside from the exceptional occurrence of aborting the attack by local remedies, the danger of production of the subglottic form in children is too great to warrant the use of such remedies as silver nitrate or strong astringents. Inhalations may be used with normal salt solution, sodium bicarbonate (one to two per cent), sodium bromide (one to three per cent), diluted lime water, Ems water, or Apollinaris to which sodium bicarbonate has been added. The inhalations should be used frequently, every two to four hours. The drinking of Ems, Seltzer, or Apollinaris, equal parts with hot milk, frequently gives relief. When there is hypersecretion inhalations containing eucalyptus oil, terebene, or gaultheria may be used. Internal medication is not very serviceable; but ammonium chloride may be given in small doses frequently repeated. For the acute laryngitis of the grippe, quinine, antipyrine, or, when there is secretion, sodium benzoate is valuable. The routine administration of emetics in laryngitis should be deprecated, especially in children; *remedium pejus malo.* I have frequently seen chil-

dren in the various forms of laryngitis suffer more and longer from the remedies given than from the disease.

For the fever, when necessary, a hot bath, antipyrine, or aconite, which is a favorite remedy in all acute catarrhal conditions, may be given. When aconite is used great care in the dosage and the prescription (as to the preparation to be dispensed) should be exercised; I have seen great harm done by indiscriminate use of aconite. The cough can be controlled by antipyrine or codeine—it is not necessary, as a rule, to give opiates. Frequently the addition of chloretone to the agents mentioned above for use as inhalations gives great relief for the irritation in the larynx.

CHRONIC LARYNGITIS

TREATMENT.—The medical treatment is that of chronic rhinitis (q. v.). In addition, the patient should be cautioned as to the necessity for removal of the cause; excessive use of the voice should be prohibited; the patient should live in pure air; sometimes removal to another climate becomes necessary; it is better to give up smoking altogether, but when this is not done the patient should be advised to smoke only in the open air; alcohol should be forbidden. Local hardening processes should be tried, as sponging, douching, exposure of the throat to air. On the other hand, a number of patients will assert that they have been cured by allowing their beards to grow or by wearing mufflers.

ŒDEMA OF THE LARYNX

TREATMENT.—Treatment here includes that of *subglottic croup,* or *laryngitis hypoglottica gravis,* as it has been called by v. Ziemssen; in children it presents the symptoms of stenosis of the larynx with or without those of croup; in the adult the croup symptoms are very rare. As soon as much swelling is found in the pharynx on the posterior pillars of the fauces and uvula the patient should be given small pieces of ice, the throat sprayed with ice water, and an ice bag applied externally. If the swelling does not disappear the mucous membrane should be freely incised. It is only at this stage that incision of the mucous membrane can act with precision; and it is then to be used as a prophylactic measure. When symptoms of laryngeal stenosis develop the patient should be watched as he would be in true croup. Inhalations, as in acute laryngitis, may be used; adrenalin and cocaine are especially valuable here. The room should be kept moist by evaporation of water, and this can be done in one of many ways; where it is possible, the croup kettle is the most convenient; otherwise, flat dishes filled with water may be placed upon the radiators; when necessary, the constant use of several atomizers, so that the spray is allowed to escape into the room, may be of service. As the essential thing is to relieve the laryngeal stenosis, the patient should be placed under such conditions that he can be observed by his physician as long as he is in danger of suffocation. The course of this disease at times is a rapidly fatal one and many valuable lives have been lost by disregarding these simple indications. If, notwithstanding the measures recommended, the patient goes from bad to worse, intuba-

tion or tracheotomy should be performed immediately. Intubation is preferable in children, but, as there may be œdema in the trachea, the operator should always be ready to do a low tracheotomy. In adults tracheotomy is always performed; it does not present the operative difficulties or dangers that are found in children, and the condition after the operation is one of greater comfort for the adult than after intubation.

SPASMODIC LARYNGITIS

Laryngospasm, laryngismus stridulus, a condition found in rachitic children only, the treatment of which is to be found in the proper chapter (v. Rickets). I have never seen any spasm of the glottis as a result of reflex conditions from any other place than the larynx; consequently I prefer to restrict the use of this term to rickets only, using for all other spasmodic conditions the term *spasmodic croup or false croup.* Here the principal mechanism of production is increased reaction to an afferent impulse from the larynx, but in a number of patients, children more commonly, the centers do not inhibit properly, for various causes. Diminished inhibition, normal in children, accounts for the frequency of this condition in them, but equally well for its occurrence in neurotic women. As a result of this I have used potassium or sodium bromide in these cases with the most signal success for a great many years. It should be given in large doses during the attack, as it is slow in its action; and it is beneficial in preventing a repetition of the attack the following night if given throughout the next day. In croupy children it should be given as soon as the symptoms of laryngitis are noticed; when this is done the attack is prevented. In addition, hot applications may be made to the throat during the attack and inhalations may be used. In uncomplicated false croup I have never found it necessary to use any other method of treatment. Emetics I never use; they certainly relax the activity of the centers, but they do more; one need only look through the literature of turpeth mineral, once a favorite remedy in the treatment of croup, or note the results following the use of tartar emetic to see how many children have been injured by their use. Aside from this the principal objection to their use is that they are unnecessary; if, as is the case in uncomplicated croup, the patient is in no danger, there is no need of taking the risk of adding further trouble to that already existing; if the child is in danger, an emetic is too crude and too uncertain a remedy to be used. When, as is the case occasionally, the center is affected by some improper condition of the stomach, lavage of the stomach or intestine is indicated. It is possible to teach parents to look upon the occurrence of these attacks in their children, if not with equanimity, at least with composure, giving them directions to send for the physician whenever the attack differs from preceding ones, or when it develops with spots in the throat; above all, to use the bromide early and never to be without it, in case they have croupy children. Potassium bromide can be kept indefinitely in the form of compressed tablets, 0.3 gm. (gr. v) each. To the carrying out of these instructions I am indebted for many uninterrupted nights with no untoward results to my patients.

In adults the bromides are also valuable, but as a rule I have found it

necessary to add chloral to them. In some subjects codeine gives relief, but in one of my patients morphine is required.

TUBERCULOUS LARYNGITIS

In the chapter on tuberculosis will be found its general treatment. By LOCAL TREATMENT the attempt may be made to destroy the tuberculous tissue; when this is impossible, relief for symptoms should be given. The fact must not be lost sight of that by the combination of proper general and local treatment improvement in laryngeal conditions goes *pari passu* with that of the general condition. With the modern method of general treatment I have seen results that twenty-five years ago would have seemed incredible. For destruction of the tubercles the local application of a forty- to sixty-per-cent aqueous solution of lactic acid seems to have found most favor. To this may be added menthol or carbolic acid. A ten-per-cent solution of the latter, applied alone, certainly gives great relief to pain. If this is not successful, the galvanocautery, the curette, or excision may be tried. In order to give relief for pain, cocaine, applied locally, especially before meals (five- to ten-per-cent solution), or by inhalation (one to five per cent), will give great relief; orthoform and anæsthesin have also been recommended. Topical applications of morphine, iodoform, anæsthesin (Ritsert) may be used in proper cases. Dysphagia may be relieved up to a certain time by the local use of one or the other local sedatives before mentioned, but in most cases they finally fail; it is well, therefore, to begin with the smallest dose that produces an effect, then to increase it slowly so that maximal doses are arrived at only after a long time.

In addition, all the indications can be furthered by inhalations of substances that tend to dissolve mucus and to ameliorate inflammation. Here the alkalies may be used, creosote or tar preparations, with or without the addition of adrenalin or chloretone.

The cough must be controlled; when the condition is hopeless, morphine should be given; otherwise codeine, hydrocyanic acid, or both combined.

SYPHILITIC LARYNGITIS

Here the constitutional treatment frequently suffices to control the local symptoms. For secondary processes corrosive sublimate may be used locally by inhalation (1:10,000), or insufflation of calomel. Tertiary conditions are sometimes relieved by potassium iodide used by inhalation.

Syphilitic ulcers are treated by silver nitrate or the local application of iodine (Iodi, 0.1 gm.; potassii iodidi, 1 gm.; glycerinum, 20 gm.). In all cases inhalations of mild antiseptics in alkaline media should be used, in order to prevent secondary infections and to remove mucus. When strictures are present they should be treated by v. Schrötter's method; tracheotomy, dilatation with hard-rubber tubes, the constitutional treatment being continued.

III. DISEASES OF THE BRONCHI

ACUTE BRONCHITIS

TREATMENT.—For the purpose of treatment the cases may be divided into two classes—bronchitis of the larger tubes and bronchitis of the smaller.

In the first class very little treatment is required; usually some household remedy is sufficient, some form of hot drink, a mustard footbath, or a hot bath followed by a copious sweat. Turkish baths may be taken, but always at home; when they are taken in public establishments erected for the purpose the danger of infection is too great, possibly also the danger of that indefinite process called "catching cold." My experience agrees with that of Osler, in that I have frequently seen very severe forms of bronchitis, in several instances pneumonia, follow this method of abortive treatment. Whenever the temperature of the patient reaches 100° F. he should be kept in bed; the physician should be inflexible in this direction. Children and old or debilitated people should be kept in the house, even with this mild form of bronchitis. For its treatment in other directions (and this holds good for all of the forms of bronchitis) the room should be well ventilated, the temperature equable, and in the dry stage moisture may be added to the air of the room. By medication we can only hasten the course of the disease, prevent its extension, and relieve symptoms. For these purposes we have a special group of drugs—the expectorants; they are supposed to act upon the secretion in the bronchial tubes; they increase and liquefy it or lessen it. In the first way ipecac, ammonium preparations, the iodides, the alkaline carbonates, tartar emetic, squills, and apomorphine are supposed to act; in the second, benzoic acid preparations, cubebs, senega, belladonna, turpentine. There may be added a third method of action, that of assisting expectoration by excitation of the nervous system; ether, camphor, musk, ammonium carbonate, alcohol are useful for this purpose. For the present the indications for the use of these various remedies must be, as above stated, the result of clinical experience alone; but even here contraindications are found. In a number of instances experimental research has shown that some of the drugs are absolutely without value—those, too, which are prized highly by clinicians; it has also shown others valuable out of proportion to the results of clinical experience, and, again, diametrically opposite conclusions have been arrived at for the same remedy by different experiments. From the clinical point of view much of the confusion as to the use of this group of drugs is due to their indiscriminate and promiscuous use, but especially to the fact that physicians deem it necessary to prescribe something for everything. The use of these drugs should be confined to those cases in which it is necessary to give them; under ordinary circumstances a tracheobronchitis of the larger tubes is a self-limited disease and runs its course favorably and without any intervention. In infants it should always be treated; in the aged or infirm this may also become necessary. My experience has taught me that the expectorants are very untrustworthy, but I should not want to be without them. In the first subdivision I use ipecac and ammonium chloride; in the second, senega, benzoic

acid preparations—especially the sodium benzoate—turpentine, the alkaline carbonates, and sometimes belladonna. The iodides I reserve for subacute or chronic cases; apomorphine I use only very exceptionally, when the others fail, my own experience not being so favorable as that of many who seem to be more impressed by experimental than by clinical results. Ipecac I give in the form of an infusion, although the fluid extract may also be used, which, however, is not so trustworthy. The infusion is made in the strength of 0.05 to 1 in 100 gm. (gr. ss. to gr. x in ℥ij), the first for infants, the latter for adults; intermediately the dose must be arranged for the age of the patients. For children some syrup is added and a teaspoonful is given every two hours. Even with these small doses some patients become nauseated, and then the dose must be reduced. Ammonium chloride may be given to best advantage in small doses frequently repeated; thus, to adults a teaspoonful of a one- to 1.5-per-cent solution every hour for twenty-four hours, then every two hours until the desired effect is produced; to children in proportion. A combination of the ipecac with ammonium chloride is very valuable—℞ Infus. rad. ipecac., 1 to 75 gm. (gr. x to ℥jss.); ammon. chlorid., 1.5 gm. (gr. xv); syrup., 25 gm. (℥ss.); or ℞ Extract. ipecac. fluid., 1.5 to 2 gm. (♏ xv to xx); ammon. chlorid., 1.5 gm. (gr. xv); syrup. tolu., 25 gm. (℥ss.); aquæ, 75 gm. (℥jss.); M. D. S.: one teaspoonful every two hours—for adults. Senega is given in the form of an infusion or as the fluid extract of the U. S. P., a very valuable preparation; the dose for adults is 0.5 gm. (gr. vijss.)—for children, 0.03 gm. (gr. ss.)—every two hours; to this ammonium may also be added; here the Liq. ammonii anisatus may be used to advantage, as it also increases the cough. Terpene and terebene have not fulfilled the expectations that were expressed on their first introduction. The stimulants should be used only when a special indication exists on the part of the heart or in temporary exhaustion.

In the first stage of bronchitis the expectorants that increase expectoration should be used; in the second stage those that diminish it.

Besides this group we have means of fluidifying or drying the secretion in the form of inhalations; there can be no doubt that medicaments can be carried into the bronchial tree by this method. For fluidifying the secretion, aqueous vapor or, better, some alkali, sodium bicarbonate or Ems water may be used. In order to reduce the secretion, turpentine, eucalyptus, tar—especially the first—are very valuable. The inhalations should be given frequently, every two hours, and, when properly used, they neither fatigue nor irritate the patient.

Emetics should be used only when there is danger of suffocation or of extension of the process as the result of an excessive collection of bronchial secretion. Here ipecac in emetic doses or a hypodermic injection of apomorphine may be administered.

In a certain number of cases the cough gives rise to symptoms, such as sleeplessness, exhaustion, or pain, which demand special relief. In robust adults codeine, when necessary morphine, may be given without hesitation. In those cases in which there is reduced local or general resistance in infants and in the aged great care must be observed in their use. In children, at least, all other measures should be exhausted before opium is used, as in them as soon as a bronchitis develops there exists the possibility of exten-

sion and the production of lobular pneumonia. As long as the process is confined to the trachea, there can be no possible objection to giving a sedative.

In the treatment of bronchitis of the medium fine and the finer tubes, besides the measures already described, other means should be used. When the fever is very high, producing nervous symptoms, antipyrine or its derivatives may be used.

Hydrotherapy, as described before in the chapter on pneumonia, is very valuable. By hydrotherapy a distinct effect can be produced upon the local conditions and also upon the symptoms. Thus the douching with cold water sometimes relieves atelectasis. The Priessnitz application made around the whole chest gives great relief to the pain. In the adult cold applications or cold packs applied to the anterior surface of the chest or around the whole thorax diminish pain, temperature, cough, and dyspnœa. Counterirritation, by means of the Priessnitz or mustard bath, as recommended by Lenhartz, especially for children, and particularly when there is great dyspnœa or cyanosis, is valuable. Iodine or blisters are unnecessary. When the dyspnœa or cyanosis becomes great we are no longer dealing with a bronchitis, but, as a rule, with a lobular pneumonia.

CHRONIC BRONCHITIS

Prophylaxis.—Whenever it is found that in a given patient repeated attacks of acute bronchitis occur, not to be explained as ordinary infections, the possibility of the development or the existence of a chronic bronchitis must be considered. The cause of these recurrent attacks, as in all cases of chronic bronchitis, must be sought for and, when found, removed when possible. Here we must take into consideration deficient nose breathing, chronic diseases of the lungs, extensive pleural adhesions, tuberculosis, chronic pneumonia; disease of the heart; nephritis; obesity, rickets and scrofula; chronic intoxications, gout, intestinal autointoxications, alcohol, and the various forms of mechanical irritation as we find them in the trades or in tobacco users. In a certain number of cases no cause can be found, or, when found, it cannot be removed. The necessity of treating the acute attacks by prophylactic measures is apparent, for in chronic bronchitis, where permanent damage has already been done to the bronchial tissues, an acute attack increases the organic changes. In practice it is difficult to make the patient understand that, as the result of so simple a thing as a common cold, he must take care of himself. In these patients rest at home should always be ordered and insisted upon until the attack has run its course. Children should not be allowed to go to school until they have recovered from the acute attack. The occupation of the individual should be changed when it is such as to favor the development of chronic bronchitis. When possible, in recurring bronchitis the patient should remove, if necessary, to a suitable climate—Florida, southern California, Georgia, Egypt, Algiers, the Riviera. In a number of patients the general treatment prevents recurrent attacks.

Treatment.—*General.*—The diet should be adapted to the individual and the remote causes. In many cases the winter cough seems to be due to lack of general resistance. Here overfeeding sometimes is invaluable. In children with enlarged glands creosote is indicated; anæmic conditions should

be treated. Renal insufficiency, either as the result of cardiac trouble or without it, must be attended to. In the first class of cases the treatment of chronic myocardial insufficiency (q. v.) is of great importance; in chronic bronchitis the possibility of changes in the right heart must always be taken into consideration; for this reason we see digitalis doing so much good in chronic bronchitis. The bronchitis due to incompetence of the left heart is more easily recognized. Renal insufficiency without cardiac trouble is treated by the measures recommended in nephritis (q. v.). In these cases the "calomel cure" of the German authors is also very valuable, 0.2 to 0.3 gm. (gr. iij to v) a day for three days. The condition of the bowels demands attention; they should be kept regular by either dietetic or medicinal means.

(*a*) *Medicinal.*—Cod-liver oil is of value when it is indicated; as elsewhere, whoever uses it indiscriminately will be disappointed in having no effects follow its use. The iodides are indicated in all cases in which there is little secretion; they are especially valuable in the dry catarrh of Laennec.

(*b*) *Respiratory Gymnastics.*—Thirty years ago we were all more or less enthusiastic over the treatment of this affection by pneumatic apparatuses, which were supposed to act by the inspiration or expiration of compressed or rarefied air. These apparatuses were formidable in appearance and their presence in the office of a physician produced a decided moral effect upon the patients; for moral effect they now have been supplanted by the large static machines. Whether the good results which were sometimes obtained were due to psychic or other effects I am not prepared to say; at all events, the pneumatic cabinet is still used nowadays in these cases.

In giving directions for active respiratory gymnastics it is necessary to tell the patient of the importance of nose breathing; it is permitted to breathe with open mouth during expiration, never during inspiration. The patient should be instructed to take a number of full inspirations and expirations twice daily, beginning with a few and gradually increasing the number. In addition, the patient may take dumbbell exercises: (1) Full inspiration with elevation of the arms to the horizontal; (2) the same, with expiration and flexure of the lower extremities; (3) a combination of the two, or more extensive movements to strengthen the respiratory muscles. When it is possible, all these exercises should be taken in the open air; otherwise in a room with open windows. For cases in which there is a great collection of mucus or in the dry catarrh with dyspnœa, Gerhardt's method is valuable; it consists in assisting expiration by pressure upon the thorax.

(*c*) *Posture.*—One of the most valuable adjuncts to the treatment of chronic bronchitis consists in having the patient sleep with his head low and the lower extremities, pelvis and thorax, elevated. This is accomplished by elevating the foot of the bed. As a result of this simple method the secretion does not accumulate in the bronchi during sleep; irritation, with all that follows, of the bronchial mucous membrane is prevented; the patient is not waked up during the night, and the morning expectoration is gradually diminished. I know of nothing that gives more relief than this method of treatment in cases in which there is much secretion.

(*d*) *Hydrotherapy.*—Besides the methods already described (v. Prophylaxis) the following may be used: local douches (50° to 80° F., according to the patient's reaction), the half bath; sitting in a bathtub and having

the water splashed or poured over the back and chest; in order to be more effective, the temperature of the water used for splashing, or better, douching, should be of lower temperature than the water of the bathtub (80° to 85° F.). This should be done daily, but the sittings need not exceed three to five minutes. I use lower temperatures still, because the majority of our patients are accustomed to lower temperatures in their daily cold bath.

(*e*) *Mineral Waters.*—For our purpose various kinds of water are recommended; their special indications, although not precisely defined, are to be found principally in the causal indication, but also in their action upon the mucous membrane; the following alkaline-saline and saline baths are indicated: Ems, Soden, Kissingen, Homburg, Carlsbad, or Marienbad, in Germany; the sulphur waters of Harrogate, in England; Aix-les-Bains, Eaux Bonnes, Cauterets, Baréges, and others, in France.

Special Treatment.—(*a*) *Medicinal.*—We are guided here by the character of the cough and the special symptoms. When the cough is dry, ipecac, ammonia preparations, the iodides, apomorphine, even pilocarpine, may be tried. When there is increased secretion, turpentine, benzoic acid preparations, creosote or guaiacol, copaiba, tar preparations, astringents, such as tannin or lead acetate, are used. Most patients, as the result of long experience, have found a cough mixture which, containing one or more of these substances, gives them relief. The cough mixtures containing opiates should be avoided. In some instances patients have some form of tea which gives them relief; the *species pectorales*, the German *Brustthee*, have been introduced into this country and are taken by many of these patients.

(*b*) *Local Treatment.*—Inhalations are used. I have never used injections into the trachea and bronchial tubes, as recommended by Reichert, v. Schrötter, Ludet-Barbon, and others, and I doubt whether their use is justified. For permanent results they can be of little value, if we may judge by results obtained by purely local measures in chronic catarrhs in other parts of the body; for temporary effect they are unnecessary, as sufficient may be done by the simpler methods of inhalation. In order that therapy by inhalation should be of value, the apparatus must be so constructed that the remedy used shall be finely subdivided, nebulized; only soluble substances should be used, best those that are more or less volatile. In the dry form, simple steam inhalations, sodium bicarbonate, and Ems water are most valuable. In the moist form, turpentine comes first; eucalyptus, menthol, creosote, tannic acid preparations, and tar preparations are also valuable. Oleum picis liquidi or iodine is very useful in those cases in which there is thickening of the bronchial tubes.

In *fetid bronchitis* carbolic acid does good service, equal parts of carbolic acid and alcohol inhaled very often by being poured into an ether inhaler, or into a mask, according to the method of Curschmann. Thymol and myrtol are also recommended. In a number of cases when these have failed Platt's chlorides have destroyed the fetor; this remedy is used either by dipping strips of muslin into it, which are hung up around the bed of the patient, or it may be applied by being poured upon the bedclothing. It has the further advantage of destroying the odor of the room.

All those methods that influence expectoration have also a decided effect upon the cough. But in a number of cases this is not sufficient; then hydro-

cyanic acid, lobelia, belladonna, or codeine should be given for the same indication. When there is spasmodic cough, chloral hydrate or morphine (codeine, heroine), with the usual precautions as to drug habit, must be used.

In all forms of chronic bronchitis the right heart may require attention (v. Chronic Myocardial Insufficiency).

BRONCHIECTASIS

PROPHYLAXIS.—Bronchiectasis in by far the greatest number of cases is a secondary condition, therefore preventive measures are important. That congenital bronchiectasis occurs is beyond doubt; that bronchiectasis may develop in children especially, usually about the fifth or sixth year of life, as the result of some congenital defect in the walls of the bronchial tubes, is possible; in the latter instance, especially, prophylaxis is of importance. Prophylaxis includes the proper treatment of those diseases that are followed by bronchiectasis; in children pertussis and lobular pneumonia, as well as those conditions found principally in the adult, chronic bronchitis, pleurisy, and chronic pneumonias. The prevention of pleural adhesions is very important, and the rule I have followed, always to aspirate a pleuritic effusion, seems best fitted to cover this indication.

TREATMENT.—We here attempt to fulfill the following indications; to prevent increase of the local condition as the result of accumulation of secretions or of infections of various kinds, and therefore also complications, and to give relief for symptoms.

Medicinal.—The attempt should be made to prevent excessive secretion; by internal medication this may be done by the use of creosote, thymol, eucalyptol, myrtol, myrtle oil, camphor—0.3 gm. (℥ v), in capsules three or four times daily; inhalations may be used, as described hereafter. Accumulation of secretion may be prevented by manual expression of the thorax; in several cases I have succeeded by placing the patient in the posture described in the previous chapter.

Limitation and alteration of the secretion (as to infection and putridity) have been attempted in various ways. The means used for putrid bronchitis have been employed here, and, in addition, a method first introduced by Dr. Arnold Chapin, the inhalation of creosote vapor in a confined space. Creosote is vaporized by being poured into a metallic evaporating dish in which there is some sand and then heated. The patient must overcome the "difficulties" of the treatment by "loosely plugging the nostrils with cotton wool, by wearing over the eyes watchglasses framed in bandage or sticking plaster, and by covering the garments and the head with oiled silk or mackintosh" (Ewart). According to Ewart, this method produces enough coughing to squeeze out "every remnant of the noxious secretion" and to purify the mucous membrane.

Sir T. Grainger Stewart and a number of other authors speak very highly of the results obtained by intratracheal injections. A dram of the following antiseptic is injected twice daily: Menthol, 10 parts; guaiacol, 2 parts; olive oil, 88 parts. This is done by the use of an especially constructed syringe; by all accounts it is not dangerous or difficult. I have never em-

ployed direct injections into bronchiectatic cavities, and cannot speak from my own experience of their efficacy.

It is highly important that general treatment should go hand in hand with local measures, although it is surprising how little the general condition is affected in some instances. Here the proper amount of the right kind of food must be looked to. When it is possible a change to a dry, warm climate should be recommended; climatic treatment may produce amelioration or abeyance of symptoms depending upon the local condition. The febrile attacks which occur in some cases must be met by the specific indications for sapræmia or septic pyæmia.

I have had no experience with surgical methods. Two measures have been recommended—pneumotomy and resection of the ribs (Quincke). The indications for the first are those of abscess of the lungs. The second is based upon the principle that when there are pleural adhesions a rigid thorax prevents the cavity from collapsing.

BRONCHIAL ASTHMA

The PROPHYLAXIS is included in the TREATMENT. The latter resolves itself into that during the attack and that between the attacks, including the causal treatment. The attack itself is the result of either reflex or direct irritation of a cerebral center, probably in the medulla oblongata. This is irritated by afferent impulses from the psychical centers, from the nerves of special sense, those of the nose, the ear, the tracheal and bronchial, the gastrointestinal, and the genitourinary tract. It is also more than likely that deficient inhibition plays a very important rôle. This hypothetical center is directly irritated by certain intoxications, such as gout and intestinal autointoxication. For our purpose it is immaterial whether the result of these irritations is a vasomotor paralysis or spasm of the bronchial muscularis, both of which, in all probability, are frequently found at the same time.

In *treating the attack* no attention can be given to causal therapy, because the paramount indication is to give relief. When the patient has been studied by the physician during the intervals special remedies for the individual may have suggested themselves, but it has been my experience that upon the whole the practical outcome is not very great, so that here, at least, purely empirical methods are followed, and frequently the patient finds a remedy for himself which acts better than those prescribed by the physician. In this connection the neurotic character of the disease manifests itself in a way as to be absolutely conclusive. I have more than once seen patients relieved during the attacks by some proprietary remedy whose composition was known to me, but when I gave it in the form of an impromptu prescription no result followed.

The most reliable remedies for the attack are morphine and chloral hydrate—the former given hypodermically, the latter by the mouth. With the chloral I am in the habit of combining potassium bromide in equal parts. In chronic cases both these remedies frequently fail to give relief. Next in importance is the use of potassium iodide, again combined with potassium bromide, equal parts; here I give a teaspoonful of a ten-per-cent solution, well diluted, two or three times at half hourly intervals; then every four

hours. In a large number of cases in which the irritation comes from the bronchial mucous membrane the effect is almost magical. But these three remedies fail in many cases; then others must be tried. Our hopes were raised by Riegel's publication on the efficacy of atropine in abating attacks, the beneficial effects being ascribed by him to stimulation of vagus inhibition. I have failed signally when I have followed this indication, but I have succeeded in a number of cases where numerous successive attacks were due to accumulations of large quantities of secretion in the bronchial tubes. The same can be said for hyoscine hydrobromate as for atropine, which, however, is more valuable in certain neurotics. I have rarely found it necessary to use inhalations of chloroform or amyl nitrite. Germain Sée's inhalations of pyridine never gave me any results. Antipyrine, 0.8 gm. (gr. xij), with caffeine sodiosalicylate, 0.2 gm. (gr. iij), given immediately upon the outset of the attack, occasionally gives relief. I have never used emetics. Solomon Solis-Cohen has recommended adrenal substance in the vasomotor form.

Most asthmatics get relief by the inhalation of some substance, either in the form of cigarettes or as fumes from nitre, the *Solanaceæ*, especially stramonium and belladonna; or of lobelia, potassium iodide, and many other things usually combined in one way or another. It is impossible and unnecessary to mention all the various substances that have been used in this connection. They are usually combined and sold in the form of proprietary medicines with all the accessories necessary for psychical effects. Many of them are very valuable; frequently it occurs that the patient has to change from one to another, but one of my patients has used one of these proprietary articles for thirty years and has always obtained relief. All arguments fail to convince patients that the use of remedies whose constituents are unknown may do harm; they cannot be blamed for this until we can offer something that is more efficient. As a matter of fact the composition of most of these proprietary products is known; but when they are prescribed by the physician they frequently do not act. Under all circumstances the physician should try known quantities, those which frequently give relief; then if the patient seeks the unknown the responsibility lies with the patient.

The *treatment between the attacks* must be directed to the removal of the causes. It is well recognized that in a limited number of cases asthmatic attacks can be cured by the removal of obstructive or irritative conditions in the nose or ears. This should always be done, but the physician should be careful not to promise too much, otherwise both he and his patient may be disappointed in the outcome. The same may be said for the removal of causes producing abnormal reflexes from the genitourinary tract. More can be done when the attacks are due to disturbances in the gastrointestinal tract. Most excellent results are obtained in the dyspeptic form, first described by Henoch, in 1876. Here the cure of the dyspepsia is followed not only by temporary relief, but frequently by cure. In chronic asthma the treatment of chronic constipation, chronic autointestinal intoxication, or of gout is of the greatest value; in the latter two, as long as the proper treatment is persisted in, attacks of asthma do not occur. It will be seen that the causal treatment is far from being completely satisfactory; we are therefore again called upon to make use of methods which have proved themselves

of value as the result of long experience; some of these result in cure, others simply in the reduction of frequency and intensity of the attacks.

In such cases the use of iodine preparations is of most value. I begin with small doses, gradually increased; when symptoms of iodism are produced the remedy is withdrawn, to be begun again after an intermission of two weeks. Next to these comes Trousseau's method of giving belladonna or atropine, revived by Von Noorden; small doses are begun with and these are gradually increased until physiological effects are produced. The effects are not so well marked as in the use of potassium iodide, but in several chronic cases the number of attacks has, in my experience, been reduced.

General indications are found during this time in the special condition of the patient. As in all neurotic conditions, anæmia must be treated—in one of the most effective proprietary remedies, consisting of seven different ingredients, iron is one and a laxative another. The administration of arsenic is frequently valuable; here, again, it fulfills the same indications that are found in neurotics. Cod-liver oil in some cases acts as a specific; in children, for instance, that are badly nourished and have enlarged glands; sometimes in badly nourished adults. When phthisis and asthma are combined the treatment of the bronchial catarrh and that of tuberculosis is most important.

The dietetic and hygienic treatment of neurotics is of special consequence. Excellent results have been obtained by so-called psychopathic treatment. The general nutrition of the patient should be provided for by proper food; he should have sufficient rest, should avoid all fatigue, mental and bodily, and all excesses, all excitement or worry. It is no wonder, with these indications, that in many instances good results are obtained in sanatoria.

In all cases *hydrotherapy* and *respiratory gymnastics* should be tried (v. Chronic Bronchitis); how much good they do in this disease by preventing bronchitis or by their psychical effect cannot be determined; that they are of benefit in certain cases cannot be denied. For the value of pneumatotherapy the reader is referred to the chapter on chronic bronchitis.

Climatic treatment is more valuable than any other method. As a rule, every asthmatic can find a climate in which he can live without having attacks. The exceptions to this rule are cases far advanced with emphysema or bronchiectasis, but even in these cases relief is afforded. For the individual it is impossible to select the proper climate; all those who have had large experience can testify to the truth of Trousseau's observations, that in some cases the slightest change will cause the attacks to disappear completely. More than once I have seen a removal from city to suburbs, or *vice versa*, followed by this result. In one of my patients a severe form of asthma was the result of his removal from one suburb to another; this did not cease until he moved back to the original house in which he had lived before removal. It is best to tell the patient that no one can guarantee relief in any one place; that he must try one place after another until he has found the proper place. Some lose their asthma in Southern California, others in the hills or upon the mountains, others at the seashore or the great lakes.

In *children* the treatment of asthma is followed by excellent curative results, provided it is begun early. In them I have found the removal of nasal obstruction and irritation of much greater value than in adults. This

removal, combined with climatic treatment, gives the best results; but the other methods should not be neglected.

Hay Fever.—The treatment of hay fever differs very much from that of bronchial asthma, being the same only as to the remedies used for the attacks. I have seen cases very much improved, if not practically cured, by treatment of the nose; in several the treatment of a slight rhinitis hypertrophica seemed sufficient. Local applications to the nose of adrenalin and cocaine give great relief; but the latter should never be used in this disease, as its daily use for six weeks or two months, the natural duration of the disease, frequently results in cocainism. I have never found any benefit from the internal administration of any drug—quinine, arsenic, nux vomica, phosphorus, or sedatives. The use of the Dunbar serum, made by immunizing animals with the pollens of *Graminaceæ*, must be tested for a longer time before it can be indorsed; the results heretofore published are of such a nature as not to be conclusive.

There are many evidences of the nasal origin of this disease, and if the irritation of the nose can be prevented the disease may be cured, provided the serum also prevents irritation of the center. The use of a serum, for all cases, then, can promise good results only if the irritant is a toxine only, which is not likely; and for Dunbar's serum this is more unlikely still, because it must be only one toxine. The best prophylaxis and treatment in all cases of hay fever is the removal to a proper climate. While for the individual recommendations are difficult, we have for this country many places that do good in these cases—e. g., Michigan, especially Petoskey, and the White Mountains. When patients do not improve in one of these regions, they should try the other. Sometimes the seashore gives relief when the others fail; several of my patients get relief by a voyage across the ocean and back on slow steamers. It is important that the patient leave his home before the outset of the disease; this is fortunately possible, for every patient learns the date on which his symptoms begin to appear.

For the treatment of complications and sequelæ of asthma and hay fever the reader is referred to the appropriate chapters.

FIBRINOUS BRONCHITIS

The Acute Form.—Treatment.—This is an exceedingly dangerous disease, the ætiology of which is by no means cleared up; the mortality is about fifty per cent, but fortunately this form is very rare. Occurring, as it does, so frequently in connection with infectious diseases, one cannot but think that it is of bacterial origin. I have seen only two cases, both fatal, one in typhoid fever, the other in septicopyæmia.

The *general treatment* should be applied to the cause, when such can be found, and to the symptoms. As a rule, the general condition of the patient is not favorable; stimulants should be freely given; these are especially necessary during and after the paroxysmal attacks, which weaken the patient very much. Potassium iodide has been recommended, apparently with little benefit. Inhalations of various remedies have been recommended—lime water, lactic acid, papayotin—in order to act as solvents upon the membrane. In my cases they gave relief, but in no way seemed to prevent the reappearance

of the membrane. All local measures that were tried for this purpose were without effect. In these cases it is necessary, also, to treat the bronchitis.

The Chronic Form.—Here the local therapy referred to above may be tried. As this form usually occurs in patients whose general condition is good, an emetic may be used for the purpose of destroying the membrane and facilitating its removal; here apomorphine, given hypodermically, 0.005 to 0.01 gm. (gr. $\frac{1}{12}$ to gr. $\frac{1}{6}$), is a perfect remedy. The administration of an emetic requires judgment; it should never be used in the acute form, never in the chronic form when harm may be done to the heart or blood vessels. Tickling the fauces may be substituted in these cases—always provided the act of vomiting is not likely to be followed by any damage. The symptoms during the paroxysm are so violent that one is naturally inclined to use codeine or morphine. This may become necessary, but the condition in the bronchial tubes is not improved by their use; on the contrary, the detachment and expectoration of the membrane is postponed.

In the intervals the causal treatment or, better, the treatment of the disease upon which this form of fibrinous bronchitis is implanted is very important; such is the treatment of chronic bronchitis, emphysema, tuberculosis, chronic heart troubles. In some instances the existence of gouty symptoms makes this treatment easy.

BRONCHADENITIS

This disease, commonly overlooked, especially in children, should be treated not only on account of its distressing symptoms, but also on account of the dangerous sequelæ that may follow it.

Prophylaxis.—Treatment of bronchial catarrhs and the prevention of tuberculosis must be taken into consideration. The disease is usually easily controlled in its early stages by proper nutrition and hygiene, by the administration of cod-liver oil, the iodides, especially the iodide of iron, or by creosote. The amount of improvement can be gauged by the cessation of symptoms as well as by examination of the lymph nodes in the neck. In a number of cases these glands have been reduced by treatment with the X rays.

IV. DISEASES OF THE LUNGS

CIRCULATORY DISTURBANCES IN THE LUNGS

Active Congestion.—I look upon this condition as purely symptomatic, and therefore to be treated as such. The principal indication in these cases is to change the circulation in the lungs in such a way that the overfilling of the blood vessels may be relieved. For this purpose (*a*) *external measures* may be used which act as so-called derivatives—hot applications to the thorax, with or without the addition of turpentine or mustard; dry cups are especially valuable, as many as can be put on the thorax. Blisters should be used only when the case is desperate and all other means have failed, for in the event of pneumonia developing, which is usually the case, the patient's skin is left in such a condition as to render further local therapy almost

impossible, and the discomfort produced by this condition should also be taken into consideration. Hydrotherapy here is very valuable; it is best used in the form of a hot bath (110° F.), in which the patient is kept for ten minutes. The hyperæmia may also be affected by diaphoresis; therefore the warm pack may be used, or a hot bath followed by a pack. As these measures are not very comfortable for the patient, internal remedies are frequently used to accomplish the same result.

The question of phlebotomy is the same as in the treatment of pneumonia; in healthy, strong, full-blooded individuals it accomplishes much good. When phlebotomy is not permissible wet cups may be used; these combine the effects of peripheral stimulation with those of blood letting. Inhalations of oxygen may be required even in this state.

(*b*) *Internal Measures.*—No remedy acts so well, in my experience, as aconite; it is to be given in small doses (one drop of the tincture of the root) every fifteen minutes for two or three hours, the condition of the pulse guiding us as to the length of time the remedy should be used. In active congestion digitalis does not find an indication, as it would manifestly increase the flow of blood to the lungs. When there is danger of inflammatory œdema of the lungs or of heart weakness, cardiac stimulants, especially caffeine, camphor, or musk, should be used. Adrenalin, when the heart weakness is due to splanchnic paralysis, is invaluable. Occasionally small doses of morphine or codeine may be required for the cough. Emetics, especially tartar emetic, are recommended, principally to reduce blood pressure, and the latter also for its action upon the bowels. It is a desperate procedure in this condition, and should be used only when everything else fails; it is contraindicated in all those conditions where emetics should not be used, but here especially when the heart is weak. The use of cathartics should not be recommended as a routine measure, on account of danger of infection of the gastrointestinal tract. A large dose of calomel, followed by a saline cathartic, is invaluable at times, as was thoroughly understood by our medical ancestors. Medical diaphoretics and diuretics are of little value in severe cases; jaborandi or pilocarpine should be used very cautiously, on account of their depressing effects, and should always be given with alcohol. Dover's powder is also used in this connection. Mild cases require very little intervention, as neither the symptoms nor the course are very alarming. In some cases of pneumonia every extension of the pneumonic process produces the symptoms of acute congestion, which at times require especial attention.

Passive Congestion.—That form produced by heart diseases should be treated according to the directions given in the chapter on chronic myocardial insufficiency. Hypostatic congestion is prevented and treated by seeing that the lungs may expand normally, especially the posterior portions. As the disease occurs only in enfeebled persons, principally during the course of infectious diseases, the physician should insist that the position of the patient in bed shall be regularly changed, so that the time in the twenty-four hours shall be about equally divided between lying on the sides and on the back. All hindrances to respiration should be removed—tympanites, anything compressing the abdomen. The condition of the heart should be carefully observed; when it becomes weak in infectious diseases, digitalis, strophanthus,

caffeine, or alcohol should be given. When inflammatory conditions exist they should be treated here as in all inflammations of the lungs.

Œdema.—For the causal treatment the reader is referred to the chapters on diseases of the heart, the blood vessels, anæmia, and Bright's disease. In the attack itself some of the remedies applied to the cause must be used—adrenalin, digitalis, caffeine, the cardiac stimulants, as required in the individual case. In many cases œdema of the lungs is a terminal condition (the cachexias, brain troubles, Bright's disease, cardiac and pulmonary disease, arteriosclerosis, some of the anæmias) and nothing can be done; in all such cases the œdema is due to a combination of causes, one of which is usually a change in blood structure, which cannot be altered. In a large number of cases treatment is life-saving. For years I have used dry cups with excellent results. Lenhartz speaks in the same way of the "mustard pack," which is made, according to him, by taking from one to three pounds of mustard with which a pap is made by the addition of a sufficient quantity of lukewarm water. This is spread upon a sheet, laid upon a blanket, and the patient is then wrapped up in both, so that the extremities, trunk, and neck are thoroughly covered, the eyes being protected from the fumes by tucking the blanket in at the chin. The patient remains in the pack from twenty to thirty minutes and is then washed off with lukewarm water. In chronic nephritis the treatment of uræmia (q. v.) is very important. The bowels should be thoroughly cleaned out; in the beginning by an enema containing common salt, sweet oil, or turpentine and water. If there is time hydragogue cathartics may be administered, or saline cathartics or calomel, according to the indication in each individual case.

Various measures have been recommended for withdrawing blood; venesection should be used, especially in the inflammatory œdema; possibly also in those cases in which the general condition of the patient warrants it, as it certainly relieves the overfilling of the right heart and improves the pulmonary circulation. When applied at the beginning of an attack it is very beneficial. Aspiration of the right auricle should never be done; there is always the suspicion that the patient died of it and not of the disease.

For the profuse secretion into the bronchial tubes many remedies have been recommended; emetics are usually contraindicated; inhalations of astringents or turpentine are of no value; the same can be said of the expectorants that might be taken into consideration for relief of this symptom. Traube obtained good results from the internal administration of lead acetate, given alone or combined with digitalis leaves, 0.05 gm. (gr. $\frac{5}{6}$) of each every hour. I have never seen any effect produced by the lead acetate. Morphine should never be given. Inhalations of oxygen are useless.

Hemorrhage.—Little need be added to that which will be found in the chapter on tuberculosis. The bleeding due to erosion of small vessels ceases, whatever the cause may be, under the methods there described, and frequently without treatment. When bleeding comes from large vessels normal thrombotic processes may cause it to cease. In such cases we should try to facilitate these processes by absolute rest and by withholding stimulants, as the lowering of blood pressure during syncope, in consequence of bleeding, is in itself the best method to give the blood vessels a chance to close up.

After the hemorrhage has ceased, the patient should be kept quiet for a long time; morphine should be given to counteract any pronounced tendency to coughing. Inhalation with antiseptics may be used, if it can be done quietly, to prevent infection of the blood which has been poured into the bronchial tubes.

BRONCHO-PNEUMONIA

(Lobular Pneumonia, Catarrhal Pneumonia, Capillary Bronchitis)

PROPHYLAXIS.—Much can be done here in the proper treatment of those diseases which lead to broncho-pneumonia. In children every form of tracheo-bronchitis, when the medium-sized tubes are affected, should be carefully watched. In infants the physician should give strict directions as to the care of the patient in every form of bronchitis. The treatment recommended in the chapter on bronchitis should always be instituted, and specific directions should be given to keep the infant in an equable temperature as well as in pure air. For these reasons infants with bronchitis should be kept in the house; when they are taken out of doors, windy and dusty days should not be chosen. Under all circumstances a veil should be worn, to prevent inhalation of dust. When atelectasis has developed, change in posture should first be tried in order to give the lung which is affected sufficient chance to expand. If this is not sufficient, increased inspiration and expiration may be obtained by suddenly splashing a small quantity of cold water upon the affected side or by means of the cold douche, which should be applied only for a very short time—i. e., until the reaction upon respiration has set in. The use of this method has been of great service to me. I have always hesitated to use emetics in this condition, though recommended by many excellent authors, for the reason that one is never quite able to count the cost in the use of these remedies. I am of the opinion that the proper treatment of whooping cough, measles, and diphtheria is of enormous value in the prevention of broncho-pneumonia. In influenza quinine has seemed to me to act prophylactically.

In order to prevent aspiration or deglutition pneumonia, prophylactic measures are very valuable. In all conditions where the protective functions of the glottis are deficient on account of faulty innervation great care must be taken in feeding the patients. This condition is found in all forms of fever in which there is coma, in uræmia, in apoplexy. Aside from the care in feeding in all cases in which the chink of the glottis is not sufficiently protected (disease of the epiglottis), or is insufficiently closed on account of disease or paralysis, extraordinary cleanliness of the mouth is indicated. For ether pneumonias this indication is especially important; these pneumonias are more common than is usually accepted, and thorough antisepsis of the mouth might act preventively. *Hoelschers* seems to have proved, experimentally, that when the saliva and mucus are allowed to flow off freely during ordinary anæsthesia no pneumonia is produced; this also should be taken into consideration.

The pneumonias resulting from occupation should be prevented here as elsewhere. The proper treatment of hemoptysis and tuberculosis may also contribute to the prevention of this form of disease.

Treatment.—In that form in which infection takes place from a remote place, such as the tonsils, the pharynx, or the nose, by way of the lymphatic or blood vessels, the treatment is the same as that described in the chapter on Lobar Pneumonia. In all other forms, which are by far the most common, much depends upon the time when treatment is begun. In order to be assured of being advised early enough, I give to my patients the following rules when to call the physician in case an infant has a cough: When the baby has a croupy cough, when there is cough with fever, and when there is cough with continuous expansion and contraction of the nostrils. For infants and children the following can be taken into consideration as to treatment.

Hygiene.—That room of the house should be chosen for the patient which contains the greatest number of windows. An open fireplace is a great desideratum, as it increases the chance of good ventilation. It was in broncho-pneumonia that I first tried the fresh-air treatment recommended for lobar pneumonia (q. v.). The results here are even more striking than in the last-named disease; the frequency of respiration is more reduced, the cyanosis shows more improvement, and the whole condition of the patient is more favorably affected. Under no circumstances should the air of the room be filled with the vapor of water, as this precludes the possibility of having the windows open, and that which is gained by the effects upon the bronchitis is more than counterbalanced by the loss accruing from the absence of fresh air. When the beneficial effects of the fresh-air treatment are once seen in a case of broncho-pneumonia, the temptation to supplant it by water-saturated air will be very slight. The position of the child in bed should be changed from time to time, and it may be of value to take the child out of bed and carry it about when there is no contraindication. By these means the development of atelectasis may be prevented.

Diet.—In infants at the breast the question of feeding may become a difficult one, as the dyspnœa precludes the possibility of satisfactory nursing. The breasts should be pumped, and the milk may then be given by spoonfuls; but even this, when it succeeds, is by no means attended by the best results. When infants are artificially fed, feeding with a spoon is more successful. In older children, milk should be the basis of all feeding; to this there may be added any form of liquid food: beef juice, eggs beaten in milk, beef tea or broths, cocoa; also carbohydrates in paps, such as farina, barley, rice, sago. When children do not take milk, some of the artificial foods, such as Nestlé's food or condensed milk, may be tried. The albuminous material may have to be derived from eggs or from predigested foods (the various peptones, albumoses).

Stimulants.—There are very few cases of broncho-pneumonia in which alcohol cannot be used with benefit. Not only is alcohol a food sparer, but it is especially valuable in this disease on account of its effects as a stimulant upon the heart. In a routine way it may be given as whisky or brandy, of which from ten to fifteen drops, well diluted in water, may be given to a child under one year of age every two hours. In cases in which stronger stimulants are required, camphor, caffeine, the various ammonia preparations may be tried (v. Complications).

Medication.—Expectorants should be used; they are given in the same way and for the same indications as in acute bronchitis (q. v.). *Emetics*

are recommended when there is great accumulation of mucus in the bronchial tubes which seriously interferes with breathing. For this purpose tartar emetic and ipecac are more frequently prescribed; ipecac in the form of the syrup is safer than tartar emetic. Tartar emetic is given in doses of from 0.003 to 0.005 gm. (gr. $\frac{1}{24}$–$\frac{1}{12}$) every ten minutes until vomiting occurs, the whole dose not to exceed 0.03 to 0.05 gm. (gr. $\frac{1}{2}$–$\frac{5}{6}$), according to the age, but never before the termination of the first year. Great care must be taken in the use of this class of drugs; they should never be administered to debilitated children, and should only be given at all as a last resort. *Narcotics* are not necessary in the routine method of treatment. Opium, morphine, or codeine is prescribed, the last being the best, for the purpose of diminishing the cough. Aside from the difficulty in choosing between the harm done by the cough and that which may follow from obtunding the cough reflex, it is very rare that they are needed in children, as the frequency of cough can be reduced by other means. *Strychnine* may be valuable for the same purposes as described in the chapter on lobar pneumonia. According to the age of the child, it may be given hypodermically in one half the dose which results from the application of the formula found in connection with thyroid feeding (v. Myxœdema). *Antipyretics* have been recommended here. According to my experience, they are both unnecessary and harmful. This has been taught us especially in connection with the broncho-pneumonias of influenza.

Cathartics should be administered only when necessary. It is not necessary to give such derivatives as may be followed by unpleasant results as infection of the bowels. When it is necessary to empty the bowels rectal means may be used; at best small doses of calomel are indicated. *Quinine* has a peculiarly well-marked effect upon the course of some pneumonias, especially those found in influenza, either the influenza vera or influenza nostras. I have used it in a routine way for the last ten years in the same doses in which it is recommended in whooping cough (q. v.). *Creosote* finds its indication as in lobar pneumonia; the carbonate of creosote may be given every four hours in doses varying from 0.015 gm. (gr. $\frac{1}{4}$) for a child one year of age to 0.05 gm. (gr. $\frac{10}{13}$) for a child six years of age.

External Applications.—Dry cups were recommended by Henoch to relieve dyspnœa; as many as possible are applied to the chest, which is then covered with warm compresses. The best application, on the whole, is the poultice, the use of which, at present, has been largely given up. It should be made of flax-seed meal and properly applied; the latter is not difficult, but is rarely done. The poultice must cover the whole of the thorax, including the apices and the axillary spaces. This can be accomplished only by great care in its application. In order that it may not slip down it must be held by bands of tape, which pass over the shoulders. It should be covered over with some permeable material, and may be changed every two to four hours. No irritants such as mustard or turpentine should be added to it, as the dermatitis which usually follows makes the child very irritable during convalescence. The objections to the poultice are that it is too heavy or too inconvenient. Some children do not bear the poultice well, and if it is too inconvenient one of the hydrotherapeutic applications may be used. The poultice gives relief to pain; it also reduces the number of respirations as well as the cough. When the poultice is removed, and the guide to the time of

removal is the absence of the dominant symptoms, the patient's chest should be washed with alcohol and water and be wrapped in cotton for two or three days longer. *Mustard packs* have been used for a very long time; they are especially recommended by v. Liebermeister and Lenhartz. According to the latter, they are indicated in all cases accompanied by hypersecretion of mucus and great dyspnœa and cyanosis. They are prepared in the following way: From one to three pounds of mustard are stirred up with lukewarm water to form a pap; this is spread upon a sheet, and the patient is wrapped up in it, care being taken that it is carefully folded around the neck so that the fumes do not get into the eyes. It is allowed to remain for from twenty to thirty minutes, and the patient is then washed; it should not be applied more than once, at the most twice, daily. Those who have used the method speak very highly of its beneficial effects upon respiration and the heart reflex. *Oil Silk Jacket.*—This is a very serviceable method, especially in those cases where neither the poultice nor hydropathic methods can be applied. The great objection is the difficulty experienced in having it taken off, on account of the great fear of again catching cold; in one instance in my experience a little patient wore the jacket continuously for six months. If the method recommended for the permanent removal of poultices be used, there is no danger of catching cold; at least most parents can be convinced that all precautions have been taken.

Hydrotherapy.—Priessnitz applications are recommended in two ways: I. A piece of flannel is dipped in water (temperature 70°–75° F.), wrung out, then carefully applied to the whole chest and covered with three or four layers of dry flannel. A jacket may be prepared as recommended by Baruch, made up of four layers of new flannel, of which only the inner one is dipped in the water, and which has been previously fitted to the chest of the patient. This is the method which I prefer, and which I always use before putting on the poultice; it has more frequently than not made the poultice unnecessary. It is not correct to cover the moist cloth with impermeable substances, as under such conditions there is no reduction in temperature; possibly the opposite may occur; besides, such an application can no longer be called a Priessnitz application. The application may be allowed to remain unchanged for two or three hours. II. The same application is made every two to four hours in a cycle, the flannel being changed always three or four times every ten, fifteen, or thirty minutes, according to the severity of the symptoms. In milder cases the first method, in the severer ones the second, is indicated. The results are very gratifying; they act in the same way as the poultice, but in addition they have a marked antithermic action which is very important. In the use of the second method I have frequently seen the whole condition of the child changed so that one might almost think of an abortive effect.

Ice-cold Pack.—This is applied in the same way as the foregoing (second method). Biedert speaks very highly of it. I have never tried it, and would not recommend it in infants or in debilitated children. *Baths* may be given in various ways. Their indication is found in cases in which the fever is high and in which nervous symptoms are present (delirium, sopor). *Ice-cold baths* have been recommended by Thomas; they should never be given to infants on account of the danger of collapse, and it is doubtful to me whether

they are necessary for children at all. Neither should cold baths be given, as they frequently cause unpleasant symptoms, such as increase in cyanosis and disagreeable heart symptoms. Baths of the normal temperature of the body are usually sufficient; sometimes it is of advantage to douse the child with small quantities of cold water while it is in the bath. The dousing is indicated when there are evidences of atelectasis or for the purpose of increasing the depth of respiration. *Hot baths* are very valuable in restlessness in very nervous children, for sleeplessness as well as for the fever (v. Lobar Pneumonia).

Inhalations.—The same that are recommended in the chapters on bronchitis (q. v.) may be given, and for the same indications. In children the atomizer should always be used, as by means of it a certain amount of accuracy is attained and the whole room is not filled with vitiated air. Oxygen is valuable only in failure of the respiratory center.

Complications.—*Pleurisy with effusion* must always be looked for; it has been suggested that exploration be done by the hypodermic needle in every case of broncho-pneumonia occurring in infants. This is unnecessary, as the rational signs are usually sufficiently developed in empyema when operative interference is required, even when the physical evidences are not characteristic. In my whole experience I do not remember a single case of serous effusion developing during the course of the pneumonia which required special treatment. *Hydrothorax* when present is easily recognized, but its treatment is futile because of the underlying cause which makes recovery from broncho-pneumonia almost impossible. For the treatment of pneumothorax, gangrene of the lung, chronic pneumonias, and tuberculosis the reader is referred to the proper chapters. For the *heart*, the treatment is that of acute myocarditis and acute myocardiac insufficiency. Digitalis has also been recommended here for routine treatment as in lobar pneumonia, but has found few adherents. It should be given to all children who have organic heart disease from the beginning of the illness. For cardiac stimulants, camphor may be used hypodermically: ℞ Camphoræ, 1 gm.; Olei amygdalarum dulc., 10 gm.; of which 0.5–1 cc. is given. Caffeine may be given in from three to ten drops of a ten-per-cent aqueous solution three times daily in mild cases. In severer ones the same solution—℞ Caffein. sodiosalicylat., 1 gm.; Aquæ dest., 10 gm.—may be given hypodermically; in young children, not more than 0.5 c.c. Adrenalin, the dose to be computed for every individual patient, should be administered for the indication set down in the chapter on Acute Myocardial Insufficiency. *Diarrhea* should be controlled by the usual remedies; at times it is necessary to give opium, irrespective of its other effects, when the diarrhea debilitates the patient to such an extent as to become dangerous to life. It is very important to recognize as early as possible the existence of *middle-ear troubles*; in some years they are not so very uncommon, and their early treatment contributes not a little to the comfort and safety of the patient. The treatment of the other complications is described in the chapters devoted to them.

Convalescence.—It is a good rule not to permit the patient to leave his room until all the evidences of the disease producing the pneumonia have disappeared, because relapses are not uncommon. It now becomes the duty of the physician to take up again the treatment of the underlying disease,

which may have been interrupted during the course of the pneumonia. When the sequelæ are of such a nature as to necessitate the removal of the patient, especially in tuberculosis, this should be done as soon as complete recovery from the pneumonia has taken place and the patient's general condition warrants it. Children recover very quickly from an uncomplicated broncho-pneumonia, but it is wise to keep them in the house for two weeks at least after the temperature has become normal. Now generous diet, tonics, and occasionally alcoholic stimulants become necessary. In some instances the physical evidences of the pneumonia are very slow in disappearing; in such cases I have found change of climate very valuable. As a rule, a change to the same climate beneficial in pulmonary tuberculosis is favorable, but as there is danger of infection with tuberculosis great care must be had in the selection of the proper place. In this country these patients may be sent in winter to southern California, to Georgia, or to Florida. In summer they may be sent to low mountains and to the seashore.

In *adults* the treatment of primary broncho-pneumonia is the same as that of lobar pneumonia. In the secondary form the disease which produces the pneumonia is of prime importance for therapy; very frequently little can be done for either the one or the other. In infectious forms, as we find them combined with influenza, causal therapy (antistreptococcic serum) mav be of benefit.

In the *aged* the treatment consists principally in stimulation. It is here that alcohol, given regularly in sufficient dosage, does much. In addition, the routine use of strychnine has seemed very valuable to me; it seems to awaken the central nervous system in such a way that reflexes are increased by its administration. It should be given in medicinal doses; no symptoms of intoxication should be produced.

The danger with these patients lies more in the impossibility of their removing the secretions from their bronchi than in intoxication. In this way atelectasis continues to develop and the process in the lungs increases. For this reason everything should be done to increase expectoration and to dry up the mucus. It is practically impossible to further expectoration by medical means; aside from the stimulating expectorants and benzoic acid and its compounds none others can be used, because nothing that reduces strength should be given. The action of these expectorants is insignificant, because they must act upon a mechanism defective on account of senile alterations. Change in posture may facilitate expectoration, at least prevent further increase in the pneumonic process. Only warm external applications should be used, because the aged bear cold so badly. Inhalations may be tried as in children, and for the same indications. The fresh-air treatment is not of great value here unless the pneumonia is associated with toxic symptoms. In a number of cases I have been forced to give it up because of the bad psychical effect upon the patient. The question of feeding is of great importance; I have seen old people die of malnutrition and adynamia even after recovery from a pneumonia. Frequent feeding and the giving of concentrated, nutritive food are indicated; but do what we will, many of these people find it impossible to take food, and they become so irritated when food is pressed upon them that apparently more harm than good is done.

CHRONIC INTERSTITIAL PNEUMONIA

(Cirrhosis of the Lungs, Fibroid Phthisis)

TREATMENT.—When the disease has developed the best that can be expected is to keep the patient from getting worse. Here all general prophylactic measures mentioned at the beginning of this section should be taken into consideration and applied to the individual case. Upon the whole, the treatment is the same as that of chronic pulmonary phthisis. Unless the cough is loose moist climates should be chosen, those of low or middle altitude, with an equable temperature; as a rule, the patient does best in a warm climate. Repeated catarrhal attacks should be avoided; also the constant irritation resulting from dust inhalation, on which account change of occupation or removal from dust or the dust-laden atmosphere of cities becomes necessary. The nutrition should be kept up by the quantity and quality of the food. This is of importance to increase general and local resistance, and also to keep the heart muscle well nourished, as the right ventricle is especially taxed in this disease. When myocardial insufficiency develops it should be treated. The cough may require attention, as recommended in the chapters on chronic bronchitis and bronchiectasis. Tonics—ferruginous, the bitters, nux vomica, or strychnine—are sometimes indicated. The proper treatment of pleurisy with effusion can be looked upon as a prophylactic measure; the treatment, medical or surgical, of pleural adhesions may do good when the cirrhotic process of the lung arises from the pleura.

PNEUMONOKONIOSIS

PROPHYLAXIS.—This is more important than treatment, as the disease can be prevented, but not cured. In most cases the disease is the result of occupation. There are two ways to prevent it—the one, change of occupation, which is manifestly impossible in a great number of instances; the other, the prevention of the inhalation of dust, which is a matter of great difficulty. In the latter instance it is frequently necessary for lawgivers and physicians to work together. It is true that in many cities factory inspectors have been appointed and much good has been done, not perhaps so much by these as by the enlightenment of both employers and employees as to the necessity of the prevention of dust inhalation. But some of the industries that lead to this disease are not carried on in factories; millwrighting, stonecutting, coal mining, and many others are carried on by small manufacturers who employ but few operators. For those in the first class the wearing of masks should be recommended; nothing will reach the second but enlightenment and, when necessary, force. A. Fraenkel calls special attention to the danger of child labor in trades that are followed by pneumonokoniosis; this is a very important consideration, for it is an accepted fact that children are more easily affected by bronchial irritants than adults. For the TREATMENT the indications are the same as those of chronic bronchitis, bronchiectasis, fibroid phthisis, and tuberculosis.

EMPHYSEMA

Hypertrophic Emphysema.—Prophylaxis.—Very little can be done here, as we are not able to foretell for any healthy individual when or how he may develop emphysema. Certain trades have been accused of producing emphysema, especially those of glass blowers and players upon musical instruments. For the latter my own long experience among musicians has verified the observation of Fortanini and of F. Fischer, both of whom have shown that in musicians neither emphysema nor its predisposition is a result of their occupation. A curious instance demonstrating the prepossession of medical men in favor of an accepted idea was shown in my class teaching. A patient was exhibited in whom the diagnosis of emphysema had been properly made by the assistant, the internes, and the members of the class, and the origin of the disease was accepted by all, without further investigation, in the fact that the man was a musician. On further inquiry it transpired that he was a fiddler. In my own experience just as many players of string instruments, even pianists, have had emphysema as players of wind instruments. The predisposition to emphysema is that which counts, and we cannot tell when this exists until the symptoms have developed. In a good many musicians the direct cause is the production of a chronic bronchitis, and this is connected with their occupation only in so far as they have followed it in insalubrious places at irregular hours combined with bad habits. The extraordinary findings of Fortanini must be attributed to the fact that his material was made up entirely of Italian trumpeters under military discipline and living in the open air. Whether the tendency to the formation of the barrel chest by premature ossification of the costal cartilages, as maintained by Freund, is or is not to be looked upon as an ætiological factor, its acceptance does not help us so far as prophylaxis is concerned. Inasmuch as the patient always comes to us after emphysema has developed, the prophylaxis can hardly be carried out practically. The proper treatment of chronic bronchitis, asthma, and whooping cough undoubtedly acts prophylactically.

Treatment.—When the elastic fibers in the lungs are destroyed, it is not possible to do anything that will cause them to be regenerated. A cure of emphysema, then, is impossible; the utmost we can do is to prevent further development of the condition and to give relief to symptoms. The first indication is met in the proper treatment of chronic bronchitis and asthma (q. v.); the second in a number of ways.

Pneumatotherapy.—To show of how little therapeutic value theoretical conceptions may be, the use both of rarefied and of compressed air is followed by good results. The former is carried out by the portable apparatuses already referred to in the treatment of asthma. The latter is accomplished by the use of the pneumatic cabinet, into which air is pumped. By both these measures great relief is obtained—more by compressed than by rarefied air; there is no evidence that either the one or the other cures the condition. *Respiratory gymnastics* are of great value in this disease (v. Chronic Bronchitis, Asthma). Especially should gymnastics, which strengthen the respiratory muscles, be used. *Massage* is indicated in those individuals who are unwilling or unable to carry out the active measures. The right heart re-

quires attention in many of these cases. Otherwise the treatment is that of chronic bronchitis.

GANGRENE OF THE LUNGS

PROPHYLAXIS.—The aspiration of foreign bodies in fevers in all conditions connected with stupor or coma should be prevented. The most common cause of gangrene is pneumonia, and it is not unlikely that a large number of these cases of gangrene consists of aspirative pneumonias; foreign bodies have been found after operation in these cases; also the lower forms of life representing the flora of the mouth. The treatment of bronchiectasis is also a preventive measure. The entrance of pus into the bronchi or into the lungs themselves may at times be prevented by early operation in retropharyngeal or subphrenic abscess or abscess of the liver.

TREATMENT.—*Medical.*—Every patient with gangrene of the lung should be put to bed and be kept quiet; it would seem that this is the only natural thing that would follow in a disease so serious as gangrene; yet in a number of cases the patient will be found by the physician, sitting up in a chair, possibly moving about the room. Rest is absolutely necessary in order to prevent the acute, circumscribed form becoming converted into a chronic or diffuse form. Special care should be given to the nutrition of the patient by using the most digestible and nutritious food possible, in proper quantities. As patients with this disease are almost intolerable to their entourage, a whole house, a whole ward being contaminated by the odor of their breath, ventilation should be especially arranged for them, and Platt's chlorides should be used, as recommended for bronchiectasis. Inhalations should be used, carbolic acid, as in fetid bronchitis or bronchiectasis; turpentine, which was highly recommended by Skoda, and has held its own deservedly in the treatment of this disease. I say "deservedly," because Skoda was the prototype of the "medical nihilist," so that anything he recommended as producing good results is at least worthy of a trial. After the cessation of fever Traube used lead acetate or tannic acid internally; in order to dry up secretions, A. Fraenkel recommends the inhalation therapy combined with the internal administration of myrtol, 0.15 gm. (gr. ijss.), three, six, or nine times daily.

What are the results of medical treatment? v. Leyden (Lenhartz) treated eight patients in this way, of whom six were cured; one was not relieved because a putrid cavity was left; one died of chronic gangrene after six months of illness. The medical treatment should be used in all except the foudroyant cases, and should be given a fair trial for at least two to four weeks, depending upon the condition of the patient. Complications and symptoms should be treated as may be necessary.

Surgical.—Aspiration and injection of antiseptics should be avoided; the method is too risky, and the proper use of inhalants produces the same results as can be obtained by direct injection. The proper and best method is that of pneumonotomy with subsequent drainage; in this operation everything can be done with precision, even the deservedly much-dreaded infection of the pleura can be prevented. In order that this operation may be followed by the best results it must be done early; the time is determined by the general

condition of the patient. In acute gangrene the results are much better than in chronic gangrene, much better for the circumscribed form than for the diffuse. The indications for the operation in the acute form are (1) the general condition of the patient; (2) that the gangrenous process be localized; (3) that the process be not too deep; (4) that the patient be in a sufficiently good condition to be subjected to an operation, which evidently may be dangerous. Unfortunately, the diagnosis as to the two latter indications is frequently impossible, as is attested by the fact that in several cases the cavity was not found in the place indicated by previous examination. Tuffier, in his collection of cases, found nine out of seventy-four in which localization before the operation had been wrong; in three of these the affected area was not found at all; in three the localization was wrong by the distance of one intercostal space; in three the contents of the cavity gradually found their way into the operative field. Certainly it is a contraindication for operation when the gangrene cannot be localized, but this need not be considered, as no one is justified in making an exploratory pneumonotomy.

The methods just described are of importance in preventing the development of chronic forms from the acute forms. Again, for this reason, early operation is indicated. In chronic gangrene the same indications exist for operative intervention as in the acute form. The results are not so good, because of the condition of the lung, chronic pneumonia, or dense pleuritic adhesions, but principally because of the general condition of the patient. In this form only carefully selected cases should be operated on. Freyhan's cases of acute gangrene gave the following results: sixteen cures, two improvements, eight deaths (A. Fraenkel). Tuffier's seventy-two collected cases of all kinds of gangrene that were operated on presented a mortality of thirty-nine per cent.

ABSCESS OF THE LUNG

Prophylaxis.—For this the treatment of the various conditions that lead to abscess formation must be considered.

Treatment.—Here the medical treatment recommended in the preceding chapter may be used. For the success of operative intervention the chances are favorable (1) in young individuals; (2) when there are small deposits at the apices; (3) when there are larger deposits at the base, if operated on early (Karewski). It may be added that the results are better in acute than in chronic abscesses, and in single than in multiple abscesses. Indeed it is very questionable whether multiple abscesses should be operated on at all; in individual cases it may become imperative, but then only as a vital indication. The earlier an abscess is operated on the better the result and the less probable is the formation of multiple abscesses as well. In the collection of cases by Eisendrath treated by operation, in ninety-six per cent of the cases of acute abscesses recovery ensued. In chronic cases 64.2 per cent of patients recovered, 42.8 per cent were cured, and 21.4 per cent were improved.

The same stress that was laid upon the importance of medical treatment in gangrene of the lungs exists here, for in a large number of cases recovery under it follows. Undue operative haste should be avoided for this reason, that everything else being equal, Quincke's statement, not to operate when

the abscess shows any evidence of becoming smaller, may be followed. But under many conditions this cannot be determined, so that, after all, not only the local but especially the general condition must determine the necessity of operative intervention. Especially is this the case in chronic abscess. One of my patients has a chronic abscess, the result of a gunshot wound received in the Civil War. He is now over sixty years of age, has had the trouble for over forty years, is a judge of an appellate court, and is rarely inconvenienced by his disease, so rarely that it does not interfere with his occupation. Under such conditions operation would be an act of inexcusable temerity.

V. DISEASES OF THE PLEURA

ACUTE PLEURISY

Serofibrinous Pleurisy.—As in all inflammatory conditions of serous membranes, rest in bed during the continuance of inflammatory symptoms is followed by the best results. As a rule, the patient needs no persuasion in this direction because, on account of the pain produced by the rubbing together of the inflamed pleural surfaces, he is forced to keep quiet. But beyond this he instinctively finds the position in bed which permits him to have control of the movement of the affected side. There is no causal treatment of the disease; there is no evidence that salicylic acid, first recommended by Aufrecht, acts in this direction; so that we are confined to symptomatic treatment.

To give *relief to pain* the best internal remedies are antipyrine, codeine, morphine, to be used in the order mentioned. Morphine may be given by the mouth in small doses frequently repeated, but when the pain resists the action of antipyrine or codeine, morphine should be given in full dose by hypodermic injection. In the beginning of an attack blood letting may be resorted to by means of dry cups or by the application of a few leeches; wet cups are not necessary. I have repeatedly seen the application of leeches followed by excellent results, although I doubt whether any of these methods has any effect upon the course of the disease; indeed, any opinion expressed in regard to the efficacy of any remedy or method of abortive treatment must be accepted with great caution, as we know that in the vast majority of cases of pleurisy the process ceases in the first stage.

External applications in a great many different ways have been recommended. Otto has recommended the application of a bandage, such as is used for fracture of the ribs; this method has been modified by a number of authors in that the material of which the bandage is made and its method of application differ somewhat from that proposed by Otto. It is really not necessary to enter into details here, as the principle is always the same, and this may be applied by any thinking physician who always makes modifications of methods to suit himself and his patient. Nowadays the vanity of medical authors in insisting upon having their names added to methods already handicapped by a qualification consisting of hyphenated proper names surpasses belief. The method by strapping does good in a number of cases; to some patients it is intolerable on account of restricting movement, and in a large

number of cases the expected relief does not follow its use. The ice bag gives frequently instantaneous relief; I have found this to be the one thing that gives relief in most of the cases. Here, as elsewhere, hot applications, such as the hot-water bag or poultices, will become necessary when the cold fails. *Counterirritant* substances are frequently used—mustards, blisters, iodine—and they sometimes give relief from pain. When anything of this kind is employed, our activity should be confined to the use of sinapisms. All those with large clinical experience have frequently seen patients applying for relief on account of dermatitis produced by the external application of some counterirritant long after the pleurisy was cured. Fortunately for us, in most of these cases the patient himself has caused the dermatitis, especially by the improper use of tincture of iodine; but here, as so often in treatment, the physician should remind himself of the trite saying, *pas trop de zèle.*

The *general indications*—fever, condition of bowels, etc.—will be easily met by the use of the proper remedies. When *effusion* has taken place the paramount indication is its removal. The indications to be fulfilled by the removal of the fluid are the *indicatio vitalis*; the prevention of disease of the lung and thorax, especially by the production of adhesions; the prevention of sequelæ, and therefore the possibility of return to the normal individual mode of living.

Nonpurulent Exudation.—The exudation can be reduced in quantity by means of (A) GENERAL TREATMENT; the principle upon which the various methods to be mentioned are supposed to act is that in diminishing the quantity of water contained in the body the general deficit will be made up by drawing upon the contents of the pleural cavity. That this is purely speculative need not be mentioned; that the various methods may do good can be fully corroborated by anyone who will try them. Most of them are used, especially in robust individuals, when no danger to life is present.

(*a*) *Cathartics:* Calomel is probably the most valuable remedy because it also acts as a diuretic; next to this come the saline cathartics, then hydragogue cathartics. These remedies should be given daily for some time and in full doses; the result upon the general condition of the patient should be the determining factor in their use.

(*b*) *Diuretics:* Here diuretin, strontium lactate, urea, potassium acetate, squills, juniper berries, and digitalis have been recommended. They are to be especially recommended in the stationary period.

(*c*) *Diaphoretics:* Pilocarpine and baths are used here. As to the first, I have repeatedly insisted upon the danger of its use; in pleurisy with effusion it should be used, if at all, only in small effusions that are stationary, and should then be given with the precautions mentioned in the treatment of dropsy. The Russian, the Turkish, the hot bath with subsequent wrapping in blankets, all the various external diaphoretics, have been used. Salicylic acid, with its preparations, probably acts as a diaphoretic; it should be given in large doses; that it does act in this way when given in sufficient quantity may be easily verified, but of all the internal methods it deserves least recommendation in this disease.

(*d*) *Diet.*—In a number of cases (1) *milk diet* is very efficient; this acts by improving the general condition, probably also by stimulating diuresis. The patient should not be put on an exclusive milk diet, but carbohydrates

also should be given (v. Typhoid Fever). In patients with reduction of nutrition or loss of appetite this method has produced good results in my hands. It is especially valuable in hydrothorax. (2) *Restriction of liquids.* To carry out the indication of restriction of fluid in the general circulation the following seems to be the best method: Dry diet—i. e., such articles of food as contain the least quantity of water—should be given; the quantities of fluid taken should be restricted, which is best accomplished by keeping the quantity ingested below the quantity of urine secreted. While this holds good for the majority of cases, exceptions must be made in individual instances. An example of this method of feeding is represented by Tufnell's diet in aneurism, which may be made the basis for treatment, and to which extra articles of food may be added; it should be carried out for from one to six weeks, according to the endurance of the patient. The diet is as follows: At breakfast, two ounces of milk and two ounces of bread and a little butter; at dinner, two to three ounces of meat, without salt, and four ounces of milk; at supper, the same as at breakfast. I have never been able to carry out this method in this country, even in aneurism, on account of the great suffering it produces and the reduction in general health that follows. Hay's modification, recommended by Osler and by Garland, is the giving of an exclusive meat diet with eggs and dry bread and a pint of fluid, either milk or water, combined with the daily use of a saline cathartic. All these methods may be varied according to individual needs; for this it is necessary to take into consideration the quantity of urine secreted, which under normal circumstances represents about four fifths of the quantity of water taken into the economy; therefore the quantity of water in liquid and solid food must be estimated (v. Appendix), and among the latter, meats, fowl, and fish. While the relative quantity of water is very great in them (from twenty-eight per cent in bread and thirty-five per cent in ham to seventy-seven per cent in veal), the absolute quantity ingested is small, on account of the small quantity of *meat* taken in the twenty-four hours. Other articles of diet may be used as follows: Beans, 12.5 per cent of water; peas, 13.8 per cent; lentils, 12.2 per cent; rice, 12.5 per cent; wheat flour, 12.6 per cent; rye flour, 14 per cent; oatmeal, 13 per cent; macaroni, 12 per cent; condensed soups, from 7 to 9.3 per cent; chocolate, 1.6 per cent; oils, 1 per cent (all the percentages are taken from Koenig's tables). All other substances, such as fruits, vegetables, salads—except those made from meat, fowl, or fish—are to be used very sparingly. With these as a basis, the physician can calculate with precision, when he thinks it necessary to do so, the quantity of water ingested. The effects upon the digestive tract and the general condition must not be lost sight of, although enough variety is afforded in the above list to meet all indications in this direction. I have never been able to obtain satisfactory results with any of these methods.

(*e*) *Tonic Treatment.*—In connection with diet already referred to, but also by the administration of compressed, easily digested food, the administration of various tonics is of the greatest value. As a rule, the ferruginous tonics are most valuable, the tincture of the chloride of iron in large doses especially so; but also the bitter tonics, the nervines, nux vomica, or strychnine.

(B) Local Treatment.—The application of blisters and other external counterirritants is also recommended; this method does not appeal to me on

account of its uncertainty and the impossibility of preventing certain unpleasant local after-effects.

The one local measure which fulfills all the indications required for pleurisy with nonpurulent secretion is the operative removal of the fluid. As compared with all the other methods just described, it is more precise, more simple, and less harmful. In all cases of primary pleurisy it is always indicated; it matters not whether the level of the fluid reaches the top of the first or the fifth rib; whether the patient is in immediate danger or not. In secondary cases, as in hydrothorax, the vital indication may be looked into for surgical intervention; but, especially in the latter stages of myocardial insufficiency, I have more than once been sorry that I did not remove the fluid from the chest immediately after its presence was detected. After a faithful and long-continued trial of the general methods of removing fluid, I now never use them except as symptomatic measures in cases where the fluid again accumulates after removal by surgical means. Aside from the comparative merits before mentioned, I was led to this procedure by the following: it requires a great impression upon the blood mass, if such is the effect produced by the various general methods, to produce an appreciable impression upon the quantity of fluid in the pleural cavity. This is the rule; I admit freely that there are many exceptions to it. I have frequently observed that the removal of a syringeful of fluid, as is done for diagnostic purposes, causes the rest of the fluid to be absorbed, either on account of change in intrapleural pressure or of chemical changes producing favorable osmotic conditions. When simple manipulation such as this proves efficient, there is no reason to make the patient miserable by the use of any protracted method of cure. When this simple procedure is of no benefit, a more radical surgical attempt should be made. I do not see that objection can be raised to this, provided the proper method is used in the proper way. We hear much of the danger of aspiration, but little of the dangers of the depressing general measures. I have never had any bad results from aspiration; aside from the trouble in carrying out the general method, I have seen collapse, just as Anders has, and others have seen scurvy, to say nothing of anæmia, following the depleting method. A simple, absolutely safe, local measure should always be preferred to a general one that produces more or less change in general conditions. One thing more has been entirely overlooked: the prevention of adhesions by early removal of the fluid. The importance of preventing adhesions must not be underestimated, as they play a most important rôle in the production of bronchiectasis, chronic pneumonias, and deformities of the chest. From long experience, I feel justified in the statement that early withdrawal of fluid fills this prophylactic indication.

In performing the operation all aseptic precautions must be taken; many sins are committed here, and some of the bad results are then ascribed to the operation. I always use the aspirator, as is the common rule in this country; the Germans use the trocar. Whichever is used should be carefully sterilized; the aspirator ought therefore to be of simple construction. The size of the needle should be adapted to the quantity of fluid; for large quantities of fluid I use a protected trocar attached to the aspirator, so that the fluid may be emptied more rapidly and the tissues be protected. The place of introduction of the needle should be so selected that the withdrawal of

fluid is facilitated by the action of gravity; that is to say, at the lowest level of the fluid. The best place is in the seventh or eighth intercostal space in the posterior axillary line, or even farther back, depending upon the formation of the thorax and the amount of fluid present. When there is an encapsulated effusion, the place of puncture is controlled by the results of physical examination. The fluid should be withdrawn very slowly, especially in large effusions, and with very little suction; here it is better to make two, or even more, attempts than to run the risk of accidents. Besides certain symptoms that occur in neurotics, the accidents occurring during aspiration can be ascribed to the reopening of blood vessels that have been compressed by the large exudate, with possibly also changes in their walls. When this large area which has been closed is suddenly opened, suction still going on during the operation, two things may follow: either œdema of the lungs or the sudden withdrawal of a large quantity of blood from the organs, inducing local anæmia, syncope, collapse, or even death. Indeed, all the complications of the operation, except those due to embolism, may be accounted for in this way.

The question of how much fluid should be drawn at one sitting can only be answered by taking into consideration the individual case. It is not necessary to withdraw all the fluid at one time. When the chest is full, enough should be drawn to relieve dyspnœa. The quantity to be withdrawn depends more upon the condition of the patient than upon the amount of fluid in the thorax. If after relief has been given no untoward symptoms arise, large quantities may be withdrawn; when such symptoms arise, the aspirator should be turned off; if they again appear when it is turned on, the needle should always be withdrawn. After a few days, when the fluid shows no signs of disappearing, the operation may be repeated. The symptoms that call for a halt in the procedure are violent cough, a feeling of constriction, or the sensation of faintness; great pain, also, will at times force the operator to desist. Under all circumstances, the patient should be put to bed upon the shortest notice of untoward symptoms, and not left in an upright position. Indeed, it is always most advisable to aspirate in the recumbent position. I once saw a distinguished clinician aspirate a large pleural effusion before the class in a dispensary, his patient sitting upright—among his contributions to medical literature will be found one on albuminous expectoration after aspiration of the pleural cavity. After the completion of the operation the place of puncture should be covered over by a strip of surgical adhesive plaster or with collodion. When all the precautions mentioned are taken, the operation of aspiration of the chest becomes a perfectly safe one.

The question when operation should be performed has been variously answered. The older clinicians laid down the rule that there should be no operation when fever was present. When there is great dyspnœa or the fluid collects very rapidly so that there is danger of suffocation, the operation should be done at once; otherwise the subsidence of inflammatory symptoms may be waited for; but even here I aspirate early, whether the effusion is large or small, my own experience having taught me that aspiration when the patient has fever is not followed by a reaccumulation of fluid. On the contrary, more frequently aspiration acts in the same way as would the opening of an abscess; the fluid disappears, and the fever with it.

In chronic cases repeated aspiration will have to be made; then injections

of various substances into the pleural cavity have been recommended, especially the use of iodine preparations; I never use them. A much safer and more logical method of treatment in these chronic cases, after repeated aspiration and reaccumulation of the fluid, is by incision, as recommended by Rosenbach and S. West. In some cases good results have been obtained; in one of my patients the effusion had been repeatedly aspirated for two years, but never recurred after incision. Unfortunately, in the majority of these cases of chronic serous effusion the cause cannot be removed, but even here incision may be used as an *indicatio vitalis*.

The *after-treatment* in all cases of serous pleurisy should be conducted on lines that are indicated by the condition of the individual. The fact that pleurisy is due to tuberculosis (ninety-eight per cent, Landouzy; seventy to eighty per cent, Netter) has led to some modification of our views in regard to treatment after the attack. While, especially in private practice, no extraordinary measures are necessary unless there is an active process in the lungs, the patient should always be directed to look after his general health. When there is an active process, or even an extensive latent process, in the lungs, the climatic treatment of tuberculosis may be established for a shorter or longer time, depending upon the condition of the patient. In a very large number of cases no after-treatment is required. In all cases gymnastics should be recommended.

In hemorrhagic exudates, some individualization as to treatment is required. A mere tinging of blood is not a contraindication for aspiration; the same may be said when the fluid is even thoroughly colored by hemoglobin. But in the latter instance too much fluid should not be withdrawn at one time, because of the danger of bleeding into the pleural cavity. When the accumulation of fluid is enough to produce danger to life the chance of internal bleeding must be taken; this is fortunately, in the nature of things, a very rare occurrence.

Purulent Pleurisy (Empyema).—Acute Empyema.—This is a surgical disease, as are all abscesses, and therefore must be treated by surgical measures. So simple a proposition as this is frequently unheeded by physicians having an excessive predilection to medical treatment, so that much harm is done and many lives are sacrificed. Aspiration is rarely sufficient. In children, in the metapneumonic form especially, it has been followed by good results in many cases. In adults I have never seen good results, although such have been reported. But as we have a simple operation, unattended by danger, always efficacious, it does not seem proper to take any chances as to recovery. I can conceive it possible in a child, never under any circumstances in an adult when the general symptoms are not urgent, to try aspiration, but this combination of conditions has not arisen in my experience. The time of performing thoracotomy can be precisely indicated for every case. As soon as the diagnosis of empyema is made the operation should be done. It has been repeatedly shown, especially for children, that the earlier the operation the smaller the mortality and the better the result. It matters not how late the disease is recognized, the patient should receive the benefits of a chance of recovery and be operated on. There are no operative risks in making an incision in an intercostal space; local anæsthesia is usually sufficient for this, and by means of a few words of intelligent explanation the moral effect of an

operation upon the patient and his friends is minimized. In two cases that I saw the patients were apparently *in extremis* with carbonic-acid gas poisoning, high fever, and unconsciousness; both recovered after an incision. In operating for empyema, local anæsthesia should be used when possible; when impossible, ether or chloroform, and as a rule it is not necessary to anæsthetize completely. Only in children, very exceptionally in adults, should simple incision be the operation of choice. In infants resection of one rib sometimes becomes imperative, so as to get more room for drainage. The place of incision is to be chosen according to the rules put down for aspiration. Resection of one or more ribs should always be made in the adult when there is time. Why this operation gives the best results need not be discussed here; the fact that it does so may be demonstrated by reference to any of the many series of statistics that have been published by reliable observers. In both the operations a drainage tube is introduced; irrigation is no longer resorted to except when the pus is putrid; then mild antiseptics may be added—never carbolic acid, on account of the dangers of carbolic-acid poisoning. A proper dressing should also be applied here; different surgeons have different methods. It should be changed frequently. Koenig believes that the bandage is a prominent factor in preventing collapse of the lung after opening the thoracic cavity. That an impermeable bandage might aid in the expansion of the lungs is possible. As a matter of fact, we do not find the lung collapsed in opening a chest for empyema simply because the lung is always held by pleural adhesions.

I have used Bülau's method of constant siphonage; it consists in the introduction of a large drainage tube by means of a large trocar, the drainage tube being allowed to remain; after securing the tube to the chest by adhesive plaster, a rubber tube connected with a vessel containing some antiseptic fluid is attached to it. The vessel may be either a pan placed underneath the bed or a bottle which must be kept below the level of the puncture, in the pocket of the patient or strapped to his side. The many objections to this method need not be stated; my own results with it were not favorable; in Germany, where it was first greeted with enthusiasm, it has steadily lost ground. This method may be used for the acute form, but it is especially recommended for the chronic form.

When these methods fail, Estlander's plan, thoracoplasty, may be used. It is used in protracted suppuration upon the principle that after resection of a number of ribs the walls of the pleural cavity come into apposition and healing takes place. From 6 to 10 cm. of three to five ribs or more are resected. Schede's operation is even more extensive, the removal of all the ribs and soft parts covering the part of the lung that has been affected. The removal of adhesions has been accomplished by curetting or excision. Pus pockets have been treated, as well as carious ribs. Any one or all of these procedures have been followed by good results, Schede's method, as a rule, being followed by great deformity. The fact that one or the other of these methods is followed by success leads to the conclusion that individualization is necessary in order to establish the procedure indicated in a given case. Thus it would manifestly be improper to resect five ribs when the process of suppuration is kept up by caries in only one of them. Schede's operation, again, would be uncalled for when adhesions can be removed in some other

way. It seems to me the time has gone by when indiscriminate operations can be performed.

In *double empyema* relief should be given by operating on one side only; after an interval of a week the other side may be operated on. Here Bülau's method is of service, certainly temporarily, until one of the radical operations may be used. *Empyema with perforation,* in any direction, should be operated on. In *tuberculous empyema* aspiration may sometimes be tried, but not always. It depends largely on the condition of the lungs whether other operations should be performed. When empyema presents itself as a cold abscess of the pleura, it is a matter of nice judgment whether it should be interfered with or not. In patients whose condition is not too far advanced, and who are generally in good condition, the ordinary operation may be performed.

The *after-treatment* is always important. The general condition should be improved by change of climate, proper diet, and tonics. The local condition is very much improved, especially in young individuals, by respiratory gymnastics; those calculated to increase the expansion of the lungs are to be used; filling the lungs with air and then making attempts at expiration with closed glottis; in order to imitate the closed glottis a Wolff's flask may be used, partly filled with water, and having a simple manometric tube inserted through one of the corks, or any other simple device may be used by means of which gradual increase of expiratory force can be gained and measured.

CHRONIC PLEURISY

In chronic pleurisy with effusion the TREATMENT is the same as that of the acute form. In the dry form the causal treatment may be of importance; the treatment of tuberculosis and that of syphilis. Even without a distinct indication for the latter, the iodides should be administered, provided there is no contraindication in regard to the general health. Iodovasogen may be used externally; counterirritants have also been recommended. Mindful as we should be of the consequences of extensive thickening of the pleura, especially when evidences of bronchiectasis or of pulmonary involvement exist, resection of ribs should be urged.

PNEUMOTHORAX (Hydropneumothorax and Pyopneumothorax)

TREATMENT.—Immediately after the occurrence of a pneumothorax the patient presents a combination of symptoms which in a great number of cases demand urgent treatment. For the dyspnœa and pain a hypodermic injection of a full dose of morphine should be used; it is valuable, also, in preventing coughing, diminishing the number of respirations, and preventing the distention of the pleural cavity with air. It acts therefore in the direction of saving life, as this overdistention, with its results—suffocation, the crowding of other organs—frequently causes death in the onset of the disease. The condition of collapse should be treated by stimulants—hypodermic injections of ether or camphor; alcohol by mouth or rectum or ammonia preparations should be given; the patient should be kept warm and absolutely quiet. Venesection is recommended in proper cases when there is much venous conges-

tion; I have never used it, but it seems rational in this stage, where life hangs on a thread and loss of blood can be easily compensated for as soon as the patient is relieved of his critical condition. If the symptoms of suffocation do not disappear, relief must be given for intrapleural tension. The means to do this must be adapted to the individual case; if there is a valvular pneumothorax, the introduction of a hollow needle into the pleural cavity gives relief; this may be allowed to remain *in situ* for some time. The objections to this method are many; the diagnosis of a valvular pneumothorax is impossible at this stage of the disease; the method may give relief only while the needle remains; as soon as it is removed the symptoms recur with respiration or coughing. It should be tried, however, all preparations being made in the meantime for the most efficacious method—operative intervention. The proper fulfillment of all indications requires that, as Unverricht puts it, "a permanently open thoracic fistula be established." Whether the condition is one of open or valvular pneumothorax, such an operation will prevent intrapleural distention; but in addition it produces immobility of the affected side, favorable to the production of adhesions and closure of the wound in the lungs. According to this author, the vital point in his method consists in permanently preventing a stoppage in the outer fistula, so that he justly warns against the use of the dressing commonly used in thoracotomy; the dressing should be so applied that air may enter into and be expelled from the pleural cavity without meeting with obstruction, otherwise the operation leaves the pleural cavity in much the same state as before, the dressing forming more or less of an artificial thoracic wall so far as equalization of intrapleural and extrapleural pressure is concerned.

The operation is that of thoracotomy: there is introduced into the pleural cavity an inelastic large drainage tube, which is attached to the skin by means of stitches. A strainer made of fine wire gauze is attached to the distal end of the drainage tube, and the dressing is so arranged that this communicates directly with the open air, the lower part of the dressing being made very thick to absorb secretions. Unverricht says that no patient should die from the mechanical results of pneumothorax who is treated at the outset of this disease. That intervention should take place only when the proper indication exists is self-evident; within the last three years two acute cases have come under my observation in which the patients got well without any interference or treatment of any kind.

After the acute stage has passed away, the method of treatment is somewhat different. Those that have not succumbed at the outset of the disease are no longer subject to suffocation; there has followed a certain amount of accommodation to the altered mechanism of respiration, and spontaneous recovery may take place. Or on account of the tuberculous process itself or other infections, excessive coughing, or complications, the patient gradually loses strength, and finally dies. In all cases there is hydropneumothorax or pyopneumothorax, and the accumulation of fluid may produce dyspnœa or constitutional symptoms. Its removal is then indicated; here there seems to be some justice in warning against the use of the aspirator, because negative pressure within the pleural cavity may tend to reopen the lung fistula. But its common acceptance by a large number of competent observers shows that the dangers of its use have been largely overestimated on theoretical grounds.

After four or six weeks from the outset this instrument may be freely used, with the precautions described in the treatment of nonpurulent pleurisy, for if the agglutinated edges of pulmonary perforation can be torn open by the very slight negative pressure within the pleural cavity, the same may follow an ordinary attack of coughing; it is therefore of little permanent value. Large, stationary, serous effusions should always be removed. For permanent fluids, even when not producing constitutional conditions, the same rules of treatment hold good as for empyema. The exception is found in tuberculous pyopneumothorax; here the general and local condition must guide us whether to operate or not.

In one of the two cases before referred to the patient insisted upon getting up and leaving the hospital after one week; contrary to all advice he did this, and came to no harm. His pneumothorax was the result of a great strain, resulting probably in the tearing away of a piece of the lung by stretching an old pleuritic adhesion. The only safety to the patient, however, consists in keeping him in bed until we have assurance that the perforation has been sufficiently closed to resist the demands made by forced expiration or coughing. Graded tests in these directions may be of value to determine this.

In tuberculous conditions the tuberculosis must be treated.

VI. DISEASES OF THE MEDIASTINUM

TUMORS

Treatment.—I can find no records of successful surgical intervention. In these cases, Röntgen-ray treatment combined with mixed toxine treatment (Coley) should be tried. When properly applied it does no harm, and may do much good. Even if the proof is offered that these methods do not cure, there is no doubt of the fact that they give enormous relief and prolong life, a fact that I can verify in at least one inoperable case. For causal treatment mercury, potassium iodide, and arsenic have been recommended; this recommendation stamps causal treatment as absolutely without value except in syphilitic tumors or adenopathies. There remains, then, the symptomatic treatment. The dyspnœa and cough should be treated with narcotics. Tracheotomy has been performed in these cases, but manifestly it can be of little use. Inhalation of oxygen may be of value. In the majority of these cases recourse must be had to morphine, given as has been recommended in other fatal diseases. Other symptoms due to pressure, extension, or involvement of neighboring organs must be met by their proper indications. In so hopeless a condition it is the duty of the physician to prolong life, giving the greatest possible comfort to the patient. A discussion of this proposition is unnecessary; still no one knows what the future may bring forth; possibly it may allow a physician to kill his patient. Euthanasia is permitted, but only when death is imminent and unavoidable.

MEDIASTINITIS (Acute)

TREATMENT.—This should be the same as in acute inflammations everywhere. When pus is present it should be removed, either by aspiration or other operative intervention. In chronic inflammation all those measures that are used in other locations may be tried. Locally iodine, counterirritants, hydrotherapy; internally the use of mercurial and iodine preparations.

It is necessary, before closing this section, to refer to a method which, at von Mikulicz's suggestion, has been perfected by Sauerbruch. It may be applied to all operations upon the lungs—abscess, gangrene, cavities, pneumothorax—but also to those in which there is danger of producing an open pneumothorax, and therefore upon the heart or in the mediastinum. The method consists in preventing collapse of the lungs, which is always due to entrance of air into the pleural cavity, by changing the intrapleural pressure; this can be done manifestly in one of two ways: either the pressure between the layers of the pleura is reduced or the pressure in the bronchial tree is increased by artificial means. Under normal circumstances the pressure within the pleural cavity is a negative one of — 7 mm. of mercury; when the air enters it it becomes that of the air. The way to imitate the natural pressure would be to reduce it, and this is accomplished by the construction of a special operating chamber in which the air pressure is reduced by a pump; the patient is operated on within this chamber, but his head and neck are kept outside of it by means of a special opening so arranged that the outer air cannot get into the chamber itself. The latter has been found necessary because, unless the operating chamber can be constructed so as to be very large, the giving of an anæsthetic becomes impossible. When this method is used, opening of the thorax is not followed by collapse of the lung.

Sauerbruch has reported sixteen operations in which this method was used. Of these, in two the pleural cavity had to be opened on account of an osteosarcoma of the sternum and a carcinoma of the breast; in neither of them did a pneumothorax or pleuritic exudation follow. Eight cases were lung surgery; one a bronchial fistula, which was cured, and seven cases of gangrene of the lungs, with two recoveries. One operation upon the heart and five upon the esophagus were performed according to this method. In all of them the operative method proved a complete success.

The production of increased intrabronchial pressure can be accomplished in various ways: by a properly constructed chamber, by temporary intubation, by the wearing of a diver's mask, compressed air always being introduced. For the present, at least, it seems that the first method is the one to be preferred.

SECTION VII

DISEASES OF THE CIRCULATORY SYSTEM

INTRODUCTION

The advance made in the treatment of chronic cardiac diseases has been very great; in no department greater except, possibly, in the treatment of infectious diseases. This advance is the result of physiological study, and notably is due to the acceptance of the myogenic theory of the heart's action advanced by Engelmann, but especially to the use of CO_2 baths by Aug. Schott, and the reintroduction by Oertel of gymnastics, as first recommended by Stokes. In the treatment of acute diseases of the heart, where the progress has not been so great, the advance is not a little due to the development of surgical methods.

For therapeutic purposes the following divisions may be satisfactorily made: I, Diseases of the Pericardium. II, Diseases of the Myocardium. III, Diseases of the Endocardium. IV, Myocardial Insufficiency (acute and chronic). V, Neuroses. VI, Congenital Affections of the Heart. VII, Diseases of the Blood Vessels. Of all these, myocardial insufficiency is the only one not commonly found in works devoted to the subject of diseases of the heart. By myocardial insufficiency is meant that condition in which, on account of its being diseased, the myocardium cannot perform its normal function—i. e., keep up the normal relation between pulmonic and systemic circulation.

The term "chronic myocardial insufficiency" was first used by Ebstein; as the condition of acute myocardial insufficiency also exists, I have thought it proper to use the term. The value of the use of this term for our purpose, as well as for other purposes, lies in the fact that the cause of the symptoms is indicated by it. On account of the fact that a disease of any coat, indeed any condition of the heart, may lead to myocardial insufficiency, it will be seen how wide the application of this term becomes. Even for valvular disease, for the chronic form always, and sometimes for the acute form, this holds good; for in decompensation, or failure of compensation, the myocardium is always affected in one way or another.

I. DISEASES OF THE PERICARDIUM

PERICARDITIS

PROPHYLAXIS.—This is very unsatisfactory. I do not know that we are able to do anything, so far as prophylactic measures are concerned. We

can to a certain extent prevent the development of all forms of cardiac inflammation by treating the original cause. The less developed the causes become the less are the chances of cardiac inflammations. Furthermore, in connection with rheumatism we can do a great deal to prevent relapses, and in preventing relapses we do something in the prevention of the development of cardiac inflammations. This is more important in connection with endocarditis than it is with pericarditis. The prophylaxis will be largely the prophylaxis of rheumatism, and the better we understand the prophylaxis of rheumatism the better shall we be able to prevent many of these cases.

Serofibrinous Pericarditis.

Dry Pericarditis.—*Treatment.*—It does not matter how mild the attack may be, as soon as there are evidences of pericarditis the patient must be put to bed and be kept perfectly quiet in every way. This is of the greatest importance in the treatment of pericarditis, because if the patient is not kept in bed he may have an extension of the process that otherwise would not occur.

The heart must be watched for evidence of myocardial involvement. Should the pulse become weak, rapid, and arrhythmic in a case of serofibrinous pericarditis, and should there be added some external effort, collapse may occur. The patient, then, must be kept absolutely quiet, which means certainly in a well-marked case that he must use a bedpan and that he must not get up or exert himself for any reason whatever. This absolute rest should be continued until every evidence of pericarditis has disappeared, until there is no longer a friction rub and no evidence of effusion. If the friction rub continues, as may be the case, the patient may be allowed to get up after all the evidence of acute illness has disappeared; that is to say, when there is no fever and no increase in pulse rate upon slight exertion. It takes much exercise of judgment in some cases to determine when to permit these patients to get up. On the whole, from ten days to two weeks is usually sufficient in an ordinary dry pericarditis.

The *diet* of the patient should be regulated according to the disease that produces the pericarditis. On the other hand, we must not give the patient with pericarditis a diet made up exclusively of one group of foods, no exclusive meat or milk diet. The muscle of the heart feels a reduction in nutrition as quickly as any other muscle in the body, if indeed not more quickly. Nothing must be done to cause a weakening of this muscle. The bowels should be kept open and the stomach must not be overfilled.

The *bowels* are best relieved by salines; when rectal methods are used they should be restricted to those acting only on the rectum itself. Other cathartics, such as rhubarb, senna, cascara sagrada, or mineral waters, may be used for individual conditions.

These patients have a certain amount of *pain*, and often this pain, combined with the rapidity of the heart's action, will cause the patient to lose sleep. For relief we must frequently resort to the administration of certain drugs. First, we should use the bromides. If these are not sufficient, the administration of morphine may be tried, a very small dose of which may be sufficient. If a very small dose is not sufficient, we may give the ordinary dose by hypodermic injection, which is always effective. The chloral com-

pounds should not be used, since they may give rise to unpleasant cardiac symptoms. The other hypnotics as a rule are valueless, because they do not control the pain; wherefore trional and sulphonal are unsatisfactory.

For the *inflammation* itself external means of various sorts are used. The most important, according to my experience, is the application of cold over the heart. It has been pretty clearly shown experimentally that cold applied externally affects the tissues much more deeply than we formerly believed. Cold is applied generally in two ways: first, by means of the ice bag; secondly, by the Leiter coil. The ice bag is kept over the heart in pericarditis day and night. It gives relief to pain, and reduces the frequency of the heart beat; in other words, it gives relief to the two dominant symptoms. If there is fever it has a tendency to reduce the temperature. Other hydropathic measures may also be used (v. Pleurisy).

Among *external measures* counterirritation still holds a place. This may be secured by means of blisters, by the galvanocaustic, by the external application of iodine, croton oil, or tartar emetic ointment. I have never been able to satisfy myself that these are of value in this condition. If external measures are used at all, those should be chosen that can be applied most accurately; wherefore preference should be given to the galvanocautery or the Paquelin cautery. The use of blisters is a barbarous procedure, only exceeded by the use of croton oil and tartar emetic ointments. By the latter the patient is marked for a lifetime. Tincture of iodine, which is such a favorite in this country, I believe to be absolutely useless. If iodine is used with the idea that it is absorbed and acts directly upon the serous membrane, other preparations should be prescribed.

In order to produce a *direct effect* upon the membrane, various things have been used—mercury, the oleate of which is the best preparation; iodine. The best way to use iodine here is in the form of the iodovasogen, a very valuable preparation. It is on the market in four-per-cent and ten-per-cent mixtures of iodine. This is to be rubbed in in the region of the heart. How much good it does in this disease I do not know.

Internal medication is not necessary in an ordinary case of pericarditis; the causal treatment should be continued and the symptoms met by proper treatment. Thus it may become necessary to give tonics. In very nervous patients the bromides become necessary; or valerian preparations, which act also as cardiac tonics. The routine use of digitalis seems to me without justification; a rapid pulse is not the indication for its use; when, however, the pulse becomes weak and rapid we have evidence of myocardial weakness; then digitalis is invaluable (v. Chronic Myocardial Insufficiency). Early use of digitalis may, under such conditions, be life-saving, for as these symptoms are commonly the evidence of myocardial weakness, an untoward result may occur from delay. When digitalis is used early, even the myocardial fibers which have been affected by inflammation may be stimulated to extra work, and acute myocardial insufficiency may not develop. To a certain number of patients digitalis should be given immediately; thus, where there is a valvular lesion the pulse must be most carefully watched and the least change in strength must be immediately met with digitalis; also in chronic nephritis and in all those general conditions in which the heart muscle is already weakened, as in grave anæmias or scurvy. When

adhesions develop, the use of digitalis may be indicated to cause more forcible contraction of the heart, a sort of cardiac gymnastics; it is asserted that pericardial synechia may be prevented in this way, but there is no way in which the truth of this assertion can be proved. Digitalis is always indicated when there are evidences of myocardial weakness, such as functional disturbance in the kidneys or congestion of the liver. I have ceased using strophanthus in pericarditis (v. Chronic Myocardial Insufficiency). In acute collapse stimulants, including the vasoconstrictor remedies, are recommended.

Pericarditis with Effusion.—All the methods used in removing fluid from the pleural cavity have been recommended here. Some of them require special attention, as conditions in the pericardial sac are somewhat different from those in the pleural cavity (v. Pleurisy with Effusion). A patient with pericardial effusion must be kept absolutely quiet in bed. The reducing diets mentioned in connection with pleurisy can rarely be used, as the most important indication in this form of pericarditis is to prevent acute myocardial insufficiency. The nutrition of the already diseased myocardium is not improved by any one of these methods; therefore the chances for acute myocardial insufficiency are increased. Here the attempt may be made to remove the fluid by the administration of diuretics; for this purpose digitalis, theobromine sodium-salicylate (diuretin), or squills may be used. To the latter there are objections (v. Chronic Myocardial Insufficiency); digitalis and diuretin are very valuable because of their action upon the heart, but diuretin especially, because of its direct action upon the kidneys. I have certainly seen good results follow the administration of diuretin in pericardial effusion. The diaphoretics I never use in pericardial effusion; pilocarpine is a heart depressant; hot baths produce palpitation and possibly collapse.

After a fair trial of the methods recommended, the fluid should be removed by surgical means. In pericardial effusion I always make it a rule first to withdraw fluid with a hypodermic syringe, principally for diagnostic purposes; but also because, as in pleurisy, I have seen absorption of the fluid as its result. Unless there is an *indicatio vitalis*, I wait a few days and then, when no improvement follows, I resort to more radical means; here, again, I prefer the aspirator, used as in pleurisy, and preferably the protected trocar, as I have in one case wounded the heart with an unprotected needle.

The indications for the operation are as follows: The *indicatio vitalis*; in all cases in which there is acute myocardial insufficiency depending upon the presence of the fluid; in the majority of cases this means a large effusion, but in a certain number of individuals with damaged hearts even slight resistance to diastolic dilatation may require the removal of the fluid. The fluid should also be removed when its presence is sufficient to make the patient an invalid and prevent his following his occupation, or when the presence of the pericardial fluid may lead to other complications.

In the performance of the operation general anæsthesia should not be used. Local anæsthetics, ether, ethyl chloride, the Schleich method are useful; at all events, they give great mental comfort to the patient.

For the site of introduction of the needle there are four recommendations: (*a*) The introduction of the needle immediately to the left of the

sternum. The great objection to this method is that the internal mammary artery may be wounded. (*b*) The introduction of the needle, 2.5 cm. (one inch) to the left of the sternum, in the fifth interspace. Here wounding of the internal mammary artery is avoided, but if we wound the heart, which is possible, its thinnest part, the right ventricle, is wounded. (*c*) As a result of the dangers of *a* and *b*, Rotch recommends puncture to the right of the sternum, when we can be guided by the right cardiohepatic angle. As a rule, this method is devoid of danger and perfectly satisfactory; it will not damage the heart unless it is low; then the right auricle or ventricle may be wounded. It cannot, however, be used except in large effusion. (*d*) The method which I use is that of Curschmann, recommended by F. C. Shattuck, E. Romberg, and others. Here the site of puncture, which is always to the left of the nipple, depends upon the percussion outlines. The apex beat is determined, then the outer line of absolute dullness, and the needle is introduced between the two points. When the location of the apex beat cannot be determined, a friction rub may sometimes be of value; under all circumstances the left cardiohepatic angle gives us positive knowledge as to the furthest extension of the fluid. When the quantity of fluid is large the determination of the apex beat is not necessary; when it is small and the apex beat cannot be determined the fluid should be withdrawn, with the patient lying down in bed. It is evident that the object is to avoid wounding the heart, which may occur even when all precautions are taken. In this direction lies the great advantage of this method; wounding the heart is provided against; when it does occur, we wound the left ventricle, which is the thickest part of the heart and which it would be probably impossible to perforate *in toto*, unless it were firmly held. Beyond the accuracy of this method this is its greatest merit. The objection has been raised that the pleura is punctured. This, as a rule, can only be the case in large effusions when, as Romberg points out, the puncture or penetration of the pleura should be looked upon as an advantage, because effusion, usually present there, may then also be withdrawn. In smaller effusions no harm is done by the perforation of the pleura with a sterile aspirator needle.

After the operation has been performed the usual methods for protecting the wound against infection are used, the patient is left absolutely quiet, and the symptomatic treatment is carried out.

Whoever has had occasion to perform paracentesis pericardii as a vital indication will testify to its marvelous effects; the cyanosis, the dyspnœa, the oppression, the symptoms of acute myocardial insufficiency, all disappear; therefore this operation should be performed, even if the patient seems to be in an absolutely hopeless condition. There are many instances on record in which this life-saving operation has snatched patients from the "jaws of death." Unfortunately, not so favorable an account can be given as to permanent results; the statistics of v. Schrötter show a mortality of fifty-three per cent. This is manifestly an exaggerated statement, because, as the operation is no longer a rare one and is frequently performed by the general practitioner (as should be the case), many cases are not reported. But this mortality is due not to the operation, but to the causes that produce the effusion—e. g., nephritis, chronic diseases of the heart. In tuberculosis with a healthy heart the chances of permanent recovery depend upon the

localization of the process to the pericardium. But the chances of remote recovery need not be taken into consideration for the individual case; here it is the prevention of immediate death that is accomplished by the operation.

The use of gymnastics or mechanical means in the treatment of pericarditis will be found in the next chapter.

CHRONIC ADHESIVE PERICARDITIS

PROPHYLAXIS.—The prophylaxis of pericardial obliteration has been seriously discussed. If it is of any importance whatever, it can only be so after an attack of pericarditis. That form connected with epicarditis, mediastinitis, chronic peritonitis, perisplenitis, or perihepatitis can certainly not be guarded against; as a rule, it is not recognized *intra vitam,* and when recognized it is too late to do anything prophylactically. Practically, the prophylaxis resolves itself into the prevention of adhesions between the two layers of the pericardium. This, evidently, can be done only in one way, by causing increased systolic contraction and increased diastolic dilatation of the heart. Special attention must be paid to the diastole, the systole being a much more active process.

AFTER-TREATMENT OF PERICARDITIS

In all cases of pericarditis this should be directed toward the possible prevention of firm adhesions. On the principle just stated, attempts may be made by various methods. Respiratory gymnastics that increase the expansion of the thorax should be used; for the active dilatation of the heart is principally produced by the elastic traction of the lungs. The use of digitalis during the attack has already been referred to; if the heart is normal it increases both systole and diastole; therefore its use may be continued for some time. According to the condition found after pericarditis, the patient should be ordered graded exercise, CO_2 baths, active or passive movements (v. Chronic Myocardial Insufficiency). When the patient has been reduced by the attack the passive methods should be used; when the condition of the heart and that of the general health warrant it the active methods are indicated; whatever is done should be done gradually and should be controlled by the physician.

When the condition of obliterative pericarditis has well established itself little can be done. The attempt has been made to increase absorption by the use of remedies already mentioned in chronic pleurisy; when one sees a case of obliterative pericarditis the futility of such external measures in very serious internal diseases is thoroughly impressed upon one. The principal indication is to give such directions to the patient that heart strain is avoided; the treatment of this, as well as of the myocardial insufficiency that eventually develops, will be found in the chapter on chronic myocardial insufficiency.

HYDROPERICARDIUM

TREATMENT.—The treatment of hydropericardium is practically the treatment of the disease by which it is produced—e. g., chronic nephritis,

chronic heart affections. As a rule surgical intervention is not necessary, but when serious symptoms develop as the result of the presence of large quantities of fluid the pericardium should be tapped. This gives temporary relief only; it is, therefore, a purely symptomatic indication. When infection exists with dropsy of the pericardial sac, paracentesis should always be done. As a rule the fluid does not collect so quickly in the pericardial sac as in the pleural cavity; but exceptions occur and the physician should always be ready to give relief when it is required; therefore a close watch upon symptoms is necessary. As this condition is frequently a terminal one, not much can be hoped for by treatment.

PYOPERICARDIUM

TREATMENT.—This is purely surgical—that of an abscess. The incision, made about 3 cm. to the left of the sternum, should be a free one; when necessary, resection of ribs must be resorted to. The cavity is then irrigated and drained. The results depend upon the cause of the accumulation of pus; if that is due to septicopyæmia they are apt to be unfavorable; if due to a local infection only they are good. Under no circumstances should aspiration be performed as the only procedure.

HEMOPERICARDIUM

TREATMENT.—The results are good or bad, according to cause. When an aneurism has burst into the pericardium no treatment will avail. When the intrapericardial pressure is increased by large hemorrhages diastole becomes impossible and the patient dies in the time required to produce diastolic death.

Medically we can do very little in profuse hemorrhages; frequently the physician when called finds his patient dead, or he cannot remove the cause of the hemorrhage. Under all circumstances, in the latter instance, all those things should be done that have been recommended in other internal hemorrhages.

Where the hemorrhage is due to trauma and repair can be secured the results are fairly good, improving constantly as surgeons become better acquainted with heart surgery. The number of patients that get well after operation for wounds of the heart is constantly increasing.

PNEUMOPERICARDIUM

TREATMENT.—The treatment is surgical, including the medical means required to stimulate the heart, the general circulation, and the treatment of collapse. Some authors recommend the aspiration of the air contained in the pericardial sac; this may be done as a temporary measure to give relief. But as infection of the pericardium usually exists or develops sooner or later, the more radical operation of incision with subsequent antisepsis should be performed. The permanent results depend entirely upon the cause of the pneumopericardium.

II. DISEASES OF THE MYOCARDIUM

MYOCARDITIS

Acute Myocarditis.—PROPHYLAXIS.—As this is a disease which occurs in many acute infections—diphtheria, scarlatina, rheumatic fever, typhoid, smallpox, pneumonia, gonorrhea, septicopyæmia, and influenza—reference to these diseases will show how much may be done for prophylaxis with regard to indirect prevention. As to its distinct prevention by treatment of the disease producing it, very little can be done in most instances. Diphtheria may be looked upon as an exception, as I am convinced from personal experience that large doses of antitoxine, given at the earliest possible time, will act prophylactically. In rheumatism the question is not decided, although, as in endocarditis, it is asserted that it may be prevented, especially by the alkaline treatment. Theoretically, the prevention of this disease depends largely on the prevention of toxæmia, less so upon the treatment of bacteriæmia, but, as the latter frequently includes the former, it seems likely that serum therapy may, in the future, act prophylactically in a measure not yet attained. As the danger to patients with acute myocarditis occurs not only during the febrile period but not infrequently long after the fever has run its course, prophylaxis *post infectionem* is of enormous value to prevent it. The great danger is fatal acute myocardial insufficiency. The patient must be kept absolutely quiet in bed until the pulse becomes normal—i. e., in tension and pressure; then the heart may be tested as to its reaction; when it reacts excessively upon slight irritation the patient must still be kept in bed. For instance, when the pulse rises twenty beats or more after taking food or after the entrance of a stranger into the room, or upon other slight provocations, such a patient should not be permitted to get up. The manner of getting up should also be controlled (v. Diphtheria, Acute Endocarditis). In diphtheria this direction should be carried out with the utmost rigor, notwithstanding the inconvenience to the patient and his objections. As the physician can only direct and cannot be held responsible for the carrying out of his directions, it is his duty to explain to nurses and to the family the importance of following them and the danger of neglecting any minutiæ. Under some conditions a plain, straightforward talk with the patient becomes necessary. In unruly children the problem becomes very vexatious and at times impossible of solution. In postscarlatinal and post-typhoid myocarditis the restraint need not be so complete, although in two instances I have seen death follow after typhoid fever on account of the patient's failure to follow directions.

TREATMENT.—Medically very little can be done except symptomatically. The digestion should be kept in order by food proper both in quantity and quality; frequent small meals are preferable to large ones taken three times daily. Alcoholic stimulants and tonics may be given, the former in small doses; strychnine may be used in small doses for its general tonic properties. Digitalis is of service principally for diagnostic purposes; the less its effect the greater the number of muscular fibers affected; experimentally it has been shown that it produces transitory beneficial effects (Pässler); under

all circumstances it should be used with great caution. I have never used strophanthus. The angina-like attacks should be controlled by vasoconstrictors, especially caffeine preparations; valerian preparations are also of value. Nitroglycerine should never be prescribed, as we do not know how much dilatation of blood vessels is already present; an increase of this might lead to serious consequences (v. Acute Myocardial Insufficiency). Morphine is rarely required. Jacobi recommends opium in children; it is valuable in them as well as in adults (Musser) on account of its effects upon the nervous system. External applications are necessary only for direct indications; simple ones may give relief for pain; the ice bag should not be used unless evidences of inflammation exist.

CHRONIC MYOCARDITIS

PROPHYLAXIS.—This is that of myocarditis and endocarditis, of alcoholism, saturnism, gout, or syphilis. The prevention of increase in the myocardial process seems to offer possibilities of some success. Here the treatment of the cause may be of benefit whenever this treatment is possible. Again, it is doubtful whether the treatment of rheumatism will be followed by good prophylactic results, but nevertheless the slightest attack should be carefully treated.

TREATMENT.—The treatment of the disease will be found in the chapters devoted to acute and chronic myocardial insufficiency.

III. DISEASES OF THE ENDOCARDIUM

ENDOCARDITIS

PROPHYLAXIS.—We so often find the statement made that nothing can be done to prevent this disease that we accept it without much hesitation. Yet it seems perfectly plain that endocarditis can be prevented by the prevention of those diseases that induce it: the infectious diseases, rheumatism, and chorea. Can we prevent endocarditis in an individual affected with one of these diseases? Not with any positive assurance of success; but it is again going too far to say that even here in individual cases endocarditis cannot be prevented. The production of endocarditis is due to two causes, a local and a general cause. The local cause is to be found in some predisposing factor in the endocardium itself, which, in many instances, cannot be reached by anything we may do, but which can be minimized by comparative rest of the heart. More than this, we possess for rheumatism, in which the fibrin of the blood is increased, a method of treatment which decidedly diminishes the tendency to fibrin formation—i. e., the alkaline method.

For the treatment of the general cause we also have measures of importance, although they are still on trial; the use of the various streptococcus sera, possibly the abortion of an attack of rheumatic fever by salicylic acid, or the proper treatment of septicopyæmia. If all mild forms of rheumatic

fever were treated properly, valvular lesions would be much rarer than they are. This certainly will be verified by all those who have seen rheumatism in children; advisedly I say "have seen," because the fact remains that in children rheumatic fever is not seen except by those who have been especially taught to recognize the disease. A large number, then, do not see the endocarditis that frequently follows rheumatic fever in children, which may produce few symptoms and the physical evidences of which may disappear, but which, nevertheless, leaves a *locus minoris resistentiæ*, predisposing afterwards to endocarditis after an infection from any source. The same may be said in the case of children with endocarditis resulting from tonsilar affections—and such cases are not rare—in which prophylactic treatment is of enormous value. Even Romberg admits that the relapsing form of endocarditis can be prevented by the prophylactic measures adapted to rheumatism.

TREATMENT.—The patient must be kept in bed. When any adventitious sound is found in the heart of a patient suffering with a disease that leads to endocarditis, the patient should be kept absolutely quiet; he should not be allowed to get out of bed for any reason whatsoever. An ice bag should be put over the region of the heart; if it does nothing else, it has a favorable effect upon symptoms—palpitation, pain, reduction of pulse rate. I have never seen harm follow its use. The digestive tract should be kept in an approximately normal condition by proper diet and daily evacuation of the bowels; the latter brought about by calomel or saline cathartics. The question whether causal treatment should be continued must be decided as to the individual characteristics. When salicylic acid preparations are badly borne they should be discontinued, for they then produce gastric, cardiac, or other symptoms not conducive to heart quiet. In all cases the large doses used should be reduced or, better, the alkaline treatment should be instituted. Antipyrine has also been recommended in this disease; my limited experience with it is favorable, even when given in comparatively small doses. Digitalis or strophanthus should be used only for heart weakness, dilatation, or myocardial insufficiency; when embolism has occurred it should never be used. The vasoconstrictors should be used as indicated (v. Acute Myocardial Insufficiency).

In some cases it becomes a nice question to settle when the patient should be allowed to get up. In general this is decided by (*a*) the condition of the myocardium; (*b*) the amount of damage done to the endocardium; and (*c*) the general condition of the patient.

(*a*) When there are evidences of myocarditis, which is usually present with endocarditis, all the symptoms must be allowed to disappear before any effort is made to permit the patient to get up. A condition of intrinsic weakness of the myocardium preventing compensation may exist and may be followed instead by dilatation without hypertrophy; this is found in patients in whom the myocardium has suffered as the result of long acute diseases, of chronic myocarditis, in obesity, in drinkers, and in old people. Here tentative efforts may be made to reduce the dilatation, either by the administration of digitalis or by stimulating the heart reflex, which may be done in the simplest way by allowing the contents of a siphon of carbonated water to be squirted upon the skin over the heart. When the heart

outlines diminish and the pulse becomes stronger and fuller the other methods to be mentioned below may be used.

(*b*) When lesions have been produced in more than one valve, or very extensive damage has been done to special valves, the myocardium may have difficulty in effecting compensatory processes. Physical examination during the acute stage of endocarditis does not permit us to draw any conclusions as to the amount of permanent damage that has been done; frequently we cannot even localize the lesion with precision. Here, then, the condition of the circulation should guide us as to the patient's leaving his bed; the tension, the relative frequency, the pressure of the pulse; also those evidences found in remote organs, the lungs, the liver. When there has been embolism the patient should be kept in bed for a long time.

(*c*) When there is fever no patient should be allowed to get up; the same may be said for those whose strength has been undermined by the causal disease; by the profuse sweats, the loss of appetite, the anæmia, sometimes the result of prolonged or improper use of salicylic acid or its compounds. The myocardium suffers quickly from impaired nutrition, therefore everything should be done to prevent and remove such impairment; iron preparations, bitter tonics, including nux vomica or strychnine; small quantities of alcoholic stimulants are indicated.

The decision having been reached that the patient is ready to leave his bed, it is best to pursue some definite method, more or less modified, however, by the individual conditions of the case. I usually begin with massage and resistant movements, applied in the mildest possible way at first and then gradually increased; the condition of the pulse as to regularity, rate, and tension being noted before and after the manipulation. When the proper reaction takes place the passive exercises are increased in force and duration. The use of CO_2 baths is accompanied by too much disturbance to the patient and I do not use them at this stage. Later on they are useful, but they are not indispensable (for the details of these methods see Chronic Myocardial Insufficiency). During the first week the patient has been allowed to sit up in bed, first for a short time, then longer and longer, until only the normal changes in pulse rate are noted. After a week of treatment, sometimes sooner, sometimes later, the patient is allowed to leave his bed and sit up in a chair by the side of the bed. The normal reaction of the pulse may be determined here by its frequency; if an increase of about twenty beats per minute is produced, it must be looked upon as an abnormal reaction. After he has sat up in a chair, the time of sitting up being gradually increased, he is allowed to walk; first short distances, then longer and longer, being finally permitted to leave his room. Then he may be permitted to walk downstairs, to go out for a drive, and finally to walk upstairs. The time required to carry out this method varies; it may be completed in three weeks, it may require months; in one patient with myoendocarditis of a severe type, and that, too, in a child where the time required is usually very short, nine months were necessary before the patient could be permitted to go about as she pleased. When compensation is not fully established CO_2 baths may be used, or the other measures recommended in chronic myocardial insufficiency. The time required in endocarditis for the patient to return to his usual occupation varies according to the individual and

the occupation. In all those occupations which produce heart effort great caution should be exercised; sometimes it will be found necessary to recommend change of occupation. It is sometimes a difficult question to decide to what extent compensation will be sufficient in relation to occupation; but the fact must not be forgotten that the heart muscle is very much like skeletal muscles, in that judicious exercise strengthens it. To the acceptance of this fact we largely owe our progress in the therapy of heart disease.

Malignant or Ulcerative Endocarditis.

The TREATMENT is that of the septicopyæmia which produces it. In two instances in adults I have seen favorable results from the use of streptococcus serum, and in one child from the use of collargolum (v. Septicopyæmia). I emphasize this because in so dangerous a disease as malignant endocarditis anything that seems rational should be tried. Romberg reports a case in which 0.5 gm. (gr. vijss.) of quinine hydrochlorate given twice daily produced "remarkable improvement," ending in recovery. Sansom has used sodium sulphocarbolate, 2 gm. (3ss.), successfully in one case. Arsenic and quinine have been successfully tried; also antipyrine. In this form of the disease the patient should be kept in bed and be absolutely quiet; alcohol may be given freely; the diet is the same as has been recommended for septicopyæmia (q. v.). Digitalis is useless, probably harmful during the acute stage. Vasomotor constrictors may have to be used.

Camphor, ether, musk may become necessary in collapse. As ulcerative endocarditis produces great valvular defects and much involvement of the myocardium, the period of convalescence is long drawn out. The treatment here is the same as that after an attack of simple endocarditis.

IV. MYOCARDIAL INSUFFICIENCY

ACUTE MYOCARDIAL INSUFFICIENCY

TREATMENT.—The heart may become acutely insufficient as the result of deficient systole or deficient diastolic dilatation; both occur, and the condition may be so severe that a fatal issue immediately takes place. The treatment in deficient diastole has already been described in connection with diseases of the pericardium. There remains for our special consideration here deficient systole or absence of systole, asystole, manifestly due either to some acute myocardial condition or to withdrawal of a large quantity of blood from the heart, whereby the absence of its normal contracting stimulus causes systolic death. To produce this condition we have in the myocardium, acute myocarditis (q. v.) and acute dilatation of the heart or heart strain. For impending heart death, asystole, little can be done; cardiac stimulants may be tried—camphor, musk, ether; strychnine should be given in small doses to improve the general tonicity, but care must be taken that vasoconstrictor effects are indicated, otherwise they may do harm; injections of digitalis may be used; probably morphine may have to be added to control suffering and to obtund afferent impulses. Caffeine may be indicated, as it improves the coronary circulation and increases systole, but with this

drug also one must keep in view its vasoconstrictor effects. External measures in the form of sinapisms, hot or cold applications, may be used. Sometimes heat gives great comfort, at other times the ice bag. The patient should be put to bed when possible, or at all events be kept upon his back and absolutely quiet.

If the patient recovers great care must be exercised for some time, but especially in the week following the onset of the condition. These patients, as a rule, should be considered as having chronic myocardial insufficiency and should be treated accordingly. When the condition has once occurred in children great care must be taken as to exercise, especially during the period of adolescence, but the results of treatment are immeasurably better in them than in adults.

The heart strain produced by excessive coughing, whooping cough, or influenza is best controlled by the remedies given in these diseases; but the paramount indication is that of reducing the number and the intensity of the attacks; codeine, opium, or morphine should be given. To improve systole digitalis or strophanthus should be administered; it is not necessary to give these in a routine way in all cases of pertussis or pseudopertussis.

Asystole due to improper innervation of the heart is beyond our control; for the cardiac nerve centers surgical intervention may be occasionally considered (in increase of intracranial pressure); when there is asphyxia, the inhalation of oxygen may be of service; in the toxic conditions nothing avails. The various cardiac stimulants should be used, but as a rule the condition is hopeless.

Under the remaining condition—i. e., when a large quantity of blood is withdrawn from the heart—we can hardly take the term of acute myocardial insufficiency into consideration, because no mammalian heart will continue to contract when its intracardiac stimulus is taken away; consequently it is not the fault of the myocardium, which, therefore, is not "insufficient" when it ceases to contract. Asystole from hemorrhage may be prevented by the introduction of large quantities of a normal saline solution into the circulation; the method (hypodermoclysis or venous transfusion) to be followed depends upon the urgency of the symptoms, on the necessity of repetition of the procedure, and whether the hemorrhage is or is not controlled. In the infectious diseases the mechanism of the production of asystole or diminished systole has been established by Romberg and Pässler for diphtheria and pneumococcus infection; and as this has been verified by Heinike, Rolly, and v. Stejskal, it may be accepted. The toxines of these bacteria affect the vasomotor center in the medulla, producing dilatation of the blood vessels and death in a very short time. Pässler and Rolly then showed that only in diphtheria might the toxine produce changes in the myocardium itself; here the symptoms are those we find in acute myocarditis. In addition, Romberg and Pässler, with Beuhus and Müller, showed that the blood vessels in different parts of the body were differently affected; they were found empty in the brain, the muscles, and the skin, but all the vessels supplied by the splanchnic nerve were overfilled. The latter is the essential feature because it explains all the clinical symptoms, the enormous lowering in blood pressure, and systolic death; for the overfilling of all the blood vessels supplied by the splanchnic nerve represents a loss of blood to the

general circulation which must lead to asystole, as the heart bleeds itself into these blood vessels and its normal stimulus to contraction is removed. This mechanism is not confined to pneumococcus and diphtheria infection alone; it occurs also in influenza and typhoid; in sepsis and possibly in other infections; in shock, especially after abdominal operations; and its clinical evidences are so well marked that it cannot easily be mistaken for acute myocardial insufficiency, as I have been able to demonstrate repeatedly since the publication of the various experiments just referred to. In treatment the application of these research results has been of great value.

Experimentally Pässler has determined by what means this condition, when once established, can be relieved in pneumococcus infection: digitalis produces a transitory effect without any effect upon the blood vessels; no effect is produced by alcohol, or, if any, a bad one; there is no effect from ether, or possibly a bad one upon the vasomotor centers; strychnine produces effects only in toxic doses; ergotin none; camphor is of value; caffeine is followed by the best and most lasting effects. Infusion of normal saline solution is followed by a good temporary effect. Massage of the abdomen is very valuable. The method I have used is based upon the use of remedies that constrict the blood vessels supplied by the splanchnic nerve and upon the introduction of a saline solution into the circulation. My remedies for vasoconstriction are adrenalin and caffeine, administered hypodermically. Adrenalin especially possesses the property of producing contraction in the blood vessels supplied by the splanchnic nerve; as its effects are transitory, it must be administered frequently—every two to three hours in the 1:1,000 solution, of which from 1 to 1.5 c.c. is given at a dose. Caffeine sodiosalicylate may be given, combined with adrenalin or alone; when the patient begins to improve, caffeine alone is given (v. Chronic Myocardial Insufficiency), the adrenalin being gradually discontinued because I have found that the action of caffeine is more lasting than that of adrenalin. Further, I apply two or three ice bags to the abdomen, to act upon the abdominal reflex, because it increases blood pressure and reduces frequency of systole. The use of this measure has done away with the necessity of massage, which is impossible after abdominal operations. The introduction of normal saline solution is necessary in order to supply fluid to the heart; it has also been positively demonstrated that this solution acts as a normal irritant to systole. When the condition is urgent, venous transfusion must be performed and repeated; after the urgency of the symptoms has passed hypodermoclysis may be resorted to, but in women never under the breast, as it is too painful, but into the thigh.

Convalescence.—The treatment of the period of convalescence depends upon the nature of the condition; that of myocarditis has already been referred to. In vasomotor paralysis, unaccompanied by heart lesions, the causal treatment of the condition is sufficient. When normal circulatory conditions are established complete recovery is rapid.

CHRONIC MYOCARDIAL INSUFFICIENCY

In this chapter the treatment of chronic valvular disease will be described, as every valvular lesion sooner or later leads to myocardial insufficiency. In this disease we recognize two stages—compensation and myocardial insuffi-

ciency. The latter stage may again be subdivided into two stages: the first characterized by the milder symptoms of circulatory disturbance, dilatation of the heart not being a constant factor; the second, in which the severer symptoms manifest themselves by dilatations of the heart and the presence of œdema or anasarca, symptoms due to venous stasis and disturbances of nutrition. In either stage of myocardial insufficiency the heart may again be restored to a condition in which the circulation can be fairly well reëstablished. All this can be expressed in terms relating to dyspnœa: in complete balance between systemic and pulmonic circulation dyspnœa is absent in exertion or occurs only upon extraordinary exertion; in incomplete balance, ordinary exertion may produce it (going upstairs or even walking); in the last stage of myocardial insufficiency dyspnœa may be present when the patient is at rest, and be exacerbated by the simplest effort, such as talking, taking food, or the slightest movement. In all cases an improvement may be expected as the result of treatment, in most cases so marked that the patient may live for many years; the great exception is found in the cardiac cachexia, in which there is no hope of anything more than improvement by treating the symptoms—the heart itself, on account of nutritional disturbance, no longer reacting to remedies.

Prophylaxis.—As a rule very little can be done here beyond the prophylaxis already mentioned in the various forms of heart disease, as the patient usually comes to us when symptoms of myocardial insufficiency already exist. The ordinary rules of life that may be called normal, the adoption of physical and psychical hygiene, act prophylactically here as in most conditions. Excesses *in Baccho et Venere* should especially be avoided; also excessive physical or psychical efforts. The various intoxications should be treated. Syphilis should always be treated in the most radical way. By attention to prophylactic measures in the period of compensation much more can be done for patients who have a heart condition tending to myocardial insufficiency; this applies especially to valvular diseases, but also to the chronic myocarditis, even in old people with arteriosclerotic changes (the senile heart of Balfour), in which a fair amount of compensation can frequently be obtained. As the maintenance of compensation depends altogether upon the condition of the myocardium, unless some new resistance to circulation develops our main object must be to keep its nutrition normal. This is accomplished by methods that act indirectly upon the heart—by food, exercise, the stimulation of normal nervous impulses, the absence of everything deleterious in its effects upon the heart; also by the judicious treatment of all affections that may put increased work upon the heart or may affect it by lowering its nutrition or may directly produce increase of the diseased condition already existing. Upon the whole, the prophylactic measures should be those of the normal mode of living adapted to the individual; the less irksome any special directions are the better.

Frequently patients who are not suffering in any way come to us to have their hearts examined; either they have been rejected for life insurance or they have become nervous about their hearts, and a compensated heart lesion is found. Or in the routine examination of a patient we find a compensated heart lesion. It will then be the duty of the physician to give such advice and directions as may be followed by prolongation of life and maintenance of health and usefulness.

The first question that will arise is, should the patient be told of the existence of his heart trouble? The question is answered in so many different ways by different authors that it strikes one that a positive or negative answer depends more upon the temperament of the author than upon the needs of the patient. It is best for both patient and physician that the trouble be known. But this knowledge should be conveyed in such a way as not to alarm the patient, for the laity, not unnaturally, have a great fear of heart diseases. One can never be absolutely sure or scientific in heart diseases, and if the physician is an impertinent scientist he does incalculable damage to the patient. In the beginning of my medical career the scientific status of heart diseases was such that we accepted the existence of a cardiac bruit as a dire omen; indeed, there are patients whom I examined at that time who always smile when they see me—because they are still alive. It is always best to confine our remarks to the objective condition, and it is not necessary to add to them anything concerning the possible or probable outcome. This is necessary, because length of time during which compensation may be maintained is determined by the care the patient takes of himself. When the physician does not tell the patient, he is taking a responsibility that really should be not his but the patient's; if evil results follow, an error has been committed by the physician. But the way in which the patient is told of his complaint necessarily depends upon the character of the patient, and the wise physician always makes due allowance for this; if he is not competent to decide how to tell the patient—in other words, when he cannot tell how much harm may follow the knowledge of the existence of a heart lesion—it is safer to consult some friend or relative of the patient, and this, as a rule, is of material assistance. On the other hand, there are those to whom we must tell the story in exactly the opposite way, occasionally exaggerating the importance of the lesion: in those who are addicted to excessive venery and alcoholism; in sport-loving individuals, frequently half-grown boys or girls, who will not desist, notwithstanding repeated warnings, from straining their hearts, this course should be followed. In very nervous people the greatest circumspection is required; many a time have I seen the lack of this followed by hypochondriasis, in one instance by suicide. When a heart disease is discovered in a patient with an incurable condition which produces the heart disease, such as senility, nephritis, chronic bronchitis, emphysema, or arteriosclerosis, it is not necessary to tell him, as prophylactic measures can be applied to fulfill indications covered by the causal disease. When in the course of an acute disease a heart disease is found, the patient should not be told of it. Whenever the physician withholds such knowledge from the patient, some other reason must be given the patient for carrying out the prophylactic instructions, and under all circumstances the condition of the patient should be explained to some one who is close to him. After recovery from the acute disease the patient must be told of his heart disease.

When the patient asks a direct question as to his heart, the *whole truth* must be used in doses, as in the case of a drug which, when administered in excessive quantities, does harm.

Occupation.—All such occupations as necessitate undue exertion should be avoided or given up. When a patient comes for advice in this connection the lesion must be taken into consideration; in mitral and in aortic insufficiency

the directions need not be so strict as in other lesions. Besides this, the muscular qualifications of the patient, especially those of the heart, must be considered. Whenever a change in occupation is advised, the effect of the occupation must be studied before a definite conclusion can be arrived at. Even when decompensation has occurred, the patient after restoration of compensation should be allowed, when possible, to return to his ordinary occupation, modified as to intensity, and this may prove perfectly satisfactory. Under certain conditions a change in occupation may mean much for those depending upon the patient, and cannot be made without serious detriment.

Diet.—It is wrong to put a patient with compensated heart trouble on a diet on account of the heart trouble itself, but if anything arises or exists that calls for regulation of diet, this should be done in heart disease as everywhere else. As the maintenance of normal metabolism is of the greatest importance for heart and blood vessels, this is the object to be attained by diet. It is undesirable for the patient to put on too much fat or to lose much weight; frequent attacks of gastrointestinal disorders are not beneficial to normal heart action; chronic intoxications should be avoided; these are the special indications that may require a special diet. Alcohol may be taken in moderation, but not daily; this is of great importance in diseases of the circulatory apparatus. Coffee and tea may be taken daily, but not in large quantities. Tobacco is not harmful if not used to excess.

Marriage.—For the man the danger lies in excessive sexual intercourse; for the woman in pregnancy and parturition. There are conditions in which the physician should advise against matrimony, but it must be unhesitatingly stated that a contraindication cannot be laid down with precision. I have in a number of instances advised women against matrimony; they have disregarded this advice, have married and have had children, one woman having six; and they are now past middle age, with their hearts apparently no worse than before. Advice should be fully given; in most cases it is just as fully disregarded. Here again the physician should not feel himself called upon to meddle: "Keep your patients' secrets as your own" is just as important as it was in the days of Hippocrates. In the man, the decision of the physician rests upon the nature of the lesion; mitral or aortic insufficiency of slight degree and nonprogressive, with full compensation, need not interfere with matrimony. In the various left-sided stenoses the patient's heart should be watched, in order to determine how much strain it will bear. Right-sided lesions should be looked upon as contraindicating matrimony. The external conditions of the patient also should always be taken into consideration. In one who can take good care of himself in regard to making no unusual demands upon his heart and in preventing recurrences of endocarditis more latitude is allowed. The occupation of the individual should have weight in the advice given; a blacksmith with a mitral stenosis will have myocardial insufficiency much sooner than a bookkeeper.

For the woman, it is conception, pregnancy, and parturition that must be feared. The enlarged uterus of pregnancy is, in and of itself, a menace to the heart; the extraordinary demands made upon it during parturition act as a direct danger, so that an acute myocardial insufficiency may be produced, and may end fatally. Besides these conditions we have the intercurrent affections that occur during pregnancy, notably puerperal nephritis. My observa-

tion has led me to believe that modern obstetrics has materially lessened the dangers arising from heart disease during pregnancy: the care that is given to patients during the early months of pregnancy and the study of their metabolism during the later months, the prevention of sepsis, and above all the use of anæsthetics during parturition, remove a number of causes that affect the heart deleteriously. But in women, as well as in men, external conditions as well as the heart lesion should be taken into consideration, and also all those conditions that might make labor difficult, such as pelvic deformities, tumors, or great muscular debility. In women the harm done to the heart by marriage is greater than in men; under all circumstances it is necessary for the physician to state to the affected individual, clearly and without exaggeration, the risks that she takes on account of the condition of her heart; the responsibility then rests with her.

Exercise.—We start with the statement that exercise of voluntary muscles acts as exercise of the myocardium; but just as excessive exercise of the skeletal muscles does harm, so it is with excessive exercise of the myocardium. Fortunately for the myocardium, we have a symptom—dyspnœa—the existence of which permits us to conclude that too much has been done. When dyspnœa occurs any special accustomed form of exercise should be given up —at least temporarily. Moreover, the individual characteristics of the patient should be considered: some detest physical exercise of all sorts, others do not feel well if they do not have a certain amount every day. Some do best with moderate quantities, others with what would seem excessive amounts. Stokes's patient with aortic insufficiency always ran behind his physician's brougham when he was making his daily rounds. Unless otherwise indicated, the patient should not be interrupted in his accustomed modes of exercise, but all unusual exercise should be forbidden. The bicycle craze may be mentioned as an example of unaccustomed exercise: it was a pitiable sight to see patients with full compensation or arteriosclerotics pumping painfully up a hill; in many instances decompensation followed. The question is frequently asked us whether certain kinds of sports may be permitted: upon the whole, tennis and football are most deleterious; next to these baseball and cricket, then golf, and, least innocuous, croquet. Yet I have some patients with full compensation who play tennis constantly and seem to thrive; they certainly do not suffer. Dancing may be permitted under proper conditions, always provided the individuals are sensible enough to desist when dyspnœa becomes marked. Billiards is an excellent form of exercise, but the best is walking, as it combines all benefits to be obtained from exercise without producing any excitement. Here also individual peculiarities must be taken into consideration.

Gymnastics are of great value; not only can they frequently be carried out more conscientiously than the exercises before mentioned, but they can be adapted to special needs. They should be performed daily; the details will be found in the next chapter.

Medical.—Digitalis should never be used unless there is a direct indication for it. Compensation is not an indication; when administered here it may do more harm than good. The same can be said for some of the subjective symptoms, such as palpitation, fluttering, or pain. In all intercurrent diseases in which the heart is a prominent factor in recovery digitalis should be pre-

scribed early unless contraindications exist. The medical treatment of any disorder arising in a patient with chronic myocardial insufficiency is of great importance.

TREATMENT.—The chief object of treatment is to restore the equilibrium between systemic and pulmonic circulation; this can be accomplished in various ways. Manifestly the best and simplest way would be to remove the cause; this, unfortunately, is possible only in rare instances, of which obesity of the heart is the most promising, though less so in syphilitics. Whether the operation for mitral stenosis suggested by Lauder Brunton, as the result of experiments upon animals, will be successful in man remains to be seen. The removal of temporary causes, however, may do much good, as also may correction of faulty processes in the digestive tract, improvement of general nutrition, and avoidance of all excesses. We are commonly confined to two direct modes of treatment of the heart: that which has an effect upon the heart itself and that which has an effect upon the blood vessels. The effect to be produced upon the heart is that of strengthening its contraction, as little can be done directly to increase dilatation. The effect upon the blood vessels is that of either contraction or dilatation. Most commonly the effects upon blood vessels are utilized to facilitate contraction of the heart, so that the blood may flow into them more freely or may be returned to the heart in a more normal manner. It is not uncommon, then, to use direct heart methods and vascular methods together; indeed, most of our methods work both upon the blood vessels and upon the heart simultaneously. All these various indications may be fulfilled by various means. In addition, symptomatic relief must be given. To fulfill these various indications we make use of medicines, physical therapy, dietetic therapy, special hygienic measures, and symptomatic treatment.

A. *Medical.*—In *digitalis* we have an ideal remedy; it increases both systole and diastole; therefore it increases arterial pressure and negative pressure in the veins, and this is followed by increased velocity in circulation. Its vasoconstrictor effects need rarely be considered, as they can be easily controlled. In its practical application many things must be taken into consideration, as its effects vary very much. In practice there is no one mode of administration that will be found suitable to all cases; the mode often depends upon the nature of the preparation used, sometimes upon peculiarities of the patient. Our knowledge of the components of digitalis is still insufficient; we know that its cardiac action depends upon at least four glucosides—digitaleïn, digitalin, digitoxin, and digitophyllin—of which only two are used for medicinal purposes—digitalin and digitoxin. We know from practical experience that those preparations are the best which contain most of the constituents of digitalis leaves—the powdered leaves themselves. Next to these are those in which both water and alcohol are used as solvents, for digitalin is not very soluble in water and digitoxin is absolutely insoluble; therefore, if we want to get the physiological effects of all these glucosides, which may or may not be the whole effect of digitalis leaves, proper preparations should be used. As all our preparations are made from digitalis leaves, the glucosides need not be taken into consideration in this connection; but it will be seen how important it becomes to select proper leaves; for the selection of leaves the reader is referred to the proper sources. But in addition all

the preparations of digitalis deteriorate with age, so that to get good effects reasonably fresh preparations should be used. The one preparation that is applicable to the greatest number of cases is the fluid extract, 0.05–0.1 gm. (℥ j–ij). While it probably does not differ materially in composition from the tincture, the quantity to be given at a dose makes it a much more acceptable remedy. The decinormal tincture of digitalis is the same as the fluid extract. If the ordinary tincture is used, only a fat-free preparation should be given. In choosing one of these preparations the physician should see that it is made by a reliable manufacturer, and that it is not too old. Frequently I have seen the fluid extract given in enormous doses without effect. In giving digitalis it is well to remember that different preparations have different effects, so that the dosage may have to be changed when preparations are changed. Not so universally applicable but the most efficient are the leaves themselves—pulverized and given in pill form, each pill containing 0.05 gm. (gr. ¾); one or two pills are given three times daily. To this there may be added quinine, the latter producing increased blood pressure when administered in small doses, as first proposed by Skoda (℞ Pulv. fol. digitalis, quininæ hydrochloridi, āā 1 gm. [gr. xvj] Ft. pil. No. xx). I rarely use the infusion, because of its unpleasant effects upon the digestive tract; theoretically its effects are those of digitaleïn with those of a very small quantity of digitalin; they are therefore less complete than those of the preceding preparations. Some authors claim that on account of the presence of digitonin all the glucosides are dissolved in water. It is also less available, especially in country practice, but in cities also, because its proper preparation cannot be intrusted to the ordinary druggist. I never use digitalin except in emergencies, and then only hypodermically. I have used Nativelles, which has turned out to be a composite preparation; the digitalinum verum of Merck is said to be a pure preparation. Digitoxin has the same properties as digitalin, but acts more energetically, more slowly, to be sure, on account of its insolubility, and it should be tried when all other preparations of digitalis fail; very small doses should be used at first—0.00008–0.00025 gm. (gr. $\frac{1}{1250}$–$\frac{1}{2500}$), two or three times daily.

In many cases the *effects* of digitalis are not far short of magical. When the proper doses and preparations have been found, results follow in from forty-eight to seventy-two hours. The dyspnœa, cyanosis, and cardiac asthma disappear. Evidences of venous stasis, the bronchitis, the enlarged liver, the dropsy disappear; diuresis sets in, and the patient feels perfectly well. When this is not the case, no good can be done by digitalis. If there is any doubt, another, and even a third, preparation may be tried, but time should be allowed for the passing off of the symptoms produced by the first preparation. It may be accepted that digitalis has a cumulative effect, but unless the remedy is given in abnormally large doses, practically this is of little importance. Under all circumstances, we have the condition of the pulse—slow and irregular, especially the latter—and the presence of weakness, faintness, or nausea to warn us in sufficient time so that serious results can be avoided by discontinuance of the remedy.

The administration of digitalis cannot be reduced to a precise method; it is necessary to give it in full doses for a week, sometimes longer; then the dosage should be gradually reduced. In certain cases it will be found neces-

sary to give it for a very long time, the doses necessarily differing with the individual; this occurs especially in chronic myocarditis. I am not prepared, therefore, to state the maximum or minimum total that may be used with safety.

Digitalis is *indicated* in all cases of chronic myocardial insufficiency except in those in which its effects upon the heart may produce bad effects upon remote organs. I here include the myocardial insufficiency of aortic insufficiency; theoretically many explanations have been offered that would seem to show that digitalis should not be used here. Practically it is of the same use in chronic myocardial insufficiency due to aortic insufficiency as in that due to any other cause. A specific contraindication to its administration in aortic insufficiency is found in a much dilated aorta; otherwise the general contraindications are the same.

The remedy is *contraindicated* in those conditions in which all increased arterial pressure or increased systolic force is contraindicated, and therefore in cerebral embolism, especially recent, or apoplexy; also in aneurisms. Myocardial insufficiency of chronic nephritis is no contraindication, notwithstanding the increased arterial pressure that exists. In the presence of a cerebral trouble or an aneurism these contraindications do not exist when the patient is in danger of his life from the myocardial insufficiency, or when the latter is the more vital indication. Here it becomes a question of nice judgment on the part of the physician. In a few individuals there exists an idiosyncrasy which prevents the giving of digitalis on account of unpleasant symptoms produced even by very minute doses. Where digitalis produces gastrointestinal symptoms, such as nausea, vomiting, dyspepsia, diarrhea, it should not be continued. The substitutes for digitalis should be tried here. On the other hand, in a number of cardiac cases it will be found that digitalis is the best remedy that can be used. In every heart case leading to myocardial trouble there may come a time when digitalis no longer produces an effect; in many of these it will be found that so many muscular fibers are either destroyed or rendered inactive by organic changes that the cardiac reserve force no longer exists. Digitalis is not indicated in neuroses without heart weakness or to give relief for subjective symptoms. It should not be used in changes of rhythm or rate, or for cardiac pain, as no relief can be expected from it under these circumstances.

Digitalis is then indicated in all cases of chronic myocardial insufficiency in which its physiological effects cannot be expected to do harm. Even when the pulse is slow and there are evidences of myocardial weakness, digitalis should be given.

Strophanthus was introduced by Fraser in 1885, and is the remedy we commonly use as the best substitute for digitalis. In medicinal doses its physiological effects are very nearly the same as those of digitalis: increased blood pressure, normal or slower pulse, prolonged systole. In toxic doses the effects of digitalis and strophanthus differ principally in that the vagus is not irritated by strophanthus (Günther). Its vasoconstrictor effects are not so great as those of digitalis, and it probably has a direct diuretic effect upon the kidneys. It has no cumulative effect, and as a rule it does not irritate the gastrointestinal tract; therefore its effects need not be so carefully watched by the physician. It would seem, then, that in all respects strophanthus

should be used instead of digitalis as the principal remedy in myocardial insufficiency. But strophanthus rarely does good where digitalis fails; its effects are not so complete, so thorough, or so lasting; and besides, it acts sometimes in a very indefinite way; whether this is due to insufficient knowledge on our part or to the intrinsic qualities of the drug itself I am not prepared to say. I can certainly verify the observation of Strümpell, that since the introduction of strophanthus I have seen more cases of sudden death than before. I have seen three cases in two years in which sudden death followed the use of strophanthus. While I am far from being able to demonstrate the relation of cause and effect here, it has served me as a warning, and now I never begin the treatment of chronic myocardial insufficiency with strophanthus. I use it, after I have completed the digitalis treatment, to continue in a milder way the beneficial effects of the latter; furthermore, in cases in which the patient cannot get along without some cardiac tonic, either for a short or a long time, it is especially invaluable, as he may be allowed to take it without being constantly under observation. Under all circumstances the tincture should be given, beginning with five drops three or four times daily and increasing to ten drops, just as frequently given. I have never used strophanthine.

Squills (Scilla maritima) has the same clinical effects as digitalis, but on account of its unpleasant effects upon the gastrointestinal tract (vomiting and diarrhea) it is rarely used as a substitute. Because of its diuretic effects it may be combined with digitalis, with good results, in dropsy. It is best prescribed in substance—0.05–0.2 gm. (gr. j–iij), in pill form.

Convallaria majalis, fluid extract, 0.3–1 gm. (℥ v–xv); Adonis vernalis, alcoholic extract, 1.5 gm. (gr. xx), or infusion, three or four times daily; Apocynum cannabinum, fluid extract, 0.15–0.3 gm. (℥ ijss.–v); euonymus; euonymin, 0.1 gm. (gr. jss.); helleborein, in pills, 0.01 gm. (gr. $\frac{1}{6}$), three or four times daily; Cactus (Cereus) grandiflorus, eight to ten drops of the fluid extract three to four times daily, have all been recommended as substitutes for digitalis. None of them can ever take the place of digitalis, possibly not that of strophanthus, so that with these two remedies the others are usually unnecessary. The physician who uses few remedies, the best of their type, and learns the exact effects to be obtained from them, gets better results than the one who uses many; the more tools used for one purpose the poorer the job. On the other hand, occasion may arise when neither digitalis nor strophanthus can be administered; then a substitute may become necessary.

The remedies that act more or less indirectly upon the heart are very valuable, because this action depends principally upon changes in the blood vessels. When the left heart is overfilled, it will be readily seen how a diminution in resistance by dilatation of the blood vessels will relieve this condition; in acute myocardial insufficiency we have the effects of vasoconstrictors upon the heart, but they may also act in giving relief to an overfilled left ventricle, especially when they act also upon the capillaries, by causing an emptying of the arteries into the veins, thus directly relieving the pressure within the left side, but also in this way facilitating the emptying of the right side and giving relief to the whole cardiac condition.

Of *vasomotor remedies* we have the theobromine and caffeine preparations, which are the most important. The physiological effects of these bodies are

somewhat different. Both have a peculiar effect upon the heart by increasing the circulation in the coronary arteries, and thus improving nutrition of the heart muscle.

(*a*) *Theobromine*, therefore, may be used in those conditions in which the coronary circulation is at fault, and by the Germans it is actually used, in the form of diuretin, as the best remedy in angina pectoris. It is very valuable in the fat heart. Theobromine is given in the form of theobromine sodium salicylate (diuretin), 1 gm. (gr. xv) three or four times daily.

(*b*) *Caffeine* has also an effect upon the vasomotor center, producing contraction of the small arteries; very little of this effect is produced by theobromine. Caffeine should be used, consequently, in those conditions where distinct effects upon vasodilatation are required plus the increased systolic contractions due to increased nutrition of the heart muscle. When dilatation of the abdominal vessels exists, the action of caffeine is very prompt and decisive. Its action upon the heart as a true cardiac tonic is much more rapid than that of digitalis. It may be used in chronic myocardial insufficiency, especially in the exacerbations due to intercurrent affections, such as influenza on the basis of a chronic myocarditis or a chronic valvular lesion, when the patient may be tided over until other methods may be used. On account of the unpleasant symptoms—nausea, vomiting, vertigo, psychic irritation—sometimes produced by it the drug cannot be used for a great length of time; indeed, this is not necessary. Caffeine is best given in the form of double salts, either caffeine sodium salicylate or caffeine sodium benzoate; these preparations are best because of their greater solubility; the former is better made in this country than elsewhere. These preparations may be given by the mouth or hypodermically, as the occasion requires; for hypodermic use, 0.1 gm. (gr. jss.) may be used two or three times daily; by the mouth they may be given in doses of 0.3 gm. (gr. v) three times daily.

(*c*) *Camphor* produces a dilatation of the peripheral blood vessels, and in this way relieves the circulation; it is doubtful if it produces any direct effect upon the heart (Winterberg asserts that no such effect is produced); it stimulates the cerebrum and the respiratory center. Its use is almost entirely confined to its stimulating effects, as permanent relief is better obtained in other ways. Combined with *ether*, it forms one of the most valuable combinations for stimulation in acute cardiac weakness. It is given in the following combination: ℞ Camphor., 1.50; ol. olivæ, 6.00; ether., 4.00. Of this mixture, from 1 to 2 c.c. may be given hypodermically. These injections should be given as deeply as possible, for otherwise either necrosis or inflammatory reactions may be produced. Ether alone, one half to one syringeful, is also very valuable, and when given in the way indicated no evil results follow; it has over the above combination the advantage of comparative nontoxicity, and it may be repeated frequently. I have used this method, which was taught me by Bamberger, for a great number of years, and have tided many a patient over cardiac collapses which seemed to be inevitably fatal. In the milder attacks of cardiac weakness, Hoffmann's anodyne (Spiritus ætheris comp., 2–4 gm.—℥ss.–℥j, well diluted) may be useful.

(*d*) *Alcohol* is a valuable remedy in heart affections; this is proved more by the results of actual experience than by those of experiment. In small doses it acts as a stimulant, producing dilatation of the blood vessels; whether

it directly affects the heart beneficially has not been conclusively decided, although it is more than likely that it does so. It is of service in those conditions of the heart that are due to infections; it may be used to counteract the vasoconstrictor effects of digitalis. In the so-called senile heart, indeed in any of the cardiac affections of old people, it is practically indispensable. It should also be used in all heart affections of alcoholics.

(*e*) *Valerian* acts indirectly in producing reduction in blood pressure and frequency of heart beats. It is of value in neurotic individuals and in acute exacerbations of chronic myocardial insufficiency. It may be given in the form of the fluid extract or the tincture, alone or combined with Hoffmann's anodyne, aromatic spirit of ammonia, or camphor.

(*f*) The *nitrites* are used for their vasodilator effects; indeed, they are the most powerful vasodilator remedies at our command. Their effects upon the heart are only indirect; there is no clinical evidence that they act directly, as Romberg asserts. The preparations used are amyl nitrite, nitroglycerine, and sodium nitrite, which differ from one another in rapidity and intensity of action. They are of special value in angina pectoris, in all conditions connected with contracted vessels, arteriosclerosis, and they are frequently administered to counteract the vasoconstrictor effects of digitalis. They are contraindicated whenever there is low blood pressure—in chronic myocarditis, for instance, when they may produce syncope as the result of their action. As they produce overfilling of the blood vessels, especially in the head and neck, they must be given with great care, if at all, in cerebral arteriosclerosis or hemorrhages; here they should be used only for the *indicatio vitalis*, when this is dependent upon the heart or blood vessels.

1. *Amyl nitrite* is most conveniently administered in the form of "pearls," each containing a dose of the remedy (two to five drops), one of which is broken in a handkerchief and its contents inhaled. Its effects are almost instantaneous, but very transitory, not lasting longer than half an hour. It is therefore only of use in giving relief in attacks of angina pectoris; but here it sometimes succeeds when the other members of the group fail. A number of cases have been reported in which dangerous, even fatal, symptoms have followed its administration.

2. *Nitroglycerine* is by far the most important member of the group. It acts in several ways: partly as a nitroglycerine molecule, partly on account of its being split up, when in contact with an alkaline medicine, into glycerine, nitrites, and nitrates. The first method produces a rapid effect, but also disagreeable symptoms, because of its action upon the cerebral circulation. The second method produces the prolonged, but not so intense, effects of sodium nitrite; the action of the nitrate is practically nothing. Nitroglycerine is administered in the form of an alcoholic solution, 1 : 100, of which one minim is given, gr. $\frac{1}{100}$ being accepted as a normal dose to begin with in an adult. The best form of administration is in the form of a solution; next comes the tablet; when a rapid action is not required, the pill form may be used. It is my custom to direct patients who have to take nitroglycerine for its rapid effects in the relief or prevention of attacks of angina pectoris, and who therefore carry this remedy with them at all times, to proceed as follows: One drop of a one-per-cent solution of nitroglycerine is dropped upon a plate; the experiment is then made to see how many simple sugar pills will absorb

this drop; then a number of drops of nitroglycerine are put into a small vial, to which are added the requisite number of sugar pills. In this way the patient is able to take his required dose in the form most readily absorbed, and therefore most active, and at a very short notice.

3. *Sodium nitrite* cannot be used in anginal attacks, as its action is too slow. It is doubtful if it need be used at all. Occasionally it will be found valuable in arteriosclerosis or in the interval treatment between the attacks of angina pectoris, when nitroglycerine fails, or when the symptoms produced by it are so annoying that the patient cannot or will not take it. Because it does not produce so much disturbance in cerebral circulation, it may also become otherwise valuable. Sodium nitrite is decomposed by the gastric juice, giving rise to eructations and derangement of the stomach; patients frequently object to it on this account. It is prescribed in solution or in tablets in the dose of from 0.05 to 0.1 gm. (gr. j to ij).

4. *Erythroltetranitrite*, recommended by v. Schrötter, is given in doses of 0.02 to 0.05 gm. (gr. $\frac{1}{3}$ to $\frac{3}{4}$), in solution, tablets, or pills. I have never tried it, as it seems to offer no advantages over nitroglycerine.

5. *Sweet spirit of nitre* (Spiritus ætheris nitrosi), for its nitrite action, must be given (℥ xx–lx) freshly prepared; not in water, as the nitrite escapes very rapidly. It is an excellent cardiac stimulant; most patients with angina pectoris have tried it without consulting their physician, and not infrequently it prevents attacks.

Sparteine sulphate was first recommended by Germain Sée, and much was expected from its use as a substitute for digitalis. Experimental evidence goes to show that its action is not that of digitalis, and clinical observations verify this conclusion. As it is made of broom tops, it was supposed that it would also act as a diuretic; in this respect it has also proved a complete failure, certainly in my own experience. The dose is variously given from 0.15 to 0.3 gm. (gr. ijss. to v) in twenty-four hours; I have given one grain at a dose, and repeated it in two hours, without any appreciable effect. After a year's conscientious trial of the remedy in heart affections, I have come to the conclusion that the drug is not a necessary addition to our cardiac remedies.

Venesection is at times of the greatest value. When the right heart is overfilled and a temporary respite is necessary, so that it may have a chance to empty itself, frequently acting in a life-saving way, this operation should be performed. Local bleeding of the heart by puncture of the auricle with an aspirator needle should never be resorted to; it is too dangerous.

B. *Physical Methods.*—All these methods have a common objective, which is attained in one way or another by exercise of the myocardium. In all the minimum effect is first arrived at, and this is gradually increased to the degree required by the individual condition.

Carbonic Acid Gas Baths.—The value of these in heart disease was established by Aug. and Theo. Schott, Beneke, and Groedel; to the former of the brothers the greatest credit is due for establishing a method, the so-called Nauheim cure, and for supporting it by his clear, precise, and frequent publications. The factors that contribute to beneficial effects in this method are the CO_2, and the temperature and duration of the bath; the greater the quantity of CO_2 in the water the lower the temperature, and the longer the duration the greater the effect. It will immediately be seen that in a combina-

tion of these three factors we have an ideal method for graded treatment, and such it has shown itself to be after at least twenty years of experience. The effects produced are the result of irritation of the sensory nerves of the skin by the CO_2 and the temperature, which is followed by increased blood pressure lasting after the patient is removed from the bath, and by a decided slowing of the pulse. Thus the distribution of the blood is altered, more going to the skin and the muscles; the splanchnic circulation also is increased by the peripheral reflex. The stimulation of the cardiac reflex through the periphery produces increased systolic contractions of the heart as well as possibly increased diastole. To what extent the presence of CO_2, as it is inhaled by the patient, produces an effect upon the cardiac centers has not been determined. The most important consequence is relief to the heart; dilatations disappear, and as the heart assumes its normal size its contractions are increased in force and the nutrition of the myocardium is improved; every time a bath is given in proper cases it is followed by an improvement of the dilatation and an increase in strength of the myocardium. The CO_2 bath may be looked upon, then, as an ideal gymnastic method for the heart; it restores compensation. The best results are obtained at Nauheim, in Germany, where the method originated, because the physicians there understand its application better than anybody else; in Germany there are other places where the method is carried out; this can be done in any place where there are CO_2-containing mineral waters. In this country there are a few places in which this treatment can be had. It is to be hoped that as the value of this method becomes better recognized, the number of proper places to which we can send our patients will be increased. As it is, in order to carry out the Schott or Nauheim treatment, our patients must be sent abroad or treated in their homes. I, in common with many others, have been treating proper cases at home. It cannot be denied, however, that the treatment at Nauheim gives better results in a greater number of cases; and this is explained partly by the fact that the patient does not give himself up so exclusively to his heart treatment when he is at home; I find it advantageous, therefore, to send the patient to a hospital. Moreover, as the giving of these baths requires skill, knowledge, and special preparations, too much household disturbance is produced when an attempt is made to give them at home.

I have prepared the baths in the following way: At first I always used the 100 to 300 gm. of calcium chloride, plus the carbonic-acid-gas generators used by Aug. Schott; at present I find that I get the same results with the CO_2 generators without further additions; possibly more CO_2 may have to be used in this way to produce the effect, but this is immaterial. The CO_2 is generated by the addition of hydrochloric acid to sodium bicarbonate; neither of the drugs need be chemically pure. The sodium bicarbonate is dissolved in the water contained in the bathtub; the hydrochloric acid is afterwards introduced in the following way: a closed bottle is held under water with the neck downward, so that when the stopper is removed the acid diffuses itself along the bottom of the bathtub; this is facilitated by moving the bottle along the bottom of the tub. It is a good plan to diffuse the HCl, especially along the foot-end of the bath; the patient steps in at the head, and as the result of his getting into the bath in this way and lying down, head to head-end, the water is disturbed, CO_2 production goes on, and if any

HCl is left not sufficiently diluted, which is improbable, no harm is done to the skin. After the sodium bicarbonate has been thoroughly dissolved the temperature of the water is taken; again after the addition of the HCl, as this may produce a rise, necessitating the addition of cooler water. The quantity of sodium bicarbonate and of HCl is always equal, beginning with 100 gm. of each, then 250, 600, 1,000, to 1,500, which is the strongest bath used.

The ordinary bathtubs cannot be used, as the acid attacks the lining; porcelain or wooden tubs should be used. The temperature of the bath varies from 90° or 92° F. to 75° or 80° F. The time of the bath is from five to fifteen or twenty minutes. The first bath would then be given at a temperature of 90° F., of five minutes' duration, and 100 gm. each of hydrochloric acid and sodium bicarbonate. According to the nature of the patient and the effect of the first bath, I increase the CO_2 and the duration of the bath; as high a temperature as 92° is rarely necessary in this country, on account of the widely spread custom of taking cool or cold baths. If the patient does not bear reduction in temperature well, the increase in duration and CO_2 should still be continued. Some patients prefer to begin with a low temperature: one patient under my charge began with 60° F., not feeling comfortable in any other temperature. When the temperature is too low and the patient begins to shiver, he must immediately be taken out of the bath, and the next time the temperature must be higher. After the bath the patient is dried off as gently as possible, and then he should rest in bed for one or two hours. Baths should never be taken immediately after meals; two hours at least should be allowed to elapse. Increase in strength of the bath is determined by the presence of good effects and the absence of bad ones. When the patient feels better after the bath, when his pulse is fuller, stronger, and slower, the strength of the next bath may be increased. When he feels worse during or after the bath, it may be well to omit it for a day; certainly it would be unwise to increase its strength. The object of the treatment is completely attained when the patient can stand the strongest baths. The duration of the treatment varies: I never undertake it unless the patient will give me at least four weeks; in a number of cases it is necessary to continue with it as long as eight weeks. The number of baths required depends entirely upon the individual peculiarities and the necessities of the case; no rule can be laid down. The necessity of the patient's being closely observed by the physician is apparent: the patient gradually learns properly to estimate his subjective symptoms, the trained nurse can keep records and determine some of the objective signs, but the physician alone is competent to sum up and draw conclusions. In the first week of the treatment a bath is given every other day, then four a week or even one bath every day.

In addition to this, the simplest way of applying the method just described, a great many other ways have been recommended: the Nauheim salts have been used, CO_2 being produced as before; or packages have been put upon the market which, when dissolved, produce the chemical result of Nauheim waters; or various devices have been constructed so that CO_2 gas is introduced; some are very expensive, especially those depending upon the addition of Nauheim substitutes, much more so than the method recommended; but every

hospital should be equipped with an apparatus by means of which CO_2 baths can be given.

The indication for the use of these baths is chronic myocardial insufficiency of the first degree, it matters not what the cause may be or whether the myocardial weakness is of recent or remote origin. Arteriosclerosis and mild attacks of angina pectoris are benefited by them, provided always the myocardial condition represents an insufficiency of the first degree.

The baths are *contraindicated*, as a rule, when chronic myocardial insufficiency is of the second degree; here the patient must be kept in bed, and when the myocardial insufficiency has been reduced to the first degree he may after a certain time be allowed to use this method. Sometimes cases of myocardial insufficiency are found which cannot, for one reason or another, be treated in the ordinary way; here a carefully conducted course of CO_2 baths may be tried. They are contraindicated in those conditions where myocardial insufficiency is the result of an acute process affecting a chronic one, and therefore in a valvular lesion made worse by an attack of rheumatic fever, in decompensation following an attack of bronchitis, in pneumonia, or in any other process affecting the heart. Here, and then only in the first degree of myocardial insufficiency, a certain length of time should be allowed to elapse before this treatment is adopted. In these cases I prefer gymnastics until improvement occurs; after this the baths. In severe angina the method should not be attempted; the danger of a fatal attack, the result of the disturbance to the patient, and the increased activity of the heart should always be reckoned with. Even in mild cases of angina pectoris the treatment must be very cautiously carried out. Embolism, aneurisms, the tendency to cerebral hemorrhage are absolute contraindications. One of my patients with aortic insufficiency and dilated aorta died as the result of a bath given at Nauheim. In arteriosclerosis all those cases may be safely treated, unless there is also brain arteriosclerosis, in which the blood pressure is low. In chronic nephritis they are very useful when the clinical picture is preëminently that of chronic myocardial insufficiency. In some forms of heart trouble—fat heart, heart strain—they are the most important method of treatment, as these can be reached only by physical methods. Finally, everyone has met with patients with whom this method cannot be used on account of excessive nervousness, increasing with every attempt.

Exercise, Gymnastics.—Here we act both directly upon the heart and upon the peripheral circulation. We act upon the heart in that we know that exercise of the skeletal muscles always implies exercise of the heart. In addition, the heart muscle, like the skeletal muscles, is strengthened by exercise. In causing contraction of muscles we produce an increased blood supply in them which results in relief to the left heart from overfilling, and also an increased circulation through the veins by the greater *vis a tergo*. Gymnastics may also be applied purely for local effect (v. Arteriosclerosis). They may be divided into two classes, active and passive; in some cases both are combined. In general, the indications for passive exercise are found in the condition of the individual, and when properly applied they can do no harm. They are practiced by an operator or by the use of various kinds of apparatus; a good operator will approximate precision, which can be obtained constantly only by the use of machinery, of which the Zander apparatus is at present

the most perfect form. Where a Zander or similar institute does not exist vibratory massage is useful, but evidently only with certain limitations. These, with or without an operator, are the methods which I use. The passive methods are of special value in the convalescent form of acute cardiac diseases or in exacerbations of chronic ones. They are also valuable because they can be used by everyone who can afford the expense; they are time-saving—so important a matter in this country—and since they are applied by some one else, they will be carried out. Many of my patients, active business men, take this form of exercise daily instead of the active forms. In the *active forms* the *conditio sine qua non* is that the patient can leave his bed. They cannot be applied with the same accuracy as the passive forms, wherefore their contraindications are very numerous. They should be used only in the mild form of myocardial insufficiency of the first degree; they are absolutely harmful after heart strain, but become useful after the heart reacts normally to exercise. They are especially valuable in the fat heart, particularly in young or strong individuals. In other respects the contraindications are those of the CO_2 bath. I never use them in angina pectoris because our degree of accuracy cannot be guaranteed, the least effort being possibly of incalculable damage in this form of disease.

(*a*) *Active Methods.*—The Oertel method, according to my experience, is one of the best, and with modifications such as can be allowed for individual conditions it is applicable to more cases than any other. It is the outcome of Oertel's experience upon himself for chronic myocardial insufficiency, due to a vertebral deformity, and it admits of more precision in application than any of the active measures except those in which machinery is used. Partly on account of the advances in mechanotherapy, but also because of the non-acceptance of Oertel's explanations of the mechanism of producing cure, this method is not so frequently used in Germany as formerly; but as I have been in the habit of using it with the best results for a great many years in obesity and in milder cases of chronic myocardial insufficiency, especially after CO_2-bath treatment, I do not hesitate still to recommend it. The method consists in having the patient walk up grades of various inclinations, beginning at first with those of small inclination and gradually increasing to the greatest. Oertel himself has recommended four grades—from 0° to 5°, 5° to 10°, 10° to 15°, 15° to 20°—upon marked courses; the patient first begins by walking on the level, then up the first grade, the second, and so on to the last. This can be done, as it is done in a number of places abroad and at Hot Springs, Va., in this country, by laying out a regular course, where distances and grades are marked. In cities (and I have always carried out this method in Cincinnati) it may be carried out where hills are found that correspond very closely to the required grades; for obvious reasons, those hills that are on car lines should be preferred. My own directions differ somewhat from those of Oertel's in that I want my patient never to become dyspnœic; and as I lay very little stress on the loss of water by the skin, sweating is not required of those under my charge. The patient is directed to walk slowly up the hill, as far as he can, without losing his breath or having palpitation of the heart; when either occurs he must immediately stop and rest, and then ride home. The next day he is ordered to walk a little farther than on the first day, always with the same precautions, and so to continue to increase the ascent until finally

he can walk to the top of the hill without having any of the symptoms before mentioned. When he has accomplished this he begins to walk faster, always with the same precautions, until finally, in the most favorable cases of fat heart, he is able to walk at a comparatively rapid gait to the top of the hill without losing his breath. The time required for the method varies according to the nature of the myocardial conditions; some patients have to continue it for from four to six weeks, others much longer—for months. It acts not only upon the muscles of the heart, but upon the obesity (q. v.). In every instance the patient should continue the method only under the observation of his physician. The many other methods, by means of ordinary apparatuses for gymnastics, dumb-bells, etc., may be useful in exceptional cases when compensation has been restored, but they are not sufficiently accurate to be recommended for that state in which the myocardium is insufficient. Respiratory gymnastics for inspiration may be valuable for obvious reasons.

(*b*) *Passive Methods.*—These are more accurate than the active ones; in some of the exercises we may combine both the active and the passive method. Massage is rarely used alone in myocardial insufficiency; it is commonly combined with resistant movements, both together making up the Swedish method. Yet I have found gentle massage useful in a number of instances, after an acute attack or after a myocardial insufficiency of the second degree has by other treatment been converted into one of the first degree. Here I use it as a preliminary to Swedish movements. Massage increases the lymph current and empties the veins; it may be made to produce emptying of the left heart, but the Swedish method is better for this purpose. The use of heart massage, by tapotement of the heart region and of the trunk, is not of much value in chronic myocardial insufficiency, notwithstanding its effect upon the heart reflex in approximately normal hearts. The Swedish method is the one that is quite universally accepted; it is thoroughly satisfactory for practical purposes, and is invaluable for the treatment of chronic myocardial insufficiency. In order that it may be carried out, an operator who thoroughly understands the method is necessary. It is of more importance, possibly, that the physician should be thoroughly acquainted with the manipulations, so that he can supervise, control, and give accurate directions. In Germany it is quite common for the physician to act as the manipulator; whatever the individual views might be in regard to the propriety of his doing this, every physician should be able to go through the various manipulations of massage and resistant movements. Certainly, wherever it is impossible to obtain a well-trained operator, the physician should himself treat the patient.

The technique of the Swedish method is as follows: In the beginning of the treatment all movements are passive; they are made by the operator—extension and flexion—the patient offering no resistance. The movements are made synchronously with the respiration—i. e., about eighteen or twenty times a minute—and in the beginning not more than five movements are made upon the same joint, this being gradually increased to ten or fifteen. The operator begins these movements in the finger joints, moving each joint by flexion and extension; in the same way the wrist, elbow, and shoulder joints; after these the toes, ankle, knee, and hip joints. All this is done with the patient lying on his back. When no untoward symptoms, especially dyspnœa, have devel-

oped, more complex joint movements and movements of the trunk are introduced. Almost without the patient's knowledge the operator begins to institute resistance to the movements: instead of the hands being extended and flexed by the patient, the flexion is now resisted by the hand of the operator; this is done with all the joints, and the resistance is gradually but imperceptibly increased with each sitting. It is quite obvious that all this requires great training on the part of the operator; for this reason the Zander apparatus is preferable, by which the resistance can be measured accurately; but a Zander apparatus, although to be desired, is not necessary to carry out this method of treatment. The sittings last from ten to fifteen minutes in the beginning, and may be extended to one hour. After the sitting the patient should always rest for from twenty-five to forty minutes, lying down and keeping quiet. The method I have described is the one I have used and continue to use, as it is the simplest, and for the present can be most easily carried out in this country. Mild as it is, in some individuals some of the movements must not be used: movements at the shoulder joint are not borne by some patients, also movements of the trunk, these last producing oppression; when this is the case they are omitted, temporarily; as the treatment continues to have its effect they can be resumed, except in very nervous patients, with whom the greatest care is required in the repetition of a movement that has seemed to be followed by unpleasant consequences. The only contraindication is a severe form of chronic myocardial insufficiency, in which the patient should be kept absolutely at rest. When used carefully, the method is applicable to all cases of myocardial insufficiency; it forms a part of the Nauheim method of treatment.

No description of the treatment of chronic myocardial insufficiency is complete which does not include the Schott movements. With a trained *personnel* they are the best exercises because they can be applied to all stages of myocardial insufficiency regardless of its cause. The only objections that can be raised to their use are that they require trained operators, and therefore in this country are limited in their application by the expense involved. Every physician should be familiar with their technique, so that he can apply them himself or at least be able to teach others their use. The movements as at present used by Th. Schott are described below. They must be performed with the following precautions:

I. The movements should be done slowly and a pause made between each set of movements.

II. If any evidences of distress are noticed, the movements must be stopped until such signs disappear; these are palpitation, nervousness, dyspnœa, or change in pulse tension.

III. The operator should offer the smallest amount of resistance at first, and this should be gradually increased with each subsequent sitting.

IV. The movements should not be applied immediately before or after meals.

V. The patient should rest after the movements.

VI. When the condition of the patient requires it, the first treatments should be given with the patient in a recumbent position.

The action of the treatment may be compared to that of the CO_2 baths. The pulse becomes slower and fuller, and the dilatation of the heart dimin-

ishes. The method is to be used as an adjunct to the CO_2 baths, and also as an intermediate method until the patient can take active exercise. In some cases both active and Schott movements can be carried on to great advantage.

I. The arms are extended in front of the body on a level with the shoulders, the palms of the hands meeting in front of the chest. They are now moved outward until in a line with the chest, the operator resisting by placing his hands back of the wrist of the patient. The arms are then moved back to their original position. This movement is resisted by placing the operator's hands on the palmar surface of the wrist.

II. Right arm hanging down, palm forward, is flexed until fingers touch shoulder, and is returned to original position. The upward movement is resisted by operator's hand on palmar surface of wrist, the downward movement by the operator's hand on the dorsal surface of wrist. Repeat with left arm.

III. Both arms hanging down, palms forward, are raised outward without bending the elbow, until the thumbs meet above the head, and returned to original position. The upward movement is resisted by operator's hand on the radial side of the wrist, the downward movement by operator's hand on the ulnar side of the wrist.

IV. Both arms hanging down, palms against thighs, are raised forward, without bending the elbows, until they are vertically extended, and returned to original position. The operator must study this movement with care in order to offer continuous resistance. In the beginning the fork of his thumb and forefinger should be applied to the radial side of the wrist; when the arm is at an angle of 45° to the body the fingers must slide around the wrist until they are folded about the radial surface. Before the reverse movement begins he receives the ulnar aspect of the wrist in the fork of his hand. As the arm descends to 45°, the thumbs move outward and the fingers slide around until, when on a level with the shoulders, the ulnar surface of the patient's wrists rest upon and are resisted by the operator's hands.

V. The trunk is flexed forward without bending the knees and brought back again to an erect position. The forward movement is resisted by one hand of the operator over the upper third of the sternum and the other supporting the middle of the lumbar region. The reverse movement is resisted by one hand of the operator over the junction of the cervical and dorsal portions of the spine.

VI. With both feet firmly planted on the floor the patient rotates his body, first to one side and then to the other, and back again. To resist this movement the operator places one hand in front of the advancing shoulder and one over the other shoulder.

VII. The trunk is bent as far as possible first to one side and then to the other, and is finally brought back to an upright position. To resist this movement the operator places one hand on the hip away from which the patient is bending, and with the other hand presses against the other side in the axilla.

VIII. This movement is like movement No. II except that the palms are turned outward and the fists are clinched.

IX. Taken in turn, each arm is extended downward, palm against thigh, and then makes a complete revolution from the shoulder—forward, upward, backward, downward. Before descending backward the palm must be turned outward. The operator folds the fingers of one hand around the radial side of patient's wrist. His other hand receives the wrist when it reaches the vertical position, and maintains the resistance until the arm has reached the original position.

X. Both arms are extended downward, palms toward thighs, and are moved backward and forward as far as is possible without bending the body. The upward movement is resisted by the fork of the hand on the ulnar surface of the wrist, and the downward movement by sliding the fingers around the radial surface.

XI. The patient holds on to a chair with one hand and flexes the other thigh as far as possible, then returns the foot to the ground. The leg should hang down from the knee joint. The upward movement is resisted by one hand above the knee and the downward movement by one hand under the sole of the foot or below the lower part of the thigh.

XII. Supporting himself with one hand, the patient lifts one stiffly extended leg as far as he can to the front; then as far as he can to the back, and finally places the one foot beside the other. The forward movements are resisted in front of the ankle and above it, and the backward movements behind the ankle. Repeat with the other leg.

XIII. Resting one hand on a chair, the patient lifts the other extended leg as high as he can laterally. Resistance above the ankle. Repeat with the other leg.

C. *Diet.*—The objects in regulating the diet in chronic myocardial insufficiency are to keep the patient and his heart in a good condition of nutrition, and not to throw on the heart more work than is necessary. For the first indication the diet should be regulated in accordance with the general rules of diet laid down in the section on diseases of the stomach, but also in relation to the stage of the myocardial insufficiency. Here, as everywhere, the physician should adapt the diet to his patient, not to the disease only. To prevent increased cardiac work these general rules are also of great importance, because the rate and force of the heart's contraction are both directly affected by many conditions in the gastrointestinal tract which can be prevented by the proper diet. As the result of the introduction of food into the stomach the cardiac force and rate are increased in the healthy heart, and most so by the ingestion of fluids; the well-known changes in pulse after a full meal are evidences of this. The mechanism of this process is the taking up of larger quantities of fluid into the circulation which have been absorbed from the gastrointestinal tract as the result of digestive processes. The diseased heart, however, does not react to the increased quantity of fluid in the blood vessels as the healthy heart does; in it we find all the evidences of overwork—dilatation, heart weakness; under no circumstances improvement in the condition. More than once I have seen the administration of a large rectal enema followed by acute myocardial weakness; in one of these patients I was able to come to the definite conclusion that the absorption of a large quantity of water produced the symptoms, all precautionary measures being taken to prevent an error in judgment. It is well to limit the quantity of food taken

with each meal, giving smaller but more frequent meals; above all, to reduce the quantity of fluid taken with each meal (v. Pleurisy with Effusion).

In the *milder cases* the diet should be regulated principally in the direction of quantity and quality of food. As many of these patients are high livers—indeed, high living is a common cause of the cardiac condition—the first thing is to reduce the quantity taken at each meal, then to withdraw those articles of food that may be accused of producing gastrointestinal troubles. When the diet cannot be shown to produce evil effects upon the myocardium, and it is the diet of a normal human being, there is no reason why it should be changed.

The use of *alcohol* should be limited; in alcoholics the quantity should be gradually reduced; those who take a moderate amount daily should be allowed to continue, provided the alcohol is absolutely necessary to them. To people who never or rarely take alcohol it should be prescribed when necessary (v. *supra*). Alcohol should then be administered in those forms of beverages that are most concentrated: brandy, whisky, sherry or port wine; no beer, champagne, or lighter wines. Coffee never does harm when taken without cream or sugar—i. e., black; the strength must be that most suitable to the patient. Tea and cocoa may also be given.

In the *severer cases* the diet must be more carefully controlled. In all these cases there is more or less disturbance of the gastrointestinal tract. The food should be given in five or six meals instead of three; it should consist of such articles as are easily digested—albumins, carbohydrates, fats, the latter in very small quantities (v. Chronic Gastric Catarrh). The formation of gas should be prevented by diet. The condition of the bowels should also be kept as nearly normal as possible. Under no circumstances should the patient be underfed; when necessary, the various concentrated foods should be used. For the reduction of fluid see the treatment of dropsy. In some cases the milk cure, first recommended by Carrell, of St. Petersburg, for cardiac dropsy, may be used. In those patients to whom there is no possibility of giving other food it may be looked upon as life-saving at times. It has its limitations here as elsewhere; except in the treatment of dropsy, I never use it unless circumstances compel me to do so. In this stage nearly all patients require more or less stimulation, therefore alcohol may be used with advantage. Anything generating CO_2 gas in the stomach should be avoided: no carbonated waters, no Seidlitz powders. When there are diseases requiring special indications for diet, great care must be taken. The diet in diabetes, gout, or chronic nephritis that would be ordinarily recommended can only be used for a short time, and then with the greatest care, the strength of the heart always being the index. In fat patients, such methods only should be used as are not depleting; in them the problem of feeding becomes a very difficult one under certain circumstances, the degree of myocardial insufficiency being the index to the dietetic treatment.

The use of *tobacco* should be interdicted in the grave forms of chronic myocardial insufficiency. In the milder forms excess should be avoided.

D. *General Hygienic Measures.*—In the severe forms rest is one of the best measures that can be used, as it brings relief to the heart by reducing its functional activity (v. F. General Course of Treatment). In the milder cases the patient's movements should be so directed that the utmost limit commensurate with safety is permitted. Psychical rest is of great importance;

frequently I have found it necessary to put patients with severe forms of chronic myocardial insufficiency under a modified rest cure. In mild cases all excitement should be avoided, certainly such excitement as lies within the power of the individual to prevent; all gambling of any sort should be given up, or any other pleasure-giving occupation which may be found deleterious. These individuals are often handicapped enough by their cardiac condition, to say nothing of their occupation; perhaps they must have their occupation, but all unnecessary increase of functional activity can be partially avoided. A great many of these patients are irritable; their friends should be advised that this condition is a symptom of their trouble; much can be spared them when this view is accepted. All psychic strains should be avoided; I have frequently seen patients collapse after these. In the severer forms these things regulate themselves, but even here much good may be done.

In men, coitus should be limited or forbidden, according to the degree of myocardial insufficiency; those patients with aortic dilatation and atheroma are to be especially warned. It is human that these warnings are frequently not taken seriously by the patient, so that sudden death results during or shortly after the sexual act. I have seen this in three instances of aortic disease and in two subjects of arteriosclerosis; in all these cases the patients had been advised of the chances of sudden death. Romberg makes the statement that such patients should be sent alone to a sanitarium for gymnastic or bath cure. I doubt whether this can be taken seriously; certainly with my patients the result would have been the same in or outside of a sanitarium. The question of marriage has already been treated of in the chapter on prophylaxis; I believe it to be wrong to advise men against marriage in chronic valvular disease, when there is the mildest form of insufficiency and the external conditions of the patient are favorable (v. Prophylaxis). I have seen one patient with fat heart and chronic myocardial insufficiency go to the altar; ten years afterwards he was well, pursuing his occupation, and apparently happy that he had not followed his physician's advice. In all other conditions advice may be given against marriage. I have rarely seen it accepted.

In women, the danger of conception has already been referred to; whether the prevention of conception should be advised by the physician, as recommended by v. Leyden and others, or an abortion performed, cannot be discussed here. Advice in this direction is usually not demanded, as the matters are taken up by the patients themselves. Certainly everything should be done to make parturition as easy as possible.

Patients with myocardial insufficiency should not go to great altitudes—not over 2,500 feet. In the winter they should go to warm climates; in the severer forms a warm climate is always preferable, but extreme heat should be avoided. Upon the whole, everything else being equal, the patient with myocardial insufficiency of the second degree is best cared for at home. In the milder cases health resorts may be recommended; in this country there is none that is especially prepared for heart cases, the climatic benefit being the principal object to be gained. When the patient is sent to a health resort, he must be directed to continue to follow instructions as to physical and psychical rest, diet, and a sensible mode of living. Under all circumstances he should put himself under the supervision of a physician.

E. *Symptomatic Treatment:* (*a*) *Subjective Symptoms.—Fluttering* and *pain* sometimes demand the attention of the physician. Most commonly they are not so great as to require special intervention; frequently an explanation given to the patient as to the harmlessness of the symptoms causes him to disregard them. In neurotic individuals they may be the starting point of neurasthenia, and in such individuals the bromides are valuable. Patients with heart disease should be taught not to think too much about their heart; when this has been accomplished much has been gained. The ice bag or cold applied to the region of the heart gives much relief; in addition, many external remedies may be advised—e. g., sinapisms, liniments, ointments, Priessnitz applications. Massage of the heart does reduce pulse rate.

Angina Pectoris.—Prophylaxis of the attack is very important. The *diet* is the same as that of chronic myocardial insufficiency; flatulency and constipation should be avoided. In the treatment of the latter, when medicine is necessary such cathartics should be used as do not cause straining, for this may bring on an attack. Rectal means are best avoided, as those that work efficiently may bring on attacks; suppositories, which, however, are usually inefficient, may be tried. Tobacco and alcohol should not be used; the former is absolutely contraindicated; the latter is to be taken only when it is absolutely necessary to the individual.

Exercise.—It is necessary to give precise instructions based upon individual indications. In the severe forms all unnecessary movements should be avoided, and in all forms patients should be warned against hurry, or that which for them represents exertion. In the mild forms only the mildest physical methods are indicated. Psychic exertion, all excitement and worry, must be reduced to a minimum. In one of my cases, in which the first attack proved fatal, the angina pectoris followed a game of cards in a smoke-filled clubroom; the patient had been playing for three hours when the attack gradually developed, to end fatally after a duration of eight hours. Change of occupation is frequently necessary; business or professional occupations must be interrupted for the time being; but in the great majority of cases change of scene should not be recommended.

Patients should be warned as to sexual indulgence. In spurious attacks of angina pectoris the cause should be treated.

Some patients have premonitions of the attack, and they can at times ward them off. One of my patients can prevent the attack by taking a sip of whisky; others use aromatic spirit of ammonia; Hoffmann's anodyne is used; nitroglycerine acts more uniformly than anything else.

Treatment.—During the attack the patient should be kept in bed. For the pain external applications may be tried—sinapisms, the hot-water bag, poultices. When the pain and feeling of constriction are not relieved by these simple means, hypodermic injection of morphine should be given. The objections raised against the use of morphine here are many: its medicinal action has been confounded with its toxic effects upon the heart; when given in proper doses it has practically no effect upon the heart. As the suffering is extreme the temptation exists to give doses that are too large or too frequent; in some cases the physician should be satisfied when the edge of the pain is taken off, so that the patient gets sleep although he may be conscious of his suffering. Another objection to its use here is found in cases

that terminate fatally: the impression may remain that the patient died of acute morphinism. The physician has positive knowledge in this direction, but it is more difficult to convince the family that morphine poisoning has not taken place. This was my experience in the case of two of my patients, who died in their first attack. Morphine may also be used in angina pectoris connected with the contracted kidney; here, as always, its use should be reserved for the severe attacks. Chloroform should not be used, as it is apt to prove dangerous in myocardial conditions. The nitrites (v. *supra*) are the best remedies to be used during the attack. My experience with diuretin has not been final. I have prevailed upon all my patients who have angina pectoris to try it, and with the following results: it does not act so rapidly as the nitrites, it fails to act more frequently, but in a number of cases it is of the greatest value, especially when the nitrites have failed to act. Theoretically diuretin seems to be an ideal remedy, as it improves the coronary circulation; further experience is required to show its precise indication; it should be given in doses of 1 to 2.5 gm. (gr. xv to xxxv) *pro die.*

Syncope during an attack should be treated as in acute myocardial insufficiency (q. v.). The digitalis group is only indicated for general symptoms; angina pectoris itself should never be looked upon as an indication for its use unless the angina is the result of myocardial weakness; then it should be used as in other conditions.

The treatment in the interval *between* attacks is very important; besides the prophylactic measures already considered, physical methods may be tried. When the angina pectoris is due to myocardial weakness they do good, but they should not be used except in the milder forms. In the severer forms possibly mild massage is admissible, but even here the greatest care must be taken, as in this form any manifestation may bring on a fatal attack.

Medicinal treatment is of the greatest value; it consists in the use of the iodides and the nitrites. Sodium iodide has been especially recommended by Huchard, but the preparation to be used must be adapted to the iodine idiosyncrasies of the patient (v. Syphilis). The iodides should be given in small doses. As a rule, it is not necessary to exceed fifteen to twenty grains a day; this is given until the patient shows evidences of iodism, then it is discontinued, again to be used when these symptoms disappear. The medication should be continued for one or more years, depending upon the cessation of attacks; it is supposed to act both causatively and symptomatically. Whatever the theoretical explanation of its effects may be, experience has shown that it is an invaluable remedy in angina pectoris, and should always be tried unless there exist specific contraindications. When none are found, it should be combined with the remedy to be mentioned next.

Nitroglycerine, which controls the attacks, I have always given in ascending doses, beginning with the minimum dose (gr. $\frac{1}{100}$) three or four times daily; it may be necessary to increase to ♏ viij to x of a 1:100 solution. As the patients become accustomed to the drug, more or less immunity being established, the doses must be increased; the indication for increase in dose is to be found in the effect produced upon the attacks and their prevention. I always use the combination of iodides and nitrites as a routine method, and the results obtained by this plan are very satisfactory. Occasionally a patient will be found who does not respond to it; frequently because he will

not carry out instructions as to rest, exercise, diet, and medication; sometimes because, even with due care, the method does not seem to suit the individual case; here a most careful search for the cause frequently shows the necessity of cardiotonic medication, including diuretin. In the great majority of cases this symptom complex is the result of coronary sclerosis, and in these the results are sometimes astonishing, notably as to the rapidity with which they are produced, but also as to their permanence. Usually when iodine is given in these cases distinct benefit is seen in from forty-eight to seventy-two hours after its first administration. The most remarkable instance I have seen, and one which demonstrates the value of this method, was in a man seventy years old, who came to me with a so-called senile heart, suffering greatly from angina pectoris; he was treated for two years, and remained free from angina pectoris for fourteen years—that is, up to the time of his death, which resulted from gastric hemorrhage.

(*b*) *Objective Symptoms.—The Respiratory Tract.*—Bronchial catarrh is improved by the treatment of chronic myocardial insufficiency; sometimes it becomes necessary to treat it directly, either when primary or secondary, especially in the direction of preventing bad effects upon the heart from excessive coughing (v. Bronchitis). *Cardiac asthma* must be treated by a hypodermic injection of morphine; sometimes digitalin injections are required; when, as is frequently the case, it is combined with angina pectoris, nitroglycerine should be added. In these cases preventive measures against the attack may be valuable; as the attacks occur during the night or late in the evening, a large dose of digitalis may be given six hours before the time when the attack is expected. The patient should be careful as to his evening meal: the simplest food should be taken, and of that not too much. He should go to bed early, and his evenings should be spent in such a way as to prevent physical or psychical exertion. Sensible people need only be warned; as a rule, they themselves realize the relations of cause and effect, and as the suffering associated with cardiac asthma is frightful, they are eager to follow the slightest hint as to prevention.

Hydrothorax should be treated by aspiration (v. Hydrothorax). The treatment of œdema of the lungs will be found in the appropriate chapter.

Gastrointestinal Tract.—Symptoms in the stomach should be treated as are ordinary gastric troubles; the treatment of the myocardial insufficiency, when successful, is frequently sufficient, but the diet may have to be especially arranged, as before indicated. On account of this the restriction in various directions may cause *constipation*, and its treatment in heart disease may give trouble. In mild cases, when the patient can bear laxative foods, no medicines are required, but in the severer cases it is otherwise. The milder medicines must always be used, for those that are followed by excessive purgation may produce acute myocardial insufficiency, which in one of my cases was followed by a fatal issue. Senna, rhubarb, cascara sagrada, podophyllin are remedies that can be used with safety; saline cathartics must be used more cautiously, only the stronger mineral waters being used, as the others are too bulky; an occasional dose of calomel is beneficial. Rectal means, when they involve the introduction of large quantities of fluid, should not be used in the severer forms of myocardial insufficiency; oil enemata may be tried unless their administration disturbs the patient too much. A rectal injection

of a teaspoonful of glycerine or a glycerine suppository may be given, but as a rule both lose their effect after being tried for a time. Diarrhea is sometimes due to the myocardial insufficiency. I have seen several cases in which it was relieved by digitalis. When this is not the case the ordinary treatment of diarrhea, medical and dietetic, is sufficient.

Dropsy: Diet.—In all dropsical conditions produced by chronic myocardial insufficiency, the quantity of fluid given should be limited. It is not necessary to discuss the reasons for this, nor is it necessary to admit the views of either Oertel or his opponents; the fact remains that in the great majority of cases of chronic myocardial insufficiency the dropsy can be improved, can be rendered stationary or its recurrence prevented, by withdrawal of fluid, the usual method of treatment being followed. In the *cardiac cachexia* nothing will do good, as all the tissues are so affected by malnutrition that the normal laws of osmosis are all set aside. As a rule, the quantity of fluid to be given may be regulated by the quantity of urine secreted; this does not include the quantity of H_2O in the food, and the fluids should not be taken with the meals. All those methods of diet that have been referred to in connection with pleurisy with effusion (q. v.) are also recommended here. The milk cure has also been recommended, and this has a certain value, because in an underfed patient with poor appetite we are introducing much more food than he has been in the habit of taking; but it will be seen that by employing this method we are still giving less water than is secreted by the kidneys. If we give to a patient secreting 1,500 c.c. of urine 1,500, or at the highest 2,000, c.c. of milk, he gets very much less water than when we give 1,500 c.c. of water and solid food in addition. In either instance we are giving less water than is required by the normal individual, which amounts to between 2,500 and 2,700 c.c. in twenty-four hours. It is no wonder that with milk, which in itself possesses direct and indirect diuretic properties, and with improved nutrition, the dropsy may disappear. But all indirect methods—diet, diuretics, diaphoretics, cathartics—should be confined to the milder forms of dropsy. For diuresis, diuretin (2–4 gm.—ʒss.–j) in the course of the day is sometimes valuable; calomel is the most valuable diuretic, given daily in doses of 0.2 to 0.25 gm. (gr. iij to iv), with the necessary precautions against salivation. All the other diuretics have also been recommended, from potassium acetate to *Blatta orientalis* (the ordinary cockroach). Catharsis has been referred to in the treatment of constipation. Diaphoresis is produced by hot-air baths or by hydrotherapeutic measures; they should be used with great caution in chronic myocardial insufficiency, beginning with mild efforts, which may be increased if the patient bears them at all well. Pilocarpine should never be used; it may produce collapse; it increases the bronchial secretion, also the dyspnœa, especially when salivation is produced. The discomfort which follows its administration alone is a contraindication to its use in chronic myocardial insufficiency. Fortunately, the milder forms of dropsy are relieved by the ordinary treatment of myocardial insufficiency; the severer forms can be definitely relieved by mechanical means. My own rule is to use these when dropsical effusions produce symptoms or endanger the patient's life; this occurs in hydrothorax (q. v.); also in œdema, because after the successful treatment of œdema the myocardial insufficiency may be relieved, which before was impossible. The skin, dis-

tended with fluid, produces a resistance to peripheral circulation which prevents the heart from recovering its equilibrium; therefore removal of œdema is an important measure to relieve myocardial insufficiency. For the treatment of ascites in connection with heart disease it is rarely necessary to use any other method than that for the treatment of œdema. There are many methods: I prefer the use of Southey's cannulas; they are used in the simplest manner, they give very little trouble, and they are efficacious. As œdematous skin is predisposed to infection, the greatest care as to asepsis should be observed; this should also be the case when for some reason the tubes or the patient has to be touched by the attendants. As a result of these precautionary measures inflammation, erysipelas, and other skin complications are very rare, certainly very much rarer than in incisions or punctures of the skin. After the skin has been rendered aseptic the sterilized trocar and cannula are introduced into the subcutaneous tissue. When, as frequently occurs, the patient is nervous about the small operation, local anæsthesia may be used. The tubes are introduced into the subcutaneous cellular tissue on the posterior aspect of the leg on either side of the tendo Achillis, the trocar is withdrawn, and then a fine rubber tube, large enough to carry the fluid into a vessel that is placed by the side of the bed, is attached to the cannula. I do not attach the tube with adhesive plaster, as the latter is apt to produce an irritation of the skin. Two tubes are introduced into each leg, and allowed to remain from twenty-four to forty-eight hours, depending upon the relief they give. I have seen as many as three gallons of fluid withdrawn in twenty-four hours. After enough fluid has been withdrawn the cannula is removed and an aseptic dressing is applied. By the withdrawal of the fluid the œdema of the legs, genitals, and abdomen, the ascites, frequently the hydrothorax, is relieved. The myocardial insufficiency is frequently relieved; almost always in the milder conditions diuresis is set up, and in some of my patients the general condition has been so much improved that they have been able to attend to their occupations. There are some objectionable features connected with Southey's tubes that cannot be avoided; it sometimes occurs that a cannula, from being very small, becomes stopped up; for the same reason it occasionally drops out. But this is no serious matter, because it is very easy to replace the cannula. Sometimes even with all precautions the opening made does not close after the withdrawal of the cannula. In that case asepsis must be still more carefully insisted upon; then the opening, after a longer or shorter time, will usually close, always in a short time when the œdema has been successfully treated; but otherwise, and the myocardial insufficiency persisting, the small opening may never close. This happens most frequently when this method is used as the last instead of as the first resort.

Nervous Symptoms.—Headaches may be relieved by the ordinary method of treatment, but sometimes special remedies are required; the elixir of guarana, caffeine preparations, antipyrine are useful. Vertigo may frequently be controlled when it is congestive by bromides, with or without ergot; when due to anæmia, by nitroglycerine. For faintness, some of the milder stimulants may be given. *Sleeplessness* is a not uncommon symptom in chronic myocardial insufficiency; a dose of digitalis, given from four to six hours before the patient should go to sleep, frequently produces the desired effect.

The ordinary measures used in insomnia (v. Neurasthenia) may also be tried. When unsuccessful, a large dose of potassium bromide—2 gm. (3ss.)—should be given; if this is not followed by the desired effect, one of the modern hypnotics should be tried. In sulphonal, trional, chloralamid, and chloral hydrate we have remedies that at times can be used with the most beneficial results; at other times most undesirable symptoms are produced by them; this is especially the case with sulphonal, trional, and chloral preparations. Paraldehyde is safer, but extremely unpleasant to the patient. Hyoscine hydrobromate is very valuable when muscular restlessness is the cause of the sleeplessness. In all cases morphine is the safest and surest remedy; it should be used only occasionally, as the morphine habit is easily acquired by these patients. A careful trial of one of the chloral group is usually followed by the selection of one remedy which may be taken safely for some time. The short trial I have made of veronal seems to show that it is valuable and harmless.

In nearly all cases of chronic myocardial insufficiency *psychical alterations* of variable intensity are found. The milder forms present themselves as irritability, depression, hypochondriasis; here proper psychical treatment by the physician is of great value. Much depends upon the temperament of the physician himself as to the success to be obtained; in private practice we frequently see one man, equipped with all modern methods, fail completely, while another, equipped with tact, succeeds. Under proper treatment these psychical conditions usually disappear, especially as they are found in insufficiencies of the milder form. The severer psychoses, which may develop in the beginning of myocardial insufficiency, but are commonly found in the second stage, should receive the most careful attention; as a rule, these patients are better taken care of in institutions; when this is not feasible they must be kept continually under observation. According to my experience attempts at suicide are not infrequent; but in addition the question of forcible feeding, as in all the severer psychoses, also comes into consideration here, and this especially is carried out with great difficulty in private practice.

F. *Routine Treatment.*—In all forms, mild or severe, rest in bed is the best remedy that can be prescribed; it diminishes the heart's work, the patient is not subjected to external irritations, and a great many of the symptoms frequently disappear without any other interference. Frequently it is difficult to persuade the patient that he must go to bed, as many consider that as soon as they do give up their case is hopeless; an explanation will frequently overcome this objection. But there are many patients who in their innate stubbornness have always fought everything out in their own way, and will continue to do so to the end; they may be mollified, but they will always remain unregenerate. A horizontal position in bed is impossible for many; their cases should be arranged for by means of pillows and bolsters; indeed, the progress in treatment may be measured in a great many of these cases by the lessening of the number of pillows used to give relief. As confinement within a room is frequently irksome, I have for years allowed some of these patients to live in the open air upon porches or verandas, especially after improvement has taken place and psychical rest is not so necessary as bodily rest. The cases that demand absolute confinement to bed are: all severe forms of chronic myocardial insufficiency; all fresh cases after acute infections, or

in heart strain. With the rest in bed the proper diet should be given, and worry and excitement prevented. I always use digitalis unless specially contraindicated, for it does no harm, and it does good in shortening the time required for restoration of compensation. When properly given (v. Medicinal Methods), and no results follow in from forty-eight to seventy-two hours, the case is almost hopeless; it should be given until the physiological effects upon the pulse and the heart are produced, but not after symptoms of intoxication appear. Then strophanthus may be administered, and this treatment may have to be kept up for a long time; if the myocardial insufficiency returns during its administration, digitalis should again be given. There are some patients who have to take digitalis, off and on, for years; especially is this the case in the so-called senile heart.

The *convalescence* should be watched, and while the patient is still in bed one or another of the physical methods must be tried; whichever of these is adapted to the individual should be continued; as a rule, the active measures should not be attempted until compensation has been fairly established. In the home, walking around the room, then through the rooms upon one floor, then going downstairs, and finally walking upstairs, fairly represent the active exercises that should be first allowed. None of these should be attempted after a meal; at least two hours should be allowed to elapse. Afterwards the patient may walk out of doors or drive, and the kind of physical treatment indicated for the case should be commenced (v. Physical Methods). Symptomatic treatment must be applied to meet the indications. Great care is required in fresh cases in the use of the Nauheim method.

G. *Special Indications.—The Heart in Arteriosclerosis.*—Arteriosclerosis produces myocardial insufficiency by its effects upon the coronary arteries, the endocardium, the myocardium, and as the result of disease in peripheral blood vessels. In these conditions the treatment of arteriosclerosis (q. v.) is frequently beneficial. In coronary sclerosis the therapy is that of angina pectoris (q. v.), of bradycardia, in addition to that of myocardial insufficiency. When there is sufficient change in the endocardium to produce valvular lesions, followed by the usual results, therapy must be directed toward these. The effect upon the heart resulting from increased peripheral resistance may be counteracted by the use of nitroglycerine. When the splanchnic area is affected, and this will frequently be found the case, the bowels will have to be kept thoroughly open; in rare instances it may even be necessary to give hydragogue cathartics, taking all precautions that have been mentioned for the use of this class of drugs. When there is great weakness these should even here not be attempted; as a rule, we succeed perfectly with calomel, senna, or mineral waters. It is only in the beginning of the condition that mechanical therapy may be used; even then the cases should be carefully selected and passive methods should be preferred. When the brain complex of symptoms exists, it is better to desist entirely until this is removed. For the use of the Nauheim method, Groedel says that in twenty-two years of experience he has never had any bad effects; but it must be used cautiously, the temperature of the bath never being allowed to be below 92° or 93° F. It is indicated when gout, chronic articular or muscular rheumatism, arthritis deformans, or neurasthenia is present. It is also to be used for the chronic myocardial insufficiency. He says it should not be used in those cases in

which digitalis and the other usual drugs have failed, yet in one case under my observation the only thing that did affect the heart beneficially was the warm CO_2 bath. After the symptoms of severe myocardial insufficiency have disappeared the treatment as to diet, exercise, and medicine should be regulated with regard to the chronic myocardial insufficiency, and also to the arteriosclerosis.

The Heart in Obesity.—As the myocardial insufficiency is due either to a relative insufficiency of the heart in that it cannot without exertion pump the blood through the enormously increased mass of a very obese subject, to changes in the myocardium itself, or to both conditions combined, it frequently becomes a nice question in which way to proceed. The first indication to be fulfilled is the reduction of obesity (q. v.). Whatever method of reduction is followed, it will be accompanied with danger to the heart, except in very young individuals; in all patients over forty and in all very obese persons, any method of reduction should be used very cautiously.

In all cases I have always followed the rule to use Oertel's plan of treatment as far as his method of exercise is concerned. When there is a valvular lesion or distinctly marked arteriosclerosis, even Oertel's method has to be used with the greatest caution. I have never used the CO_2 baths, which are so highly recommended by many German authors, because the Oertel method has been satisfactory. The condition of the myocardium can be reckoned with only so far as symptoms are produced; it is well recognized that physical examination of the heart gives very unreliable data in this direction. We must then depend upon the other symptoms of myocardial insufficiency, especially those of venous stasis; even these are not thoroughly trustworthy, as some of them are due purely to the great accumulation of fat in other parts of the body. Generally we may say that fat people over sixty years of age, anæmic subjects, or obesity of extreme degree should be treated as if there were trouble in the myocardium. In very obese people, the taking away of the fat from around the individual myocardial fibers, already suffering from malnutrition, produces a condition resulting in a flabby and acutely insufficient heart. In these cases the diet should be so arranged as to give a sufficient number of calories for the weight of the individual, albumins being principally used, but not to the complete exclusion of fats and carbohydrates; in other words, no depleting diet. Much stress should be laid upon the gradual withdrawal of fluids. The ordinary remedies for chronic myocardial insufficiency should be tried; manifestly digitalis will frequently fail because the myocardial fibers can no longer be called upon to contract properly.

When the myocardial insufficiency is of the second degree the patient should be treated as all such patients are. Passive gymnastics should be used as soon as improvement begins, then active methods. Whatever is done after the acute symptoms are relieved must be continued for a long time; quick results evidently should not be striven for. The diet should be so arranged that the loss in weight is a very gradual one. Here we are frequently met by opposition on the part of the patient, who is not satisfied unless he continues to have ocular evidence of decrease in weight every week. To get permanently good results it is necessary that both physician and patient be content to continue the treatment for a long time. If a patient is satisfied with reduction in weight after six weeks of diet, and then goes back to his

former habits of eating, drinking, and sleeping, not much can be expected. Depending upon the degree of obesity, the patient should be under observation from one to two years.

Syphilis of the Heart.—When this exists (and the diagnosis is difficult), antisyphilitic treatment is followed by excellent results, as the cases on record show.

Diminution of Heart Force as the Result of Prolonged Rest.—We find this in prolonged convalescence from acute disease, after surgical operations, in fractures that keep the patient in bed, or in reduced subjects. In these cases the physician should be on his guard, as acute myocardial failure may occur. As soon as evidences of the condition under consideration are found the patient should be treated as in the recovery from acute myocardial insufficiency. Strychnine and strophanthus are both valuable; equal parts of tincture of nux vomica and of tincture of strophanthus may be given. The mechanical therapy is, however, essential.

V. NEUROSES OF THE HEART

PALPITATION

The difficulty in treating this radically lies in the difficulty of removing the cause; it has already been referred to in connection with chronic myocardial insufficiency. As a neurosis we must seek the causes common to neuroses in general; when these are removed the symptom is removed. When the excessive use of tobacco, coffee, tea, or alcohol can be established, the withdrawal of their use is sufficient. The symptom occurs most frequently in neurasthenics who lay great stress on it, as most of them have cardiophobia. According to the nature of the individual, explanation of the origin of the trouble, apparent neglect of the symptom by the physician, or its treatment becomes necessary. Obviously, in a neurasthenic patient it would be no good to show great interest in the heart by repeated examinations or repeated questioning. In a great number of cases psychical influence is sufficient; in some, however, serious effects, such as insomnia and hypochondriasis, are produced by it. Direct symptomatic treatment should be used only when absolutely necessary; the exercise and medication used in neurasthenia (q. v.) are frequently sufficient. When this is not the case the patient should be put to bed, and the ice bag applied to the region of the heart or to the nape of the neck in the worst forms. In ordinary forms heart massage, electricity, or cauterization of the spine may be tried; whether they act by suggestion or otherwise does not concern us; they frequently do good. Medicinally the bromides or valerian preparations may be given; stimulants are sometimes required—e. g., ammonia, camphor—when there is a feeling of faintness associated with the palpitation. Under no circumstances should heart remedies be prescribed; they do no good, and they counteract all the psychical impression that the physician has laboriously striven for. Nowadays our patients want to know not only what is prescribed for them, but also the effect that is expected. The diet should be regulated, flatulence and constipation

should be avoided. When possible, some serious occupation or diversion should be found to work against abnormal heart consciousness; when abnormal heart consciousness is removed, in most of these cases the condition is cured.

ARRHYTHMIA

Here we are not concerned with the arrhythmia of organic heart disease; in that case, when the heart trouble underlying can be removed the symptom itself disappears. In the treatment of arrhythmia due to lesions of the central nervous system, compression or concussion, or tumors, the same holds good. In toxic arrhythmia the removal of the cause results in complete recovery; this is found especially in the excessive use of tobacco, coffee, and tea; also in diseases of the kidney. Reflex arrhythmia, accepted by Baumgarten in his exhaustive classification as from the stomach, or sometimes as the result of pain, can frequently be relieved by the proper causal treatment. In kidney troubles the proper treatment also gives relief. The same relation exists between arrhythmia and neurasthenia as exists in the case of palpitation. Symptomatically hydrotherapy, either by general or local application of cold, sometimes is of value. Apart from those mentioned for palpitation, no other medicines are available.

TACHYCARDIA

Here again we exclude the tachycardia due to organic diseases of the heart or to Graves's disease. The simplest form of tachycardia is that of individuals whose normal pulse has been 75, but who come to the physician with a pulse that never goes below 100 or more a minute. This, with a normal heart beat as I have seen it in men, is always the result of great nervous wear and tear; in women it is one of the symptoms of the menopause. In men, the removal of the cause is the principal indication; in other respects the ordinary treatment of neurotic conditions is called for, as the tachycardia is only one of many nervous symptoms. In women, ovarian tablets—0.3 gm. (gr. v)—frequently act exceedingly well; here the action of ovarian substance may be almost reduced to a demonstration: the tachycardia ceases with the administration of the remedy, and begins again with its withdrawal.

Paroxysmal Tachycardia.—In paroxysmal tachycardia we have a difficult condition concerning the ætiology of which we know nothing; it is fortunately a rare condition. The treatment, therefore, is that of the attack, and we cannot judge with certainty of the efficacy of our treatment because the attack may abruptly and spontaneously end at any time. Some of these patients can prevent the occurrence of attacks by taking hot or cold drinks, by changing posture, bending over forcibly, or lying on the ground, and by various other manipulations. One of my patients, at the time of writing a man eighty years of age, who has had attacks of paroxysmal tachycardia for forty years, could inhibit the attack by tickling his nose with a penholder; but this procedure has possibly lost its effect, for it no longer acts with precision.

During the attack the patient should be kept quiet; it might appear that a patient with a pulse of 200 and over would naturally have to keep quiet,

but this is not the case, as some of these individuals suffer very little. Cold should be applied to the region of the heart or the spine in the form of ice bags or Leiter's coils. When the patient is nervous or anxious, bromides may be given; when necessary, a hypodermic injection of morphine. Pressure upon the vagus has been tried, without effect as far as my own experience goes. The same result has followed the galvanization of the vagus. As electricity and suggestive treatment usually go together, I may add that patients with paroxysmal tachycardia are not open to suggestion in such a way that attacks may be relieved thereby.

BRADYCARDIA

This is a symptom only which may be produced by faulty innervation, which, however, is not generally its prime cause. It is commonly the result of exhaustion, in the infectious diseases, of excessive sexual indulgence, of weakness, or of overwork. We find it in a number of heart affections, in those in which the nutrition of the heart muscle is affected—e. g., coronary sclerosis, chronic myocarditis, and in others in which there is increase in intracardiac pressure, especially in dilatations from heart strain. In a number of anæmic, chlorotic, or underfed subjects the symptoms may also be present. In the majority of cases examined by Riegel bradycardia was due to gastro-intestinal diseases. It is also found in jaundice and nephritis. Toxic conditions (digitalis is the typical toxine), alcohol, lead, uræmic poisoning, chronic autointestinal intoxication, and excessive use of tobacco or coffee also produce it. We find it in central nervous disturbances: meningitis, concussions, or pressure upon the brain from whatever cause. In pregnancy or after confinement, with or without change in rhythm, it is supposed to be due to a reflex nervous mechanism. In some few individuals bradycardia may be looked upon as their normal condition; I have seen it develop in adults after an acute infectious disease, and then remain as the normal pulse rate. From all this it will be seen how the treatment must differ in individual cases. In some no treatment is required; in others the causal treatment is paramount, as the bradycardia itself rarely produces ill effects, and is usually discovered accidentally.

One form requires special attention; it might be called *paroxysmal bradycardia.* I have seen it especially in brain workers, in whom the pulse rate, normally of 72 or over, may suddenly fall to 50, the fall being accompanied by symptoms of depression, languor, and frequently by gastric symptoms. Here free purgation, a vacation, restriction in eating and in smoking are always followed by good results.

In old people, whose pulse is usually slow, increased bradycardia, combined with cerebral symptoms, is frequently relieved by strict attention to the condition of the bowels; in these cases it seems clear that change in circulation in the vessels supplied by the splanchnic nerve is sufficient to give relief.

ADAMS-STOKES DISEASE

When any cause is found, such as arteriosclerosis, it should be treated. Some sufferers from this disease prevent attacks by getting into the knee-

elbow position, with the head as low as possible. Otherwise the treatment must be purely symptomatic. When respiratory symptoms occur, the inhalation of oxygen may be of value. When there is evidence of myocardial failure, stimulants are required; sometimes nitroglycerine, at others digitalis, hypodermically administered, according to the proper indications for their use. The apoplectiform attacks should be treated as they would be under ordinary conditions; the same can be said for the epileptic seizures.

VI. CONGENITAL AFFECTIONS OF THE HEART

TREATMENT

At birth the child may be asphyxiated; all the methods used to give relief for this condition should be employed, but they will very frequently be without success. When the child lives it should be kept warm, as with peripheral circulatory trouble heat regulation is interfered with, and artificial means must be adapted to meet increased radiation. During the period of infancy the clothing should be properly adapted to this end; special care must be taken with feeding, as these children are predisposed to gastrointestinal troubles on account of changes in circulation in the mucous membrane of the alimentary canal. For the same reason they should not be exposed to infections, especially to that of catching cold. Anxious mothers are apt to test their children to see how their mental development goes on, to find out whether they can walk; this should be discouraged. One of the trials of the physician is to stand by and see a mother try to console herself in a case of malformation of the heart or a bad prenatal endocarditis. As the child grows older the bone deformities in the spinal column and thorax must be attended to in such a way as not to interfere with the general health of the child. When the time for walking has arrived, a period always much later than that in the case of the normal child, it is not necessary to exercise unusual care; the child soon learns how much exertion is possible, and therefore is not apt to overdo. Now, as before, all necessary prophylactic precautions against chronic or acute myocardial insufficiency should be taken. When these occur, the usual methods of treatment should be instituted. As many of these children live, especially in private practice where all precaution and care are possible, nothing should be neglected.

VII. DISEASES OF THE ARTERIES

ARTERIOSCLEROSIS

Prophylaxis.—It is rarely possible to do anything to prevent the development of this disease. This conclusion is logical if we take into consideration the mechanism of the production of this disease as first described by Thoma. The primary cause of the disease, according to him, must be looked upon as a loss of elasticity in the blood-vessel wall, upon which follows a

compensatory process consisting in the deposit of connective tissue. We cannot prevent the first stage, because patients seldom present themselves to us; when they do, much good may be done, for the first stage may be detected when it is well developed. In the stage of compensation the removal of the cause may naturally be followed by good results, because the elasticity of the blood vessels at least may be increased to a certain extent, thus preventing sclerosis. The fact may be accepted that individuals are born with a certain quantity and quality of elastic tissue; from this we conclude, and this conclusion is verified constantly in practice, that a given cause will produce more or less effect upon blood vessels, according to the individual elastic factors. Furthermore, observation has proved the fact, thoroughly in accord with the views just stated, that arteriosclerosis develops early in certain families, that it is hereditary; in such cases something may be done prophylactically. In such individuals all those causes that should be taken into consideration in the second stage are also important in the first stage. The arteriosclerosis of old age does not lend itself to prophylaxis, as it is more than a simple functional process; it is due to involution, which cannot be prevented. The preventive measures, which must also always be taken into consideration in the treatment of every individual case, consists in the consideration of the causes of the disease. Excessive use of the blood vessels should be controlled. Here all the abnormally great efforts that are required in the competition of modern civilized life are fruitful as ætiological factors. Needless to say that nothing can be done prophylactically, rarely even when the disease is already established; no class of men is more frequently subject to this disease than physicians. This cause cannot be removed by preaching, as it finds its origin in the demands made upon us by the exigencies and methods of modern life. Whether a return to less complex conditions or a working out of the law of the survival of the fittest will be the solution remains to be seen. It is easy to say that all excesses should be avoided; in certain directions this may be done; in others, especially those connected with the individual occupation, it is practically impossible. Excessive functional use of the blood vessels always produces loss of elasticity; whether the blood vessel supplies blood to the central nervous system, the gastrointestinal tract, or the muscular tissue is a matter of indifference; therefore, excessive functional activity should be checked in the blood vessels by diminishing activity in the various organs; in the nervous system, neural or psychic activity and excessive venery; for the gastrointestinal tract the taking of too much food; and excessive muscular exertion should be avoided. In addition, however, the quantity and quality of the blood have a great influence upon the production of arteriosclerosis. The quantity because, either by overfilling or underfilling of the blood vessels, elasticity is lost; the first, overfilling, is found in many who overeat and overdrink, the blood vessels being kept in a chronic condition of overdistention. The quality of the blood may affect the blood vessels in various ways, by direct or indirect action upon the heart, inasmuch as blood pressure is increased, or by direct action upon the blood vessels in producing irritative conditions that result in loss of elasticity, or by an action upon the vasomotor centers. Among these may be mentioned alcoholism, syphilis, and gout as the most common; then obesity, diabetes, tobacco, saturnism, and, finally, some of the acute infectious diseases, such as malaria and rheuma-

tism. Prophylaxis and treatment of these various conditions is of enormous importance in the prevention of arteriosclerosis.

TREATMENT: A. *Medicinal.*—We possess in the iodides a remedy which is followed by most excellent results in this disease, and we owe its general introduction to Huchard. Many of us used this remedy independently of Huchard, because we had in mind the possibility of the removal of connective tissue by its persistent administration. As a result of this, having used potassium iodide before Huchard had published his results, I have had a very long experience with this class of drugs in arteriosclerosis which has led me to the following conclusions:

The iodides should be administered in every case of arteriosclerosis. Syphilis is not a special indication, in that their effects are not any more pronounced in its presence than in its absence. It is immaterial whether sodium iodide, which was first exclusively recommended by Huchard, or any other iodide preparation is given. The method of action ascribed to the drug by Huchard (the direct reduction in arterial pressure) cannot be proved by experimental research. The drug acts as an iodine preparation, and only as such; I have obtained the same results from iodipin and iodonucleoid as from potassium and sodium iodides. How it acts we are not in a position to state with precision, but it is impossible to do away with the impression that it acts by causing absorption. In a number of individuals iodine acts curatively. In order that good effects shall follow the use of this drug, it must be given for a long time as recommended for angina pectoris (q. v.). I have no experience with the nitrites except in angina pectoris; it is not reasonable to conclude that their prolonged use could be followed by permanent effects.

B. *Dietetic.*—Besides the diet of the various causal diseases, specific diets have been recommended. In a general way the diet should be so regulated that no undue demand is made upon the blood vessels; the quantity taken with each meal should not be excessive; alcohol, coffee, tea, and tobacco should be forbidden. As animal food, during its digestion, produces a number of substances which increase functional activity in the liver and kidneys, and consequently in the general circulation, more than food from the vegetable kingdom does, I have for many years placed these patients upon a modified method of vegetarianism. They are allowed all forms of vegetable food, and where it is possible they are given albumin. As a rule, albumin in the form of meat is not required, as milk albumins and eggs are permitted. This diet has also been recommended by a number of French observers, although they permit the use of white meat. The objection of Romberg, that this method leads to underfeeding, is absolutely without foundation. When the patients are satisfied with this diet—and this depends largely upon their habits as to food—their general condition is not reduced. Rumpf has studied the question of prevention of atheroma in arteriosclerosis; he regulates the diet by the introduction of food containing small quantities of calcium (meat, breads, butter, fish, cream, sugar, potatoes, rice, cucumbers, weak coffee or tea), to which he adds the administration of sodium lactate for the purpose of increasing the alkalinity of the blood and diuresis. I have had no experience with the method; indeed, its results cannot be well estimated, because atheroma does not of necessity accompany or follow arteriosclerosis.

C. *Physical.*—The Nauheim method may be used, with the precautions and contraindications that have been stated in connection with chronic myocardial insufficiency. In extensive arteriosclerosis, active gymnastics should not be used. Resistant movements should therefore be limited in all cases to the milder forms of the disease. Massage is of value because depletion of veins may follow, giving relief to overfilling of the arteries. Vibratory massage is of value, as its activity may be localized with the use of properly constructed apparatus. Whether elasticity can be regained, as is alleged by some authors (Lagrange), is still doubtful, although it is possible, as is shown by the effects of the proper use of iodine.

D. *Symptomatic.*—In all the various combinations of symptoms that are the result of arteriosclerosis the general treatment should be used. The treatment of the various conditions of the heart—coronary sclerosis, chronic myocardial insufficiency, tachycardia, arrhythmia, Adams-Stokes complex (q. v.)—has already been described. For the symptoms on the part of the gastrointestinal canal great relief is frequently obtained by massage, and under all circumstances laxatives should be administered the use of which is indicated as in chronic constipation. Hemorrhages are to be treated as described elsewhere. The symptoms on the part of the nervous system require special consideration. For the headache nitroglycerine or caffeine preparations may be used. The vertigo which is common in older people is controlled in most cases by the use of ergot, with or without bromides. In senile epilepsy I have found nitroglycerine of value, and the ordinary methods of treating epilepsy without much value; during the attack it is necessary to watch the heart; hypodermic injections of digitaline or caffeine should be used, in accordance with their proper indications. The neurasthenic symptoms of arteriosclerosis are best treated by the treatment of the disease; it is highly important to take arteriosclerosis into consideration in every neurasthenic over forty years of age. The mental symptoms should be treated, taking into consideration whether they are due to circulatory disturbance or to lesions; in the latter case little can be done; in the former very much may be effected by the cautious use of digitalis, ergot, caffeine, or the bromides, according to the proper indication. For the renal complications the reader is referred to the proper chapter. The symptoms produced by changes in circulation in the periphery are not usually affected to any great degree by local treatment. In intermittent claudication, rest or vibratory massage may be tried. Erb has recommended electricity in the form of the electric bath; I have tried both galvanism and faradism in the various manifestations of arteriosclerosis of the periphery, but have never satisfied myself that they are permanently beneficial. Much more can be expected from the persistent use of iodine, notably in intermittent claudication, although here, also, I have seen cases when no form of treatment availed.

ANEURISMS

TREATMENT.—The principles upon which any method of causative treatment of internal aneurisms should be based are (*a*) the production of increased coagulation of blood within the sac, and (*b*) the diminution of the sac. This has been taught us by the post-mortem discovery of aneurisms that have been obliterated. The first, when it can be thoroughly carried out,

includes the second, because the cavity is filled up and the walls of the aneurism are strengthened, so that eventually the aneurism may be diminished in size. The success or failure in treatment depends upon the possibility of applying it; it is more than doubtful if anything but a sacculated aneurism can be benefited in this way, though the smaller the opening of the sac the better the chance; but here, on account of thinness of the wall or of multiple aneurisms, the method may fail. It must be confessed that curative methods of treatment have as yet produced a very small percentage of recoveries, but in a disease so commonly fatal, any promising method is acceptable. In most cases by treatment we can aim only at prolongation of life and relief for symptoms.

Aneurism of the Thoracic Aorta.

TREATMENT.—*Medical.*—The patient must be kept absolutely quiet in bed; how this should be effected has been stated (v. Rest in Chronic Myocardial Insufficiency). In aneurisms it acts by reducing the frequency and force of the heart beat, thus causing less distention of the aneurismal sac and slowing the blood current, both of which are favorable to coagulation of blood, besides tending to prolong life—i. e., preventing rupture of the sac. When good effects are produced, the patient can be kept in bed for as long as three months or more. When no effects are produced in from six to eight weeks, the patient should be allowed to get up, but with all those precautions that have been described in connection with acute myocardial insufficiency. It is better not to use gymnastics of any sort; but should they become necessary, passive movements are indicated; as little rise as possible in blood pressure, however, should be effected by them. As a rule, directions given to the patient as to his movements, which should be gradually increased, are sufficient. The *diet* should be that of Tufnell (v. Pleurisy) as a basis; additions and modifications may be made, otherwise it will be very difficult to have it carried out. Under all circumstances fluid should be limited, as it dilutes the blood and increases blood pressure. It is difficult to explain the action of this diet in these cases; it may increase coagulability by concentration of the blood, resulting in the presence in larger quantities of the blood-coagulating factors in a smaller bulk; it may, as a result of reduction in blood pressure, prevent dilatation of a sac, which occurs with normal blood pressure. These, combined with many other effects, may explain its action. For practical purposes, rest and diet should be used in every case. Potassium iodide, which was first introduced by Bouillaud and reintroduced by Chuckerbutty, is recommended by all who have written extensively on the treatment of aneurism. How it acts we do not know; that it does act all can verify who have used it; even if a cure does not follow, relief is given to symptoms by the use of the iodide. It should be given in ascending doses, beginning with 0.3 gm. (gr. v) three times daily and increasing gradually to 1 to 1.5 gm. (gr. xv to xxv) three times daily, care being taken to prevent excessive physiological effect, as iodism may produce very unpleasant symptoms in a patient with a thoracic aneurism. The iodine, as in arteriosclerosis, acts in all cases, whether they are due to syphilis or not. In one case of fusiform aneurism of the aorta I have seen an apparent cure by the combination of rest, diet, and potassium iodide. As the diagnosis can with modern diagnostic methods be established so much earlier

than formerly, it is possible that our medical means may become more satisfactory.

In addition, the external application of cold is very valuable. This can be effected by means of an ice bag or the Leiter coil; they should be used with the usual precautions to prevent trouble in the skin. The result as to relief of symptoms is sometimes most striking; they also exercise a most beneficial effect upon the heart's action, and the patient feels that he must keep quiet on account of the ice bag. With the proper precautions, then, cold applications can be kept up for a great length of time, being allowed to remain several hours at a time, then being taken off for the same length of time and applied again, the condition of the skin being observed. When there is danger of external perforation, which occurs in from three to four per cent of all cases, the greatest care must be exercised.

Exceptions in the application of the routine method just described must be made in debilitated, anæmic persons; to these a nutritious diet, not containing too much fluid, should be prescribed, as thereby the coagulability of the blood is increased.

It is difficult in some instances to decide when the limit of benefit to be obtained by this method has been reached. We have here to rely on the disappearance of symptoms for our decision; if the aneurism becomes smaller or remains stationary, if the pulsation becomes less and the subjective symptoms diminish or disappear, we are justified in concluding that further absolute rest and strict diet may be modified. I quite agree with Sansom that two months are sufficient; sometimes less time is required to produce consolidation; certainly if it does not occur in two months it is not "within the possibilities of therapeutics" to produce it.

The subcutaneous injection of gelatine, as first recommended by Lancereaux, may be tried when the routine method fails; from 100 to 150 c.c. of a 1–2.5-per-cent solution of gelatine in normal saline solution are injected into the subcutaneous tissue, not near the aneurism. This injection at first is made every six to eight days, then every two or three days, the whole course of treatment lasting from six to eight weeks. The objections to the method are that the injections are very painful, but, more important, that tetanus has followed the subcutaneous introduction of gelatine. The latter can be prevented by extraordinary care in the preparation of the solution, and this should always be insisted upon. The method is especially advised for sacculated aneurisms. The results have been disappointing, but even if, as A. Fränkel claims for it, the beneficial effect depends upon the fact that the patient believes he is undergoing a special treatment, and is therefore content to rest for eight weeks, the method should be given a further trial. It is certainly worth one's while to find something that keeps the patient so absolutely quiet that aneurisms can be cured, and it is not definitely settled that the gelatine does not have some effect upon coagulation. Certainly its application to bleeding surfaces leads us to believe that such is the case. Let me add that more aneurisms have been cured by rest with gelatine than by rest without gelatine.

Everything having been done by medical means, the question arises what should be done next. When improvement has followed, the patient should be warned against extraordinary exertion; but he may be allowed to follow

his usual occupation by graded steps unless this is of a kind to require too much physical exertion. When no improvement occurs, the decision must be left to the patient himself: either that he keep himself quiet, which may be forced upon him by the nature of the symptoms; that he continue with his occupation until the end comes, which for the properly constituted individual is the happiest solution of the question, or that he subject himself to one or other of the surgical procedures.

Surgical.—The method of Brasdor, by slowing the circulation in the sac, may be used, in the case of aortic aneurism, by ligation of the common carotid or the subclavian artery, though this is no longer employed in connection with thoracic aneurism. The other methods depend upon the fact that the introduction of a foreign body into the circulation causes a deposit of fibrin upon it. This is accomplished in various ways. *Filipuncture*, introduced by Moore, consists in the introduction of a foreign body that offers a large surface for the deposit of fibrin; Moore himself introduced twenty-six yards of fine iron wire into an aortic aneurism; since then watch springs, silver wire, horsehair, catgut, and other substances have been used. *Acupuncture* (Macewen) consists in the introduction of thoroughly aseptic pins in such a way that they "just touch and no more" the opposite wall (Gairdner). The pins may be shifted so as to act upon various parts of the wall; they may be retained in the sac for from twenty-four to thirty-six hours. The principal object is the production of white thrombi, and their deposit upon the walls of the sac. *Galvanopuncture* is done for the purpose of causing coagulation by electric action; it may be accomplished by simply leading the current through the sac by means of an introduced needle or by the combination of electrolysis and filipuncture, as first proposed by Carradi. The results following the various operations can best be expressed by stating that successful cases are reported. We have no means of determining their absolute value in a concrete case; neither can we estimate their comparative value except by conjecture.

Symptomatic.—Injections into the sac should never be made. When the aneurism comes to the surface, it is always well to have it covered and protected against mechanical injury; this can be done by the wearing of a pad or elastic bandage, and gives at times much relief to the patient. For the pain it is necessary sometimes to give morphine hypodermically; it is well to try antipyrine or its compounds, as they frequently give great relief; when this, combined with the ordinary routine treatment, is not successful, opium preparations will of necessity have to be employed. The dyspnœa should be treated as in cardiac asthma. Inhalations of oxygen are very valuable. Tracheotomy should be performed for only two conditions: when dyspnœa is the result of bilateral laryngeal paralysis or as an *indicatio vitalis*. Bleeding sometimes gives relief. For the dysphagia little can be done; the introduction of a sound is inadmissible on account of the danger of perforation of the aneurism. In individual cases the performance of gastrostomy may have to be taken into consideration. The treatment of myocardial insufficiency must be conducted on the lines already laid down in the appropriate section; the digitalis group may be used in cases in which the myocardial insufficiency, for the time being, seems more dangerous than the aneurism. For external rupture of the aneurism compression should be used; for internal

rupture the usual methods employed for the treatment of internal hemorrhage; in both instances the permanent result of the treatment is very unsatisfactory, and only temporary benefits can accrue.

Abdominal Aneurisms.

Here the routine method recommended in the treatment of thoracic aneurisms should always be tried first. Brasdor's operation has been performed by ligation of the iliac artery. Many cases have also been treated by pressure, a method introduced by William Murray in 1864; the operation is performed under anæsthesia, and digital pressure or pressure by a properly constructed tourniquet is applied. The compression may be proximal or distal, depending upon the location of the aneurism and upon which of the two most affects the pulsation in the tumor. The dangers connected with this method of treatment are so great that it offers little encouragement, although a small number of cases have been cured. Peritonitis, thrombosis, or embolism of blood vessels, obstruction of the bowels, injuries to the abdominal organs are the dangers that have been mentioned even with the few cases recorded. After all, in most cases no benefit has been derived from the operation.

SECTION VIII

DISEASES OF THE BLOOD AND DUCTLESS GLANDS

I. THE ANÆMIAS

For the sake of convenience the division into primary and secondary anæmias is adhered to; the term primary, or essential, anæmia expresses our ignorance as to causation; when the causation of the anæmias is discovered by future investigators another classification will be adopted. In all the anæmias it is the duty of the physician to try to find the cause; it is because this is not done, and in many forms cannot be done, that our treatment has been unsatisfactory and simply symptomatic. While it cannot be denied that in certain forms of anæmia symptomatic treatment is invaluable in that the removal of certain abnormal conditions in the blood reëstablishes normal function of other organs, and thus leads to normal blood making, yet this symptomatic treatment is based wholly upon empirical and not upon rational methods. It certainly shows us how little we know about the essence of the anæmias.

ACUTE (SECONDARY) ANÆMIA

The TREATMENT OF HEMORRHAGES which produce this form of disease will be found in their appropriate chapters, as will also that of their direct result on the circulation. For all acute secondary anæmias we have a dietetic and a medicinal treatment.

The *diet* should be arranged as indicated for the cause of the hemorrhage, and will be found described in connection with those diseases in which hemorrhages are apt to occur. Under all circumstances we must bear in mind that the digestive function is lowered by profuse bleeding. For the thirst which accompanies the loss of blood, small quantities of water, cracked ice, or rectal injections of water may be given. Milk is the food which is best begun with; this may be followed by carbohydrates, meat, eggs, finally the normal diet; always, at first in small quantities, frequently given.

The MEDICINAL TREATMENT resolves itself into the giving of iron in some form or another. Iron may be given as food iron, or in the form of inorganic, or especially prepared organic, iron preparations. In this form of anæmia food iron seems to be the best for administration; meat, eggs, beef juice, blood itself, bovinine are especially indicated. The action of iron and its preparations can be stated briefly as follows: Iron is absorbed partly by the upper part

of the gastrointestinal tract, partly by the stomach, but the greater portion in the upper third of the small intestine; it is deposited in the liver, the spleen, and the bone marrow, which act as storage depots; it is eliminated by the mucous membrane of the lower section of the intestine, and also by the kidneys. The formation of red corpuscles from erythroblasts is hastened by iron preparations, both by increase in hemoglobin formation and by stimulation of regenerative activity in the bone marrow. We may then conclude that iron preparations are especially valuable in those forms of anæmia in which hemoglobin is reduced; as a matter of fact, our experience has taught us that in secondary anæmias and chlorosis this is the case; while in the other anæmias in which the blood corpuscles are especially reduced, in pernicious anæmia, the hemoglobin being relatively increased, the results of iron therapy are very doubtful. It would seem, as a result of this experience, that the formation of red corpuscles is stimulated, not directly but indirectly, by the increased formation of hemoglobin.

The inorganic preparations of iron are many; of these Blaud's pills or any of the iron carbonate preparations are most commonly used at the present time for the treatment of anæmia. They should be administered in full doses; the objection to them is that a number of patients cannot take them on account of their effects either upon the gastrointestinal tract or upon the nervous system—e. g., vertigo, insomnia. In these cases, then, they cannot be used, and the so-called organic iron preparations or chalybeate mineral waters are of value; of the latter, Saratoga, Sweet Chalybeate in Virginia—indeed, most of the Virginia springs—have some ferruginous water, and there are a great many others in this country that have not been utilized; in Germany and Austria, Pyrmont, Franzensbad, Kissingen, Langenschwalbach; in Belgium, Spa; in Switzerland, St. Moritz; to which may be added those of Levico and Roncegno, containing both iron and arsenic. Excellent results are obtained at home by the use of many of these waters.

Of organic iron preparations there are many; indeed, so many that it is impossible to mention them, especially as new ones are constantly added. That they act by suggestion, as stated by some authors, is certainly incorrect; I have carefully observed a number of cases, and have convinced myself by repeated blood examinations that some of these preparations are very valuable. In so far as a suggestive effect may influence beneficially the general nervous condition and indirectly the blood structures, we should gladly acknowledge the additional value of a remedy. That such a contributory effect exists in all such remedies as have been pushed by commercial interests by means of widespread propaganda there can be no doubt. But that suggestion alone will increase hemoglobin and red corpuscles from fifty per cent to the normal, I am not prepared to believe. Personally I have had most experience with Kobert's hæmol and hæmogallol, which I still use in proper cases. Schmiedeberg's ferratin is also a valuable remedy; I have never used the peptonates, the albuminates, the various combinations with nuclein or with potassium permanganate. One of the most commonly used preparations is the peptomanganate of iron.

The most accurate and efficient method of giving iron is subcutaneously. Here the question of absorption from the intestinal tract does not come into consideration as regards the quantity of iron. The iron gets into the lymphatic

circulation, and thence into the blood; in this way its fullest efficiency is developed. For hypodermic use only two preparations may be considered, the green citrate and the glycerinophosphate of iron; but I no longer make use of the latter, as the injections are too painful. The green citrate of iron, Ferrum citricum oxidatum, is administered in a ten-per-cent solution, of which 1 c.c. is given as a dose. The greatest care is required in the preparation of the solution—the less its acidity the better; but the essential part is its sterility; it should be kept in small bottles, hermetically sealed, containing enough for just one dose. In this way it seems to keep indefinitely. A platinum needle must be used for the hypodermic syringe, otherwise iron oxide will be deposited within it.

The injections may be given into the skin of the back, always deeply, or of the thighs; they are always painful; the pain does not last long, however, and in upward of a thousand injections I have never had any unpleasant effects produced. They should be given every day or every other day, as the case demands.

The effects of arsenic upon the blood are not even so well understood as those of iron. Experimental research has shown that different results may follow; Stockman and Grieg (Cushny) found the blood cells and hemoglobin unchanged, but the bone marrow in a state of great activity. There can be no doubt, however, of its activity as far as general metabolism is concerned; digestion and nutrition are improved, therefore gain in strength and weight follow its use. It is rarely indicated in this form of anæmia, but is valuable in other forms.

CHRONIC ANÆMIA

This is one of the most common affections the physician is called upon to treat. On account of the great number of causes producing this disease, its treatment is very difficult; anyone can prescribe iron for anæmia, but in many instances one is only, as it were, pouring water into a leaky bucket. But iron succeeds so frequently on account of its indirect effect upon the cause that upon the whole iron therapy is indiscriminately used with reasonably good results. One of the common causes of anæmia is hemorrhage, blood being lost in comparatively small quantity, but daily or very frequently; to determine the existence of this loss when it is not apparent, as in hemorrhage from the female genitalia, the bladder or the kidney, the urine must be examined for blood; in epistaxis, hemorrhoids, or in the hemorrhagic diathesis the fæces must be examined. With the modern methods for detecting blood in the fæces, undoubtedly many cases will be found in which there is a definite cause for the anæmia (ulcer or tumor of the stomach or intestines, *Ankylostoma duodenale,* infusoria).

Anæmia may be the result of improper food or bad hygiene; this we frequently find in school children, in whom it develops as soon as they are sent into badly ventilated schoolrooms, and in the agricultural population in various parts of the country, who live on food that is not rich in iron, and who seldom have meat, eggs, or fresh vegetables.

The condition results from a large number of diseases which affect the structure of the blood directly or indirectly; all those diseases in which fever is present, all those caused by improper food, insufficient in quantity and quality;

continued suppuration; the loss to the body from lactation or albuminuria; chronic gastrointestinal diseases; the infections, syphilis, malaria. Of the greatest importance is that group of causes due to toxines that are produced in the intestines as the result of chronic autointestinal intoxication; probably a large number of the worms that are found in the intestinal tract act in this way by producing a toxic body. Anæmia is produced by a great number of chronic intoxications: lead, arsenic, opium, mercury. We furthermore find it in all those conditions in which metabolism suffers as the result of some condition of the nervous system indirectly affecting the nutrition or blood formation. When a cause is found it should be removed; it is not absolutely necessary, in most of these cases, to use the therapy that has been referred to in the previous division to hasten recovery unless the anæmia persists after the removal of the cause, or when it does not conflict with the causal therapy.

The following additional directions may be carried out: The patient should exert himself as little as possible; besides the complications that might arise from exertion, rest, mental and physical, conduces to blood formation and prevents waste of hemoglobin and albumin. It should be the object of diet to introduce as much blood-iron as possible; the limitation is the digestive capacity of the individual; but fortunately blood-iron foods, except those in fruits, are easily digested; therefore plenty of eggs and meat should be given. In a number of cases a milk diet acts most beneficially, because intestinal autointoxication is prevented; consequently it may be necessary to carry out a modified Weir Mitchell treatment in individual cases. When there is constipation, food-iron may be given in the form of vegetables and fruit, of which spinach, asparagus, apples, and strawberries are the most valuable.

In a certain number of cases a change of climate may be recommended; the climate should be chosen with regard to the indications that exist for the individual case. Some should be sent to mineral springs the waters of which contain iron and are slightly laxative; others may be sent to the seashore with advantage; others, again, to the mountains. Anæmic patients are benefited by all these: the change of scene and air; relaxation from the usual occupation; the improvement in appetite; the various stimuli to elimination by the skin, the intestines, the kidneys—all conduce to improvement by favoring proper blood formation and preventing blood destruction.

CHLOROSIS

Prophylaxis.—To a certain extent this disease is preventable, especially when the patient can be directed by the physician. The disease occurs also in males; I have seen the classical clinical picture in a number of young men, but it is most common in females during the period of sexual development, between the ages of twelve and twenty years; relapses are common at any age after this time. Chlorosis is decidedly upon the increase among the native population of this country; where formerly I saw it principally among immigrants, at present the greatest number of cases comes from the native born. This is verified for Boston by Townsend, sixty-three per cent of whose patients were born in the United States.

In the immigrant the development of chlorosis in this country is readily explained by change in mode of living: from outdoor life to indoor life; from

a worker in the fields to a servant in a household; from living upon the diet of a peasant to that of servants' food; finally from nostalgia, so common, especially in the Irish immigrant. In the female born in this country who has not been subjected to any of these causes, that change in the whole mode of life, in its aspirations and occupations, which has occurred during the last twenty-five years, is accountable for the increase in chlorosis. Woman to-day, though with a different physical and mental endowment, is competing with man; following the same vocations and largely neglecting her principal vocation, the total result being physical disaster, of which chlorosis is one form. When external conditions are favorable, one physician can sometimes prevail with his charge by suggesting normal hygienic physical and psychical measures. When external conditions are not favorable very little can be done, and unfortunately this is the case in a great many instances. Under all circumstances it should be the duty of the physician to advise parents that during the period of pubescence and young womanhood the girl should be spared as much as possible; that she should lead the normal life of a woman as nearly as possible, even if she has to gain her livelihood as a competitor of man. Much of this is a sociological question to be settled in the future. In the selection of occupation much can be done for prevention: mental work is more harmful than physical work; the greater and the more acute the competition the greater the damage. Girls in large factories suffer less from chlorosis than do students in college; this is notably the case in students of music, in whose occupation we find all the elements conducive to physical breakdown. Athletics should be encouraged; not the strenuous kind such as is indulged in nowadays, which by competition does harm to nerve function, but the simpler forms that can be practiced daily with the distinct purpose of improving general health. Cleanliness of mind and body is of great importance. Proper diet should be insisted upon; in this country, at least, the slate pencil-eating chlorotic has been supplanted by the girl who lives on sweets and pickles. The use of alcohol should be discouraged; certainly the use of tobacco, especially the smoking of cigarettes. Much may be done then by prophylaxis; how much can be done depends entirely upon circumstances.

Treatment.—The results obtained from treatment in this disease are excellent. Whatever theory one may have regarding the origin of chlorosis, iron therapy is the treatment that leads to the best results. It was in connection with a number of refractory cases that I made my investigations on the Intestinal Origin of Chlorosis (1893), the conclusion to which they led me being that chlorosis was due to faulty hæmapoiesis, a conclusion that has been adopted by a number of authors as a result of other processes of reasoning. While as the result of further investigation since the publication of the first article I have had occasion to reject one of the proofs of my theory, the therapeutic measures which were the logical result of this theory remain unchanged. Even without confirmation from others, my long experience, now extending over fifteen years, would permit me to urge the continuance of this method of treatment. It consists in the administration of an intestinal antiseptic before meals and an iron preparation after meals. Even with an incomplete carrying out of the method, Townsend was able to verify my statement that in chlorosis increase in hemoglobin is greater when an intestinal antiseptic (beta-naphthol) and iron are given than when either

is given alone. My investigations showed that salol or beta-naphthol, in the majority of cases, is the best antiseptic, and that of the iron preparations the organic give the best results. With long-continued use of the method I have found it necessary to make slight changes. Of the antiseptics I find that beta-naphthol is the most efficient, that next to this comes salol, but in a number of cases, presumably with a tuberculous tendency, benzosol is valuable. For the iron preparation I find the difference between any one of the carbonates and the organic preparations to be so small that practically the result remains the same whether one or another is given, so that at the present I give 0.3 gm. (gr. v) of either salol, beta-naphthol, or benzosol before meals, and Blaud's pills after meals. In children the organic iron preparations, hæmogallol or ferratin, are preferable because they may be made up into tablets containing chocolate or saccharin, forming a very agreeable preparation.

With this medicinal treatment, which in the mild cases is sufficient, other things must be taken into consideration. The gastrointestinal tract needs special care; the stomach frequently requires attention, as in the treatment of hyperchlorhydria or gastroptosis; the intestine, as in constipation. Constipation is present in the majority of cases, but relief for constipation alone, as first stated by Sir Andrew Clark, whose pills also contained iron, will not cure chlorosis unless the treatment is supplemented in one way or another by the administration of iron. Under all circumstances the bowels should be kept open; all coprostasis should be prevented (v. Constipation). The diet should be prescribed to meet the conditions in the stomach and in the intestines. In a number of cases a milk diet with carbohydrates will be found very valuable; to a certain extent forcible feeding must be applied. When the appetite increases the iron-containing foods may be added, depending entirely upon the digestive capacity of the individual.

The patient should be urged not to go to the extent of fatigue in any direction; rest after meals is especially beneficial. In the severest forms the patient should be kept in bed, the food prescribed as above, and iron used hypodermically. Even in persistent, comparatively mild cases the hypodermic use of iron is indicated. Severe cases do best when removed to a sanitarium or properly constructed hospital; in any form of chronic anæmia a change of climate may be recommended. In several instances I have found it necessary to send immigrants back to the country from which they came. I have had no experience with the use of sweat baths or of venesection in chlorosis, although both these measures seem rational.

For the symptomatic treatment it is necessary to remove everything that may contribute to anæmia (v. Chronic Anæmia). E. Grawitz, who considers chlorosis a neurosis, asserts that he gets good results from bromides or valerian preparations; but as he combines with their use hospital treatment, good care and feeding, sweat baths and massage, it is more likely that the nervines act in a purely symptomatic way. The treatment by mineral waters is the same as that of chronic anæmia.

Arsenic is indicated especially in those women in whom there is menorrhagia. As a rule, the administration of iron increases this unless it is given only in the intervals between menstruation; to be effective it must be given hypodermically.

PERNICIOUS ANÆMIA

As we are dealing with a disease which, according to our present point of view, is the result of different causes, the study of every individual case becomes necessary for successful treatment. This is frequently accompanied by insurmountable difficulties because of the insufficient development of the sciences collateral to medicine. The literature of the treatment of pernicious anæmia is very unsatisfactory, inasmuch as many cases are reported cured by many remedies, the cure undoubtedly having been nothing more or less than a remission which, as is known to all, may occur in any case and extend over a considerable length of time.

CAUSAL THERAPY is most efficient when the disease is due to intestinal parasites, especially to the bothriocephalus and *Ankylostoma duodenale*, and it is more than likely that as our knowledge increases other parasitic forms will be found. In the progressive anæmia produced by the two parasites mentioned prophylaxis is of great importance, for which, as well as the treatment, the reader is referred to the proper chapter. It is only proper to emphasize the fact that pernicious anæmia does develop in connection with diseases of the gastrointestinal tract, the bothriocephalus form being the type; and here an intoxication takes place. Whether intoxication is a result of septic conditions in the mouth, as affirmed by William Hunter, or of atrophy of the stomach, or of intestinal autointoxication, it is not our province to discuss. The fact remains that by taking these causes into consideration, good results have been obtained. E. Grawitz has reported four cases that have been cured by therapy based upon the view that the disease is enterogenous; he makes the statement, to which I assent, that when no other cause is found in an individual case, it should be treated as of enterogenous origin. When stomatitis is present it should be treated (v. Stomatitis Ulcerosa); in these cases streptococcus serum has been used, apparently with benefit, although the connection between a suppurative process in the mouth, which may result from any one of many bacteria, and the effects of antistreptococcus medication is not very clear to me. Whether we look upon atrophy of gastric mucous membrane as a cause or as a result of the disease, all gastric conditions should be treated by proper diet and medication; as a rule, hydrochloric acid should be given in pernicious anæmia.

Grawitz insists upon lavage of the stomach for the purpose of preventing abnormal chemical changes in the intestine; he also recommends lavage of the intestine. The treatment of the intestine consists in the prevention of coprostasis by the proper treatment of constipation. The diet should consist of milk and an approach to vegetarianism, as referred to before in connection with chronic intestinal autointoxication. In one case, by giving laxatives I succeeded in producing a rapid change for the better; the treatment was continued on the basis of intestinal autointoxication, and after three years the patient seemed well. Intestinal antiseptics may be useful in relieving symptoms, but they will not remove the cause.

Arsenic has been looked upon as a specific in this disease; it should be given in increasing doses, beginning with the minimum and gradually augmenting it, then remaining at a stationary dose for from one to two weeks,

finally gradually diminishing again. The drug may be given by the mouth in the form of Fowler's solution, the Asiatic pills, or as sodium cacodylate, the latter being used when the former cannot be given on account of unpleasant effects upon the gastrointestinal tract; it is, however, by no means so efficacious as the two other preparations. Hypodermic injections of sodium arsenite, 0.001 gm. (gr. $\frac{1}{60}$), may also be used; in individual cases it is decidedly advantageous to administer the remedy in this way. The results from arsenic, as expressed in the older statistics before the days when remissions were thoroughly understood, need revision. It is not probable that arsenic cures pernicious anæmia, but there can be no doubt that many patients are benefited by its proper administration; this has been shown repeatedly as the result of clinical experience. It is also satisfactory to know that research has shown that arsenic acts beneficially upon the blood-forming functions in the bone marrow; but this action can be looked upon only as temporary, for the cause of improper function in the blood-forming organs does not seem to be removed by arsenic. We conceive of the action of arsenic only as removing the cause by its effect as a disinfectant; if it acts as such, it is not sufficient to remove the cause of the disease. Its beneficial effects, however, are so well marked that next to the gastroenteric treatment it is the most valuable; by hypodermic injection a combination can be made so that one does not interfere with the other.

I have obtained no effects from organotherapy; the use of bone marrow has been largely discontinued by the profession, and can now be looked upon as a historical landmark of the crudity of our conceptions in regard to organotherapy.

Oxygen inhalations may be prescribed and are of value for general metabolic changes; it cannot be said that they act curatively.

Transfusion of blood has also been used; in one case the patient seemingly was saved from death by it, but, as has been the experience of others, the next relapse was not in any way affected by a transfusion. R. C. Cabot, in a review of 110 cases, comes to the conclusion that neither bone marrow, arsenic, nor inhalation of oxygen has any effect upon the course of the disease; I fully agree with this statement, and would say the same of transfusion of blood.

The HYGIENIC TREATMENT of this disease is the same as that of chronic anæmia: the patient should rest as much as possible, reducing wear and tear to a minimum, but at the same time a compromise should be made between the normal mode of life and that which is best for the condition of the patient. During a relapse this is not possible; in the interim improvement is frequently more rapid, when the patient can be treated as being no longer an invalid.

II. LEUKÆMIA

It is very doubtful if any case of any form of leukæmia has ever been cured; in the acute form the disease lasts for weeks, in the chronic for years. As we do not know the ætiology of this disease, causal treatment is impossible. There remain the various drugs already recommended in pernicious anæmia—

arsenic, iron, oxygen inhalations—to which may be added quinine and eucalyptus globulus. The local therapy should be conducted with regard to the indications; when enlarged lymphatics produce disturbance in respiration, they should be removed when possible.

Since Senn (1903) has reported good results from the use of the Röntgen rays in a case of splenomedullary leukæmia, a number of cases have been put on record in which temporary good results have been obtained by this method of treatment. These consist in general improvement, reduction in size of the spleen and the liver, in a diminution in the number of white corpuscles (from 1,500,000 to 8,000 in Grawitz's case), and an increase in the number of red corpuscles and in hemoglobin. In lymphatic leukæmia the same results have been obtained by X-ray treatment. Experimentally it has been determined by Heinicke that the follicles of the blood-forming organs are destroyed by the action of the X ray in the lymphatic glands and the spleen, and also the lymphoid and myeloid tissue in the bone marrow (Milchner and Mosso).

As yet we are not in a position to speak of permanent cures, but nothing that has so far been done equals this method of treatment in efficacy.

Splenectomy does not promise much in this disease; improvement has followed it, but the final result has always been the same, since the cause of the disease is not removed with the spleen. Vanserts (1897) reports thirty cases of splenectomy in splenic leukæmia of which four only recovered from the operation. In one the diagnosis was doubtful; a second improved, but was found in bad condition after three years; of the two remaining one died in three months, the other in eight months, after the operation. Lindner (1905) suggests earlier operation in order to lessen this great surgical mortality. In the one case which he reports, the patient was alive after two years, but the blood was still abnormal. But notwithstanding the bad outlook for cure, the physician can do much in individual cases to give relief and to prolong life.

The symptoms on the part of the gastrointestinal tract require special treatment; diarrhea and gastric disturbances should be treated; hemorrhages may require special attention; the night sweats, the debility, cardiac collapse are treated in the same manner as when they occur in other diseases.

The diet should be largely nitrogenous; we know that albumin decomposition is one of the characteristics of this disease; it is well, then, to provide against it by proper diet; in the later stages it alone is sufficient to determine the time of death. Exercise should be regulated; it should be moderate in amount, and is best in the open air. When for some reason this cannot be accomplished, massage or Swedish movements may be employed.

III. HODGKIN'S DISEASE

It seems reasonable here to treat the manifestation which is most apparent, especially as good results are recorded from it and also because at times it becomes absolutely necessary. In the early stages of the disease the enlarged lymphatic glands should be extirpated; there is no doubt that in a number of cases the course of the disease has been modified by this operation. When the glands become larger during the disease they should be removed only for

the relief of pressure symptoms. For the purpose of their reduction many things have been recommended: the internal or external application of iodine (from the former little can be expected, none from the latter); the internal and external use of creosote preparations, which in some cases give good results; hydrotherapy may also be tried. A good method is undoubtedly the injection of arsenic into the parenchyma of the gland, as recommended by v. Ziemssen, the same doses to be used as in pernicious anæmia, but the injections need not be made daily. I am not prepared to say that parenchymatous injections are absolutely necessary, for we find marked improvement in the glands when arsenic is injected subcutaneously, or even when given *per os*. At all events, arsenic is the best remedy we possess for the treatment of this disease; it should first be tried by the mouth; if no result follows it should be given hypodermically. All irritating injections into the gland structure should be avoided, as we are apt to add injury to the already existing condition, which in itself is sufficiently serious, especially as we cannot be assured of the efficacy of our measures.

X-ray treatment gives the best results of all methods that have been advised; it is simple, and while it may not cure the disease permanently, astonishing improvement follows. Holding and Warren collected twenty-two cases which had been treated in this way; of these twenty-seven per cent were cured symptomatically, fifty-nine per cent were improved, and fourteen per cent were either not improved or terminated fatally.

Splenectomy should not be advised. In Banti's disease the results of extirpation of the spleen seem to be more favorable. Otherwise the treatment of Hodgkin's disease must be the same as that of the preceding forms as to diet, hygiene, and symptomatic measures.

IV. PURPURA

TREATMENT

The CAUSAL TREATMENT of this disease is not satisfactory; it is to be hoped that future investigations may enlighten us in regard to its nature. So many causes are accepted, and so different is the classification made by various authors, that it becomes necessary to state that for the present, at least, we must consider everything as purpura when the clinical evidences of this disease are present, regardless of the ætiological factor. It seems entirely illogical to call only that form of disease purpura of which the cause is known. We know that purpura occurs in a number of infectious diseases; indeed, it is more than likely that more than one form accepted as purpura by those who use the ætiological classification is due to infection. In these cases the causal treatment of the infections may be invaluable; in purpuric fever in horses the veterinarians use antistreptococcic serum. That the condition of purpura is due to toxæmia and not to bacteriæmia is probably true; purpuric conditions due to serum therapy are common; all these sera are absolutely free from bacteria; there is some toxine contained in horses' serum that produces the condition. Many other toxines are mentioned as producing the

disease. The treatment of toxæmia should not be neglected in those cases in which it may be supposed to exist.

In all cases of purpura the patient should be kept in bed, not only because thus the disease runs its course more rapidly, but because rest in bed may prevent serious, or even fatal, hemorrhage. The importance of this direction may be emphasized by reference to a case which came under my observation: A young man after an attack of influenza developed purpura; on account of an epistaxis he went to the office of his physician, returning home in the evening; during the night the physician was summoned, and found his patient suffering from cerebral hemorrhage; I saw the man in the morning, and verified the diagnosis; the hemorrhage was evidently profuse, symptoms of compression developed, and the patient died in the afternoon. There is no reason for believing that this cerebral hemorrhage might not have developed if the patient had been left in bed; indeed, I have seen three cases, all after influenza, in which this did occur; but it is difficult to convince the family that in a disease which may become fatal or dangerous upon short warning the physician has done his whole duty when he allows his patient to move about. The rest in bed need not be so absolute as for acute myocardial insufficiency; the patient may be allowed to change his bed, to lie upon a lounge or upon a cot in the open, but no exertion of any sort should be permitted. In a large number of cases enforced rest is very irksome; in children, especially, it is carried out with the greatest difficulty; fortunately, in them the prognosis is more favorable; but it seems better for all concerned that the physician should give his directions, and his reasons for giving them. In my experience, rest is more important than anything else. My rule is to keep the patients quiet until no further hemorrhages develop; this may be two weeks, it may be six weeks, or even more. When the patient gets up, he must not immediately go back to his ordinary occupation.

The diet should be carefully controlled; except in those forms produced by Bright's disease or various cachexias, all food should be given cool, certainly not hot; the most easily digested food containing much albumin should be given—milk, eggs, scraped raw meat, beef juice. In all these cases I give fruit juices—those of lemons or oranges especially. No stimulants of any sort should be permitted unless they are indicated for the relief of symptoms; this includes coffee and tea.

Both diarrhea and constipation should be avoided; the addition of the fruit juice to the diet and its proper use usually prevent constipation; when it develops, the milder laxatives, such as senna, cascara sagrada, or rectal measures, may be used; even the salines should be used with great caution, as we do not wish to put the intestine in such a condition as to predispose to intestinal hemorrhage. Diarrhea should be checked by change in diet, by the use of astringents, and by the early use of opiates.

The remedies that have been recommended for the disease itself are numerous; ergot is probably the most commonly used. I have never seen any benefit arise from its administration as far as the general condition was concerned; it should therefore not be used in a routine way; the same may be said for hydrastis canadensis or hydrastinine; arsenic is of value, especially in those cases in which relapses occur, and also for the period of convalescence; lead acetate, gallic acid, or turpentine sometimes seems to have some

favorable action. Calcium chloride—1–1.5 gm. (gr. xv–xx)—for children in proportion, three times daily, as recommended by Wright, has seemed to me to be the most valuable of all the remedies that have been recommended, although it by no means acts in all cases.

Peliosis Rheumatica.—In this condition the salicylates and antipyrine have been recommended; they deserve trial, as antipyrine especially gives relief for the pain. In this form rest and external applications of lead and opium wash applied warm have served me better than internal medication.

The *symptomatic treatment* is that of the symptoms as they arise under other conditions. The mouth, the hemorrhages, and the collapse occurring after large hemorrhages, require special attention.

During *convalescence* the anæmia may require treatment; tonics according to their special indication should be given. The diet should be the most nutritious, most easily digested, and at the same time the most appetizing that can be selected for the individual. Change of air may be recommended when conditions are favorable. During convalescence all functions should be made to approximate the normal condition. Litten calls attention especially to the necessity for frequent examination of the urine, on account of the possibility of a developing nephritis.

V. HEMOPHILIA

PROPHYLAXIS

This can be carried out only by taking into consideration the peculiar hereditary transmission that was first observed by Grandidier, and has been fully verified by all successive observers. As the disease is transmitted to the offspring only through the female members of hemophilic families, these should refrain from marriage. For the prevention of development of symptoms the males should avoid injury, and when possible no operations should be performed upon them. Even the slightest operation, such as the extraction of a tooth, leeching, cupping, circumcision, may be followed by very unpleasant and even fatal results. Vaccination was followed by a fatal result in one instance on record. In one of my patients, a female bleeder, normal confinement was followed by the most profuse hemorrhages I have ever witnessed, yet she lived and subsequently gave birth to four children. It was thought that by the bringing on of abortion the hemorrhage could be more easily controlled, but the loss of blood was even greater than before, for it continued longer.

TREATMENT

This consists in the controlling of hemorrhage; adrenalin is probably the best remedy that can be used; locally when possible, if not then by hypodermic injection. In my own practice it has completely supplanted the use of ergot, which, however, has occasionally acted very efficiently. Gelatine locally applied has also been used with excellent results. The use of iron perchloride, tannic acid, or lead acetate cannot be recommended in these cases, as the other remedies are so much more certain in their action. In one of my hemophilic

patients, who had to have teeth extracted, the dentist, at my request, made a little apparatus which the patient kept in his mouth and which pressed upon the bleeding place enough to control the hemorrhage.

VI. SCURVY

PROPHYLAXIS

In order to prevent the development of scurvy both the predisposing and the direct cause must be taken into consideration. The predisposing cause is anything that may reduce general health: some of the acute infections, bad hygiene, poor drinking-waters, improper or insufficient food, great nervous or mental exertion. It seems, then, in this respect to coincide with all other infections, and as a matter of fact the trend of modern opinion is in the direction of accepting scurvy as an infectious disease. The direct cause would then presumably be a lower form of life, the other views being that this cause is a chemical substance, a ptomaine, or an absence of certain important food elements, such as fruit acids. As far as infection is concerned, only increase in resistance can be considered for prophylaxis. To prevent ptomaine poisoning it is necessary to see that albuminous food is taken that has not been tainted; that this can be done successfully, even under most unfavorable conditions, was shown by Nansen in his remarkable trip to the arctic regions. Fruit or vegetables are not necessary to prevent scurvy, as many people live without them and never get scurvy; that their presence acts as a prophylactic has been shown so frequently that it may be accepted without hesitation. How they act upon the disease is still a matter of speculation, but no definite or acceptable explanation has as yet been arrived at.

At present, when all voyages are of comparatively short duration, sea scurvy has been reduced to a minimum. Land scurvy occurs principally in endemic or epidemic form in those countries in which sanitary and hygienic conditions are poor. Sporadic cases occur everywhere.

TREATMENT

For the cause, the administration of fruit juice is of prime importance. Lemon juice is usually given—the juice of from two to four lemons daily. The diet should be confined to fresh meat, fresh milk, potatoes, fresh vegetables. This diet should be adapted to the condition of the gastrointestinal tract; in some cases the one article of diet, in others the other, or a combination of one or more, is necessary. It is always important at first to reckon with the condition of the stomach; when this is normal, a very liberal diet of fruit and vegetables may be prescribed. For vegetables, spinach, potatoes, cabbage, cresses, radishes, beets, turnips, onions, asparagus may be recommended; green salads are also of value. All juicy fruits are especially valuable; if necessary, the juice of strawberries or raspberries may be given; oranges are in the same class with lemons, and are usually preferred by children. The constipation should be treated as in purpura, the mouth as in stomatitis ulcerosa, the hemorrhages as in any other disease.

Convalescence is usually, except in very bad cases, quite rapid, but the anæmia may require treatment as in purpura (q. v.).

INFANTILE SCURVY

PROPHYLAXIS.—Much can be done prophylactically, although scurvy sometimes develops in breast-fed infants. The statement that holds good for infant feeding in general is the one that obtains here: to give the infant that kind of food suitable for it. The cause of the disease, as in scurvy in adults, has not been found, but to my mind there is no question that the disease has increased very much in frequency. This increase coincides with the introduction of methods intended to render the food more or less sterile. Inasmuch as prolonged heating destroys the citric acid normally contained in milk and changes the albumin, and because citric acid and uncooked food prevent and cure the disease, it does not seem unreasonable to conclude that heating the milk—i. e., giving cooked foods—has something to do with this increase. In the methods used for preservation of food, the heating of the milk is the essential feature. That the disease occurs with some of the proprietary foods would be a natural conclusion from this; most of them are prepared by heat, to which may be added the possibility of changes going on in them during preservation. That for this reason all proprietary foods should be tabooed is overshooting the mark. But it is a wise precaution, when it is necessary to give sterilized milk to children, to give some fruit juice at the same time.

TREATMENT.—Whatever may be said as to prophylaxis and ætiology, there are few infantile diseases so amenable to treatment as scurvy. Not only are the results positive, but they follow in a very short time after treatment has begun; I have seen a thoroughly well-developed case of scurvy entirely cured in a week, improvement beginning as early as the third day of treatment. Abortive cases, which as a rule are overlooked, do just as well, and infants that have been ill for weeks or months not infrequently recover in a very short time. In the severe cases the causal therapy must also be used, but here the patient's life is endangered by local conditions, hemorrhages, or by the general condition of debility.

The *causal treatment* is simple. The infant must have unboiled food; raw milk is the best. If the child is at the breast, either a wet nurse must be found or artificial feeding instituted. If the child is fed on a proprietary food, this must be given up, and when possible raw milk should be substituted. In addition to the proper food, the juice of a lemon or an orange should be given daily. I have never had trouble in giving orange juice to infants, but when they will not take it or lemon juice, mashed potatoes do very well; in the poorer classes potatoes may be substituted for oranges or lemons, as I learned from Cheadle, whose experience I can verify.

For *symptomatic treatment*, the mouth must be looked after as in stomatitis ulcerosa; the anæmia may require ferruginous remedies. I always make it a rule to add beef juice or bovinine to the food of the infants, and I believe that this has prevented severe anæmia. For the pain, immobility of the parts affected should be striven for; this is not difficult, as the infant naturally inhibits motion, and may be kept quiet by the simplest form of appliance.

Not infrequently it will be found necessary to carry the child on a pillow. The condition of the gastrointestinal tract should be looked after according to the methods referred to in the chapter devoted to this subject. The hemorrhages should be treated in the same way as in adults.

VII. DISEASES OF THE SUPRARENAL BODIES

ADDISON'S DISEASE

TREATMENT.—The more or less obvious connection that exists between Addison's disease and diseased conditions of the adrenals has led to organotherapy. For this purpose the raw suprarenal bodies, or an extract made from them, or the active principle has been used. Of the gland itself, 3 gm. (gr. xlv) may be given three times daily, or a glycerine extract corresponding to this dose. A dry extract has been made, of which one grain corresponds with gr. xv of the gland. The adrenalin (or any other preparation containing the active principle) may be given in the ordinary dose. The therapeutic results vary very much according to different observers; Kinnicutt has collected forty-eight cases, of which six were cured and twenty-two improved; this is probably the most favorable statement that has been made. Many authors have seen improvement measured by gain in weight, loss of pigmentation, amelioration of symptoms. Quite a number have seen no results whatsoever from the treatment. As Addison's disease is a rare one, individual experience is usually confined to few cases; as for myself, in the two cases in which these adrenal preparations were used, and I tried them all, no results whatsoever followed. In this disease, as in so many others, remissions may occur, and a rational skepticism should especially be entertained as to therapeutic results. For the present we are justified in stating that in every case of Addison's disease organotherapy should be attempted; furthermore, that the results are not so satisfactory as in some other conditions—myxœdema, for instance—and that care should be used in administering these remedies, for recent investigations seem to show that organic damage may be produced (arteriosclerosis—His) which may not be altogether a negligible quantity.

Symptomatic treatment is important under all circumstances, especially that directed to gastrointestinal symptoms, and all our therapeutic resources are frequently required to meet these symptoms. No very active laxatives should be given, for diarrhea is to be feared, as it may increase the adynamia and so induce a fatal termination. The *gastric symptoms*—dyspepsia, nausea, vomiting, pain—require attention. The anorexia frequently makes feeding the most important problem. Diarrhea must be controlled by the usual methods, especially when adynamic symptoms have developed.

The *diet* should be adapted to the particular symptoms on the part of the *gastrointestinal canal.* In the last stage of the disease the selection of food for the patient drives the physician to despair, especially as the weakness continues to increase and no relief seems possible.

For the *adynamia* the patient should be kept in bed; generally this is done from necessity, the sufferer finding it almost impossible to move.

Iron and arsenic have been recommended; the latter in ascending and large doses is sometimes followed by remissions; strychnine or nux vomica may also be used. One can hardly get on without the use of some form of stimulant, either alcoholic or other; champagne, wine whey, and brandy or whisky are the most valuable.

The cardiac collapse that occurs so frequently as the final symptom should be treated by vasodilators, cardiac stimulants, ether, camphor; as a rule, death occurs suddenly when this condition develops.

For the symptoms on the part of the *nervous system*—vertigo, faintness, syncope—the proper remedies should be applied; convulsions should be treated upon general principles. For the coma, in which condition most of these patients die, nothing can be done.

VIII. DISEASES OF THE SPLEEN

MOVABLE SPLEEN

The indications are those that have been put down for all movable organs in the chapter on enteroptosis. Here a properly fitting bandage is, as a rule, all that is required; it must go well up over the lower end of the thorax, and usually there is no need of a pad. A. Rose and N. Rosewater recommend methods of *strapping* the abdomen. When the abdominal muscles are very much weakened by repeated pregnancies, an attempt may be made by massage, gymnastics, and electricity to strengthen them. Ordinarily this is without any appreciable result.

When the symptoms produced by the movable spleen become unbearable to the patient, operative intervention may be resorted to: either fixation by suture or by artificially produced adhesions or, when this is not successful, by splenectomy. When the pedicle becomes twisted, producing symptoms, the spleen should be removed.

CHRONIC ENLARGEMENT OF THE SPLEEN

Enlargement in connection with leukæmia, pseudoleukæmia, and malaria has already been referred to. The remedies that have an effect upon enlargement of the spleen, principally on account of their effect upon the diseases producing it, are arsenic, quinine, eucalyptus, piperin, the iron preparations, and mercury or the iodides. All other methods that cause the spleen to contract by stimulating contractility are of service; when organic changes are so great that contractility is interfered with, these are of no use. Hydrotherapy, in the form of the cold douche or the alternating cold and hot douche, may do much good; the sitting need not last longer than from one to two minutes. Massage of the spleen may also be used with good results. When the spleen is not too large, faradic electricity frequently produces diminution in size. In enlargements due to infectious diseases these measures are especially to be recommended, but not in other forms. Parenchymatous injections should not be used. Splenectomy is especially valuable in that form of anæmia

called splenic anæmia. In enlargements due to abscess, echinococcus, tumors, or cysts, the treatment is entirely surgical. Any chronically enlarged spleen should be removed when it produces either serious local or remote disturbance. The contraindications are found in the general condition of the patient and in the futility of its removal on account of the cause producing the enlargement.

IX. DISEASES OF THE THYROID GLAND

GOITER (Struma)

PROPHYLAXIS.—There is little definite knowledge as to the ætiology of goiter. I have studied endemic goiter in the northern part of Michigan, where not only human beings, but cows and horses are affected. It has been suggested that in such regions, of which there are many in Europe, the inhabitants should be directed to drink boiled water only; for observation has shown that many patients develop the disease after drinking water from certain sources. It has not been shown that boiling the water removes the cause; neither have chemical analyses demonstrated that either the presence or the absence of iodine in the water has any effect upon the development of endemic goiter. Thus we are again in the dark, and only so far as it is shown that those who drink a certain kind of water are afflicted with goiter can the water be looked upon as a possible cause.

The hyperæmia produced in the thyroid gland as the result of exertion (carrying loads up great altitudes) has also been thought to produce goiter; this certainly is not the case in Michigan, where the country is flat. Certain trades (lace workers) have been accused of causing goiter. Certain it is that in endemic goiter attention must be given to improvement in hygienic conditions. In the special instance under my observation there were overcrowding, poor food, and poverty; yet all this alone cannot account for the existence of endemic goiter. Epidemics of acute goiter are on record (Kraus) among soldiers in particular garrisons; among girls in boarding schools; here the particular cause must be discovered and, if possible, removed. Hirsch considers endemic goiter a chronic infectious disease.

There is a definite connection between goiter and the sexual functions, especially in women, in whom goiter is much more common than in men. We therefore see the disease developing at times when there is some change in sexual function: before and during puberty, during pregnancy and confinement, and, according to my observation, during or immediately after the menopause. It is during these various epochs that the thyroid gland should be watched.

TREATMENT.—The indications for treatment are twofold: cosmetic, and the production by the goiter of symptoms either directly or remotely endangering life.

Medical.—This method must be confined to the parenchymatous and the vascular form of goiter. It consists essentially in the use of iodine in some form. The method of action of this drug is absolutely unexplained; the fact that iodine does reduce goiter in a large percentage of cases has been estab-

lished by years of clinical evidence, provided the patient is treated early enough in the disease. In order to determine the efficacy of this treatment it is necessary to take measurements; this is best done by taking a landmark, such as the vertebra prominens in the back, and carrying the tape around the greatest circumference of the tumor; if this is not sufficiently satisfactory other vertebral levels should be taken; frequently it is necessary to take four levels in order to have accurate results. In small goiters the external use of iodine is generally sufficient, care being taken to have the iodine mixed with a fat that is easily absorbed, and in the strength of from five to ten per cent. Iodovasogen is an excellent preparation. A small quantity should be well rubbed in daily; the effects upon the skin should be carefully watched, and the treatment should be continued for months, if necessary. It is unfortunate that iodine discolors the skin, for colorless preparations of iodine and the iodides, when used externally, are valueless, so that the persistence of the patient in carrying out this method depends largely upon the intensity of his desire to be rid of the trouble. Fatty excipients can be found which may be washed off, then the discoloring effects of the inunctions are not so well marked. When this method is not applicable it is necessary to use one of the iodine preparations internally. My preference is for sodium iodide, a two- to five-per-cent solution, of which a teaspoonful well diluted is given three times daily. The effects must be carefully watched, in order to prevent the development of unpleasant symptoms (cachexia strumipriva or acute iodism). As soon as the reduction of the gland begins the dose is reduced. The results are very gratifying; in a number of cases the reduction is permanent; frequently there are relapses, which are to be treated as before. Much was expected from the thyroid gland preparations after the Bruns and Reinhold publications (the former reporting nine cures out of twelve cases, the latter five out of six). Aside from some of the unpleasant symptoms produced by thyroid feeding, I agree with Ewald that the results are very disappointing. As will be shown hereafter, the use of thyroid medication is still in an experimental stage. For cosmetic purposes iodine preparations should not be given for too long a time in this disease; they have a decided effect upon the mammæ, causing reduction in size (Ricord, Boehm). Injections of iodine into goiters should not be used, the risk of producing strumitis is too great and the chance of cure too small. The treatment of excessive and diminished functional activity of the thyroid gland will be referred to under Graves's disease and myxœdema. The symptoms on the part of the heart and lungs will be referred to under their proper headings.

Mechanical.—The medical treatment may be assisted by gymnastics, especially in the vascular type of goiter. The patient, lying upon the back with the head low, is directed slowly to flex the head and extend it; to begin with three minutes' duration of this exercise daily, and prolong it to ten minutes daily.

Surgical.—The indications for surgical intervention are (*a*) when the goiter produces marked symptoms of hyperthyrea after failures of medical treatment; (*b*) when the goiter by its presence produces symptoms of pressure, especially upon the trachea or upon the larger veins of the neck, which may prove fatal.

THYROID ABSCESS (Struma Inflammatoria)
THYROIDITIS ACUTA (Strumitis)

Both these conditions must be treated like any other inflammation of a superficial gland. The importance of not puncturing thyroid glands has already been referred to. External applications of mercurials have been recommended—the ice bag, Leiter's tubes; then warm applications—poultices; but above all, early incision when there are evidences of pus.

EXOPHTHALMIC GOITER (Graves's, Basedow's, Parry's Disease)

TREATMENT.—It is impossible to formulate a theory that will explain all the various conditions of Graves's disease. The theory at present most acceptable ascribes the disease to hyperthyrea. Opposed to its acceptance is a large number of cases successfully treated by thyroid feeding, so that apparently in these cases there could have been no hyperthyrea; yet with our lack of accurate knowledge regarding the action of the internal secretions upon one another, the addition to thyroid material in the blood may have a favorable action in stimulating the antagonistic glands or in producing antibodies. This theory seems probable when we consider a number of cures caused by the use of other animal extracts—thymus, suprarenal gland, ovary, spleen. Certain it is that the thyroid plays a very important rôle, for it has been shown that goiter may produce the symptoms of Graves's disease; but, above all, artificial hyperthyrea does produce all the symptoms, including exophthalmus, of this disease. As a rule, thyroid therapy is contraindicated in Graves's disease; I have seen two patients in whom the use of this method was followed by a rapidly fatal termination. It is impossible, in an individual case, to state when thyroid gland is indicated. Under all circumstances great care is required in its administration, and an increase in tachycardia under small doses ought to be looked upon as an absolute contraindication. Graves's disease is caused by a toxæmia (thyroid); what produces this toxæmia is unknown, though it is usually supposed that there is some nervous influence at work, and one particular kind of successful surgical intervention (sympathectomy) seems to prove this statement. Cases of Graves's disease, then, may be treated with the following indications: to remove the toxæmia or to remove its cause. For these purposes many methods have been successfully used.

Medical Treatment.—My favorite method of treatment, which I have employed for over twenty years, is as follows: it consists of the continuous use of quinine hydrobromate, with or without ergotin. This salt was chosen because it is better borne by patients than the other salts—i. e., cinchonism is not so easily produced. As will be seen, my experience has been very extensive in the use of this drug.

Quinine hydrobromate is given in doses of 0.3 gm. (gr. v), in gelatine-coated pills, four times daily; to each pill is added ergotin, 0.065 gm. (gr. j), when the quinine alone does not give results in forty-eight hours. As these pills may have to be given for a great length of time, I may here say that I have never seen any bad permanent effects follow their administration; one of my early patients took four of these pills daily for nearly three years with-

out detriment to herself. The effects of this method of treatment are as follows: first the tachycardia disappears, then the thyroid gland diminishes, and finally the tremor and the exophthalmos. The first change usually takes place after the treatment has been used for forty-eight hours; it should then be continued until all the symptoms have disappeared; in the fully developed cases this result has been reached in as short a time as four months and as long a time as three years. In the treatment of twelve fully developed cases I have had only three failures; in abortive cases there have been less; I do not take into consideration the number of cases I have seen in the last three years, because relapses may occur up to this time. The failures were in that class of cases which may be called the foudroyant form, originally so or developing as such in a relapse. Occasionally, however, a case is found in which there is no apparent reason why the treatment should not succeed; however this may be, nine of my original twelve cases have been without any symptoms for at least three years, and may be considered perfectly cured. I have seen a large number of cases of the aborting form, especially those developing during or after the menopause, improve under this treatment in from four to six days, so that the whole clinical picture was changed.

On account of the general condition—the extreme nervousness of the patient, for instance, or the state of the heart—it frequently becomes necessary to supplement this method by the Weir Mitchell treatment.

In order to test whether the recovery is complete it is necessary only to withdraw the quinine; if symptoms do not return in two weeks, the patient may be considered cured. How the quinine acts it is impossible to say; it may act indirectly upon toxic bodies in the blood, by slowing the heart, by contracting the arterioles, or by stimulating inhibitory centers. At the time of writing I have treated forty-one cases of Graves's disease with this method, with five failures.

Another method, which seems to depend for its efficacy upon a direct removal of a toxic agent from the blood, was forced upon my observation in 1899. The wife of a physician, with fully developed Graves's disease, was attacked with sepsis from tonsilar infection, which produced endocarditis and a septic diarrhea; she recovered from the sepsis, but the diarrhea continued for three months. As a result of this diarrhea all the symptoms of Graves's disease disappeared; finally the diarrhea also got well, and the patient now (1905) seems completely well. Kocher has recommended sodium phosphate, which also acts by elimination. W. H. Thompson has called special attention to the intestinal method of treating Graves's disease, and reports excellent results. My own results with this method are by no means so favorable as those obtained by the quinine and ergotin methods, although in combination it may succeed in individual cases when the latter alone fails.

A large number of drugs have been recommended in this disease: strophanthus is not a specific, and should be used only for its cardiac indications; arsenic can be given for its general effect; the bromides are at times invaluable for nervous symptoms; belladonna is valuable because of its effects upon the nervous system and upon the bowels.

Electricity is followed by good results in some cases, although I have never seen a patient cured by it; Chvostek's method should be used—the anode placed at the sternal notch, the cathode at the angle of the jaw; the gal-

vanic current should be applied, not to exceed three milliampères, in daily sittings lasting from three to five minutes; faradism has also been recommended; while galvanism may be followed by reduction of the tachycardia as well as of the nervousness, I have never seen any effect produced by faradism.

Organotherapy has been used with good results. Thyroid preparations have been recommended and cures have been reported; for this purpose either thyroid extract, 0.3 gm. (gr. v), or iodothyrin, tablets containing 0.25 gm. (gr. iv), should be given three times daily. Here, as elsewhere, a part does not take the place of the whole, and iodothyrin is most valuable in simple goiter, while for other diseases of the thyroid gland the extract made from the whole gland is more effective. While cures in Graves's disease following the administration of these thyroid preparations have been reported by good authors, the use of them is altogether contrary to the accepted opinion in regard to the nature of this disease. We believe that Graves's disease is principally due to a hypersecretion of the thyroid gland, therefore thyroid preparations are not indicated. Thymus extract has also been recommended; it contains iodine, like the thyroid gland, but it is safer than thyroid medication, as it contains less iodine.

Ballet has prepared a serum from dogs whose thyroid glands have been removed; Möbius's serum is obtained from goats. I have had no experience with the former; Möbius's serum gives relief, but I have never seen any permanent benefit follow its use. Lanz has succeeded in four cases by giving the milk of goats whose thyroid gland had been removed.

Hygienic Treatment.—It is of great importance to prevent loss in weight; the *diet* must therefore be directed to this end, and, when necessary, forced feeding must be instituted. Upon the whole, the dietary should be that of chronic heart affections, with special reference to the condition of the stomach and bowels; the carbohydrates should be given in sufficient quantities (v. Chronic Myocardial Insufficiency). The patient should lead a regular life, free from excitement and worry. Exercise should be limited; dancing, athletics of all sorts, riding, should be forbidden. I know of one sudden death which occurred after a ride of two hours' duration.

Hydrotherapy is valuable. The following may be recommended: For the nervousness, lukewarm baths, warm salt baths, the half bath, douches to the spine; for the enlarged gland, local applications by means of Leiter's coil, cold applications, or the ice bag; for the tachycardia, the ice bag at the nape of the neck or over the region of the heart. Nauheim and open-air baths should not be recommended.

Climatic Treatment.—Excellent results have been obtained by this without any other treatment. Low mountains (not to exceed 2,500 feet in altitude) and warm seashore resorts are especially favorable. Good results are also reported from high altitudes (Swiss mountains) as winter resorts, but with cardiac dilatation these should be avoided.

Symptomatic Treatment.—In this disease, as well as in all others in which nervousness is a prominent symptom, the treatment of symptoms is very important (v. Neurasthenia). The physician must have patience, and while he continues the form of treatment chosen, he must also give relief to the individual symptoms as they arise. In removing these he not only builds up

his patient physically, but gives him renewed courage, increases his power of resistance, and in a word improves his nervous tone. The treatment of symptoms in the various organs is that recommended in their several chapters.

The *results* of medical treatment are very favorable, from seventy to ninety per cent of all cases being cured by it. They are best in the rudimentary form; better in the form which develops gradually than in the one developing suddenly with full force (the acute form); better in women than in men, and better in the old than in the young. But notwithstanding these good results from medical treatment there remains a certain number of cases for the surgeon.

Surgical Treatment.—The operations for this disease are exothyropexy, sympathectomy, ligation of the four arteries of the thyroid gland, and partial exsection of the gland. The last seems to be the operation preferred by the larger number of surgeons, although B. Farquhar Curtis maintains that Jonnesco's operation of sympathectomy gives better results. Kocher, who has had the greatest experience with thyroidectomy, has reported, through his son, 59 cases of Graves's disease operated on by him. Four of the patients died; of the remainder, 39 had postoperative symptoms, 16 were free from them. Finally, in 45 of the cases—that is, 76 per cent—a cure ensued; in 8, or 14 per cent, there was improvement; in 2, or 3.5 per cent, only slight improvement; the 4 deaths (6.7 per cent) were due to acute tetany. In view of such results as these one can appreciate the statement made that every case of Graves's disease should be treated surgically. Here, again, the best results obtained by the most experienced surgeon are taken as a basis, and naturally the conclusion drawn must be fallacious. That such is the case is shown by a collection of cases made by M. A. Starr from various sources (1896): of the 190 cases reported, 23 patients died as the immediate result of the operation; 45 were improved; in 45 the result was doubtful; in 3 there was no improvement, and in 74 there was a complete cure. The cures were less than forty per cent, and fourteen per cent died as the result of the operation. Taking into consideration that these statistics were published in 1896, it is possible that with the advance in surgical technique a better showing might now be made, but even granting this, there must still be left a large number of cases that are either not improved or are left with postoperative symptoms which may become permanent and are entirely independent of surgical technique. Thus the conclusion that every patient with Graves's disease should first be given the chance of thorough medical treatment will be generally accepted. If all attempts are unsuccessful and the patient's condition warrants it, he should be operated on.

The indications for the operation are as follows: (*a*) *Local:* When the thyroid gland becomes so large that it produces symptoms of compression. (*b*) *General:* When the patient gets rapidly worse on medical treatment; when he loses weight continuously; when there is constant fever; when the tachycardia cannot be controlled; when the disease renders him unfit to pursue his usual vocation. Operation is contraindicated by bad general condition, as also in organic heart changes. Here, as elsewhere, the physician should not put off the operation until the patient is so reduced that any operative intervention becomes out of the question.

CRETINISM, MYXŒDEMA, OPERATIVE MYXŒDEMA, CACHEXIA STRUMIPRIVA

Treatment.—We have here a group of diseases due to athyrea, to a loss of thyroid functional activity. As a result of the consideration of this fact the therapeutic problem becomes a very simple one; its solution is found in supplying to the economy those substances that are no longer formed on account of deficient activity of the thyroid gland. Even when the gland has been extirpated, this substitution therapy will remove those symptoms that follow this operation. There are very few therapeutic results that can be gauged with so much certainty as this one, and much has been said and written about it, not infrequently with extravagant enthusiasm. We must not lose sight of the fact that in giving thyroid gland to patients affected by one or the other form of myxœdema we are not removing the cause of the disease, therefore our therapeutic results can only be of a temporary nature, however brilliant they may be, and therefore this therapy must be continued, as will be shown hereafter, as long as the patient lives.

Thyroid Therapy.—This may be carried out in various ways. In 1889 Bircher transplanted human thyroid gland into the peritoneal cavity of a patient whose whole thyroid gland had been removed; the symptoms of myxœdema disappeared for a time, but returned; a second transplantation was followed by the same results. About this time Lannelongue and Victor Horsley were investigating, independently of each other, the effects of transplantation of thyroid glands; the latter especially came to the definite conclusion that while temporary good results were very marked, no permanent good result could be expected, because the transplanted gland was ultimately absorbed. In 1890 Gley and Vassali used thyroid juice from sheep or dogs by intravenous injection, G. R. Murray a glycerine extract of the same by hypodermic injection. The objections to these methods are obvious; the uncertainty of having a sterile preparation, the pain produced, the frequency with which the remedy had to be applied, all caused these methods to be given up, especially as it was found (Mackenzie, 1892) that administration of the gland by the mouth produced the same good results as followed the other methods. At first raw thyroid gland was used, then the desiccated gland or an extract made from the gland. The raw gland is no longer in use, but tablets containing the desiccated gland or a dry extract are the forms in which the thyroid therapy is usually carried out. In 1896 Baumann published his remarkable discoveries concerning iodine as a constituent of the thyroid gland, and also in regard to thyroidin, a substitute for the thyroid gland itself, although supposedly a component part of it during life; it may be used in the treatment of all diseases in which thyroid gland is indicated. All observers speak very highly of this substitute. I have never used it in myxœdema, being fully satisfied with the results obtained from good preparations of the thyroid glands. The dose of thyroidin is from 0.1 to 0.3 gm. (gr. jss. to v). Other preparations are thyraden, a dry extract, 1 gm. of which equals 2 gm. of the gland; Fränkel's thyroantitoxin, thyrogen, thyroglandin.

In the routine treatment of any one of these diseases the preparation that is chosen should be given in small doses at first, and if physiological effects

are produced the dose should be reduced; if this is not the case the dose should be gradually increased, as it is found that most individuals acquire a degree of tolerance, so that large doses may be given. There are remarkable exceptions to the production of tolerance; in one case of infantile myxœdema it was impossible to keep up thyroid medication because the symptoms produced by the smallest dose were almost alarming. As I have always used the dry gland in the form of tablets—0.3 gm. (gr. v)—the following remarks will always refer to this preparation. In *infants* the dose should be calculated for the age, taking the adult dose as 0.3 gm. (gr. v). This is multiplied by a compound fraction whose numerator is the age in months divided by 12, and whose denominator is 20; thus for a child three months of age the calculation would be:

$$\frac{\frac{3}{12}}{20} = \frac{\frac{1}{4}}{20} = \frac{1}{80} \times 5 \text{ grains} = \frac{1}{16} \text{ grain.}$$

But even this small quantity should be given at first only once a day, then twice, and finally three times daily. The first unpleasant symptom that usually develops in infants is restlessness; they sleep badly, lose their appetite, and become irritable, all this so markedly in contrast with the condition preceding the administration of the thyroid preparation that it cannot be overlooked. When any of these symptoms is noticed the dose should be reduced below that which has been calculated to be normal. If they do not develop, the dose should cautiously be increased, first once a day, then twice a day, and then three times daily; every increase in dosage is made in this manner until tolerance is produced. If care is not taken to watch the bad effects of this medication very alarming conditions may develop—vomiting, collapse, even death. Besides the effects produced in older persons, we find in infants that thyroid therapy changes the process of ossification so that it becomes normal.

In *children* the same precautions should be taken as to dosage, the ordinary posological rule sufficing; here we have the pulse to guide us; when it becomes very rapid the medication should be interrupted. The benefits derived are the same whatever be the age of the patient.

In *adults* I begin with half the normal dose—0.15 gm. (gr. ijss.) three times daily; if no unpleasant results follow then the dose is increased to one tablet, 0.3 gm.; after this the increase is made by adding one fourth of a tablet, the effects always being controlled, until the maximum dose is reached, which, according to my experience, has never been higher than two tablets three times daily. The untoward symptoms produced in the adult are as follows: increased frequency of the pulse, palpitation, headache, nervousness manifested by sleeplessness, tremor, restlessness; congestions in various parts of the body; pains, especially in the limbs; perspiration; vomiting or diarrhea; increased temperature; sometimes albuminuria or glycosuria.

The treatment should be continued until all the symptoms of the disease have disappeared, and this occurs in a very short time; but as soon as the treatment is discontinued the symptoms gradually develop again, so that these patients must be treated as long as they live. No complete recovery has been recorded. I prefer to give the thyroid preparations as just described until all the symptoms of the disease have disappeared, then gradually to reduce the dose and give the patient a period of freedom from medication until symptoms again develop. This is the most agreeable method for the patient; the best

way is to give small doses of thyroid constantly, but it will be found that patients object to this continued dosing.

The beneficial effects are truly wonderful: the intellect improves and is practically made normal; the patient loses in weight, one of my patients losing seven pounds a week for five weeks; the appearance of the skin changes, and with it the normal physiognomy returns; digestion improves, and in the course of from two to four weeks the patient, who has been unable to work for years, is enabled gradually to resume his ordinary vocation. As yet it is too early to answer the question how long it is possible to keep a patient in this condition—a condition, as one of my patients puts it, of "corporeal resurrection." One of my patients, a teacher, has been under my observation for nine years; she does her work after having been incapacitated for eighteen months, gives all her lessons, but continues her medication; she seems perfectly satisfied with her condition, but her colleagues tell me that her work is deteriorating. The only victim of myxœdema that does not always react perfectly is the cretin; while in most of them the results are excellent, I have seen only one case in which bad effects were produced by the treatment.

Diet.—Blum has apparently shown that the thyroid gland binds toxic bodies that come from the intestinal tract, and Lang has shown that in dogs whose thyroids have been extirpated meat diet produces tetany, even when they are fed on thyroids. Biedert lays stress on milk diet. One of my patients put herself on a partly vegetarian diet, which made her "feel better." Others have had the same experience. It is wise, then, to try in all these cases a diet made up of milk, eggs, vegetables, cereals, and fruits, without meat.

X. DISEASES OF THE THYMUS GLAND

TREATMENT

The treatment of these diseases must remain unsatisfactory until our clinical knowledge has been more firmly established. In the status lymphaticus all those remedies may be used that are used in general for enlarged lymphatics (v. Scrofula). Great care should be exercised in the use of anæsthetics, chloroform being apparently very dangerous. In the so-called asthma Millarii, thymic asthma, all those various remedies may be tried which have an effect upon lymphatic glands. Operative intervention has proved of great value in this condition, as well as in tumors. For the laryngismus stridulus the gland has been resected or treated by fixation so as not to compress the trachea. The acceptance of the thymic origin of laryngismus stridulus has led to the use of thymus extract in whooping cough; I have seen no good results follow its use. Because this extract contains iodine, it has also been used in goiter, and some good results are claimed for it in Graves's disease.

Recent experience has shown that both the thymus gland and the enlarged lymphatic glands, associated with the status lymphaticus, may be reduced by X-ray therapy. Hochsinger reports a series of cases in which these manifestations of the status lymphaticus have been removed in this manner. I have seen one case in an infant having asthma Millarii, enlarged thymus and bronchial lymphatic glands, in which a complete cure was effected by this method of treatment.

SECTION IX

DISEASES OF THE KIDNEYS

I. MOVABLE KIDNEY (v. Enteroptosis)

II. ANURIA

As this may be the result of obstruction or of faulty function in the kidney, the treatment must differ according to the cause. In the obstructive form the treatment is surgical. In the nonobstructive form the treatment should be adapted to the individual case. The routine practice of giving diuretics is to be deprecated; when we have a kidney so disabled by organic disease that no urine is passed, the principal object of treatment should be to give it rest, not to stimulate it by giving it more work; this is especially the case in the early stages of acute nephritis. Under these circumstances no diuretics—digitalis, sweet spirits of niter, diuretin, squills, etc.—should be used for their effect upon the kidney; when digitalis or caffeine is indicated for the heart, it should be given. In these cases remedies should be used that preserve the kidney and lessen its embarrassment—e. g., sudorifics, cathartics—and the quantity of water given should be commensurate with the needs of the economy (v. Treatment of Nephritis). The hyperæmia of the kidneys may be relieved by poultices at the back, dry cupping, or hot applications of any sort. The treatment of uræmia (q. v.), which may follow, calls for different measures. When the anuria is due to collapse, as from cholera or after operations, hypodermoclysis, intravenous injections of normal saline solutions, besides the ordinary remedies used according to the nature of the collapse, are indicated. Here, especially, hot rectal irrigations are valuable. In yellow fever (q. v.) the treatment should be used that has been adopted by the native physicians. Hysterical anuria requires little attention; the question of deception must here be taken into consideration; at all events, in the three cases that have come under my observation, a disregard of the symptom by the physician was followed by its disappearance in a short time. In cases of anuria in acute nephritis, Edebohls's operation should be considered (v. Nephritis).

III. HEMATURIA

The causal therapy cannot be here referred to, as it will be found in the chapters on the various diseases that produce it. Under all circumstances,

when hematuria occurs, the patient should be put to bed and bland diet ordered until the origin of the bleeding is ascertained; when this has been done it will determine the treatment to be pursued next, unless the loss of blood is very great. Should this be the case, hemostatics should be used; the best is adrenalin; next in efficiency comes ergot; gallic acid, tannic acid, lead acetate, and turpentine are useful in moderate degrees of hematuria. When no cause can be found—i. e., in so-called renal epistaxis—nephrotomy must be taken into consideration; it is not, however, always successful. Under all circumstances the nephrotomy in these cases may be considered an operation done for diagnostic purposes; some trouble which produces the hematuria may be found and removed. In one case in which, after nephrotomy, no cause was found and the hemorrhage did not cease, large doses of calcium chloride had a most excellent effect upon the bleeding. In all non-obstructive cases it is well to give urotropin, in order to prevent infection.

IV. HEMOGLOBINURIA

TOXIC HEMOGLOBINURIA

Treatment.—This can only be treated symptomatically; we include here methemoglobinuria and hematoporphyrinuria. The patient should be put to bed, his diet restricted, and large quantities of fluid should be given to wash out the kidneys. The prevention of the condition is of greater importance than its treatment, for we can do very little to give relief. The remedies in use that have produced hemoglobinuria are as follows: guaiacol; some of the acids—e. g., chromic, sulphuric, hydrochloric; solanine in sprouting potatoes; saponine in the soap bark (quillaiæ cortex). The relation of quinine to black-water fever has already been referred to.

Methemoglobinuria and its dangers have already been considered in connection with the use of potassium chlorate in diseases of the mouth. But the use of coal-tar products has added a large number of drugs which produce methemoglobinuria; the most dangerous of those commonly used is antipyrine and acetanilide; phenacetin, pyridine, naphthol, pyrogallic acid, carbolic acid, and their derivatives, have also produced this symptom. For hematoporphyrinuria, sulphonal and trional are found as the principal causes.

In methemoglobinuria, inhalations of oxygen are indicated. Under all circumstances, the cause of it should be removed—i. e., the drug producing it should be withdrawn. For the nephritis that follows the use of these drugs very little can be done; it is usually much less developed from the use of the antipyrine group than from potassium chlorate. Hematoporphyrinuria ceases when the cause is removed; a fatal termination seldom occurs, but this has happened.

PAROXYSMAL HEMOGLOBINURIA

Prophylaxis.—For prophylactic purposes as to the attack, the patient should not expose himself to the action of cold; he should not overtax himself physically or mentally. According to the characteristics of the attack as to season, he should at the time the attack is expected be especially careful as to

his clothing; the best method of prevention consists in removal to a warm climate. As most of these attacks occur in winter, the difficulty of prevention increases.

TREATMENT.—Many of these cases have been treated by antisyphilitic methods, with excellent results; even without the history of syphilis this method is worthy of a trial (Copeman found syphilis in six out of his seven cases). In malaria (q. v.) the use of quinine may be taken into consideration; when the diagnosis of the paroxysmal nature of the disease can be made out, quinine should be tried. To be absolutely safe, however, arsenic should first be tried unless there is immediate danger. It is not correct to consider the hemoglobinuria of malaria as identical with paroxysmal hemoglobinuria; intermittent paroxysmal hemoglobinuria may occur; this may be the indirect result of malaria, and when the latter is removed the paroxysmal hemoglobinuria is also removed. During the attack the patient should be kept in bed, his diet as bland as possible, and unless there are contraindications he should take as much fluid as possible. The attacks are not dangerous as a rule, but there are fatal cases on record. Chvostek recommends amyl nitrite for abortion of the attacks.

V. OXALURIA

It is not our province to discuss the existence of an oxalic acid diathesis; this much is certain, that the presence of oxalic acid in excessive quantities for a great length of time does damage to the urinary tract by the production of hematuria or the formation of calculi. If, as we frequently find to be the case, remote symptoms such as dyspepsia or neurasthenia coexist, treatment is especially valuable, for in a large number of cases disappearance of oxaluria and relief for symptoms occur together.

The important indication is *regulation of diet* in such a way that large quantities of oxalic acid are not introduced; abstinence from rhubarb, tomatoes, pineapples, apples, strawberries, sorrel. In this way the quantity of oxalates is diminished, it is impossible to cause them to disappear entirely, as oxalic acid is formed during the normal process of metabolism. Excess in the eating of sweets, carbohydrates, or albuminous foods should be forbidden. As it occurs with gout, oxalic acid being formed from uric acid, the dietetic treatment of gout (q. v.) may have to be instituted. It is also well recognized that with dyspeptic conditions in the stomach, in most cases a condition of subacidity, oxaluria may coexist. Dilute hydrochloric acid, or especially dilute nitrohydrochloric acid, 0.6–1 gm. (℥ x–xv) well diluted, taken after meals, frequently gives good results.

VI. PHOSPHATURIA

Phosphoric acid in urine represents the phosphoric acid contained in food; in addition, however, it is more than likely that it is derived from organic combinations of phosphorus as found, especially in the nervous system, in the form of nuclein, glycerophosphoric and oleophosphoric acids, lecithin, and

protagon. The precipitation of phosphates alone cannot be taken as an index of disease; in order to determine phosphaturia, daily examinations of urine (a specimen taken from the whole of the twenty-four hours' quantity) must be made. If the phosphates are then found increased and the indication exists for their diminution, treatment should be instituted. Excessive wear and tear of the nervous system should be avoided. A diet reducing albumins to the minimum but containing much carbohydrate may be instituted unless the phosphaturia is endogenous, due to nervous wear and tear, when there is difficulty in controlling phosphaturia. von Noorden and his pupils have shown that a large quantity of the phosphates can be prevented from passing into the urine by the addition of calcium carbonate to the food. Creta præparata, 1–2 gm. (gr. xv–xxx), is given two or three times daily; in this way the phosphoric acid is bound to the calcium, the combination remaining in the intestine or coming back and being eliminated there after absorption. von Noorden alleges that under certain conditions at least one half, and sometimes more, is prevented from leaving the system by the urine. For the treatment of phosphaturia *per se*, this may not be of great importance; for certain conditions in the kidney, however, it is much more so.

VII. BRIGHT'S DISEASE

ACUTE BRIGHT'S DISEASE

PROPHYLAXIS.—The prophylaxis is that of the diseases producing it; very little can be done here, as it is impossible to tell how and when a patient may become affected by acute nephritis. For some diseases (v. Scarlatina) it seems possible in a measure to prevent its full development.

TREATMENT.—The principles involved in the treatment of nephritis, either acute or chronic, are (*a*) rest to the kidneys, (*b*) prevention of retention of waste products in the blood, and (*c*) the treatment of symptoms.

The kidney can be spared as to functional activity by proper forms of diet that make small demands upon its activity. The importance of carrying out the indication for rest is the same as in other diseases in which there are inflammatory changes; in the acute form *restitutio ad integrum* takes place much more quickly as the result of rest; in the chronic forms life is prolonged and the production of symptoms prevented. Unfortunately there is a limit to the giving of rest to the kidneys, because complete cessation of function would lead to dangerous retention in the blood of materials that should be removed by the kidneys and cannot be removed in any other way.

It follows, then, that the treatment as applied to the first and second principles must go hand in hand, a fact that has been established by constant experience.

First in importance is food. As to the detail of *diet*, we find as the result of experience and experiment that we are justified in laying down some general rules; but, as has been so often emphasized, our chemical knowledge is not sufficient to warrant us in making statements that may require absolute rejection in the future; besides, we must treat the patient and not the disease.

Milk is used as the diet for nephritic patients of all kinds nearly the world

over; exclusive milk diet need not be taken into consideration, as the large quantity of water contained in four liters of milk (the amount necessary to keep an adult in a condition of normal metabolism) is too great to allow the kidneys to rest. But in addition, with a functionally inactive kidney, water retention is bound to take place, leading to dropsy and heart disturbance. On the other hand, by the addition of large quantities of water in the food those waste products that produce uræmic symptoms are diluted, therefore the chance of uræmic symptoms developing is diminished. The giving of large quantities of fluid, then, should be regulated for each individual case in relation either to the danger that comes from the kidney or to that from the retention. Experience has shown that milk diet (not exclusive) is a very valuable therapeutic measure in nephritis, and this finding remains unshaken. In its favor the following may be mentioned: milk contains large quantities of fluid; it makes small demands upon the digestive functions; it contains comparatively small quantities of common salt; and its nuclein, which is a paranuclein, does not produce purin bodies in large quantities.

The importance of NaCl in nephritis has been referred to by Korányi and his pupils, by Widal and Chantemesse, and by many others. It has been shown that in most forms of nephritis retention of NaCl takes place; this may be the case with any of the substances normally secreted by the urine as well. Sodium chloride is the great regulator of osmotic processes in the body; an excess of it in the fluid of the blood causes it to become hypertonic, the result of which will be found in diminution of excretion of water by the skin, the lungs, possibly also in the kidneys. As a result albuminuria increases, but above all retention of water, and therefore an increase in dropsy, follows.

von Noorden seems to show that the purin bodies are fairly well eliminated by the kidneys; the more recent observations as to uric acid do not seem to confirm this, but even he admits that it is well not to give those articles of food that may produce an increase in the alloxuric bodies in the urine, such as uric acid.

The great objection to giving milk in nephritis is found in the large quantity of albumin contained in a quantity sufficient to keep up normal metabolism; thus in 3 liters there will be found from 105 to 120 gm. of albumin, which is at least 20 gm. more than the minimum established by Voit, this figure being probably much too high. Its final decomposition represents an amount of waste products—about 35 gm. of urea, plus phosphates and other substances—that would increase the demands made upon the functional activity of the kidney, and might do a great amount of harm. The large quantity of fluid given with milk may also be a great objection to its use, in that rest of the kidney is not promoted by it. It will be seen, then, that absolute milk diet is out of the question in any case of nephritis, and that the quantity of milk to be given must be regulated for each individual case. As a result of investigation, von Noorden and his pupils have given a list of substances that are difficult of elimination for the kidneys—a list that agrees fairly well with those that have been found deleterious by experience. It is as follows: Kreatin can be diminished by giving the patient albumin derived from milk, chicken, eggs, and vegetables, from the latter of which kreatin is absent; therefore the albumin should be derived from these substances; my own experience has shown me, in correspondence with that of

many others (v. Scarlatina), that white meat is the only meat that should be given to patients with nephritis. Phosphoric acid has been referred to in connection with phosphaturia. Urea can be diminished by diminishing albumins; this can be done in acute or subacute cases with impunity for from three to four weeks, the general condition of the patient being the index as to the time limit. The caloric value of the food may be increased by the addition of fats or carbohydrates. In acute forms fruits should usually be forbidden; if they are used, raspberries and grapes, or their juices, on account of the absence of benzoic and oxalic acid therein, may be given. Vinegar may be given as well as citric acid. Alcohol should be used only for specific indications (debility, heart weakness), in small quantities as a stomachic in chronic cases.

The functional activity of the kidneys is improved by *rest*; this occurs as the result of its effect upon the circulation, on the diminution of bodies produced by cellular wear and tear, and by improvement of elimination by the skin and lungs when conditions are favorable.

Relief for *retention* must be given in a large number of cases when symptoms of uræmia, of cardiac disturbance, or of dropsy develop. Diaphoresis is the most important method that can be used. Kövesi and Roth-Schulz state that by means of sweating from ten to twenty per cent of the substances that are removed by the urine may be removed by the skin; by profuse and prolonged sweating, even fifty per cent. Sodium chloride is eliminated in various ways; it seems to depend on the amount of œdema present, so that H. Strauss proposes to divide nephritic patients into two classes, those in whom there is NaCl retention and those in whom there is none; but, as he finally suggests, this is unnecessary, as the dropsy may be removed mechanically, and then these patients react in the same manner as all others with nephritis. v. Leube has called attention to the possibility of the production of uræmia by copious sweating, and he recommends the giving of large quantities of fluid while the patient is undergoing the process. Theoretically this is correct, because by removing fluid from the blood it becomes more concentrated, and the substance or substances that produce uræmia will therefore be present in a more concentrated form. Practically uræmic attacks have occurred after profuse sweating; all patients with dropsy may, however, be safely treated in this way, for obvious reasons. Even when dropsy is absent, I have seen the most excellent results produced in patients with uræmic coma where the administration of fluids *per os* was impossible. Until the substance or substances producing uræmia have been discovered, we are not in a position to tell whether or not diaphoresis produces or prevents uræmia in a given case. Diaphoresis is best accomplished by dry heat; there are many apparatuses specially constructed, so that the skin, except that of the head and neck, may be acted upon; in some instances it is necessary to keep the patient in such a hot-air bath for many hours (uræmic coma). When cardiac symptoms are present great care is required in the use of this method; hot baths or hot packs may be substituted; neither of them is devoid of danger, nor are they so efficient. In the use of pilocarpine we must be guided by the individual conditions (v. Scarlatina, Chronic Myocardial Insufficiency).

Experience has shown us that catharsis is of enormous value in nephritis; hydragogue cathartics are invaluable—jalap, elaterium, the salines. Person-

ally I should not like to be deprived of them in nephritis; water retention is relieved, but above all, various substances, such as urea, uric acid, phosphates, and, to judge solely by results, a large number of toxic bodies are eliminated by the intestines.

The action of *diuretics* depends upon the amount and structure of renal secretory substance that can be affected by them. From what has been said, it is improper to make use of them in a routine way, because the diseased organ is so stimulated that harm may eventually be done. An exception to this is found in the use of digitalis, which, while it acts indirectly as a diuretic, gives rest to the organ in relieving abnormal circulating conditions. The other diuretics—diuretin, caffeine—should be used in emergencies, their efficiency having been proved; but the number of cases in which they are applicable is limited, and precise indications cannot be laid down for their use. The use of calomel may be recommended in cases with dropsy, calomel and jalap in large doses being one of the old favorites; how much the calomel effects as a diuretic cannot be decided, but this is unnecessary so long as the results are good.

The removal of the toxæmia can be accomplished by bleeding, and in certain cases of uræmia bleeding is invaluable, especially when the uræmia is combined with chronic myocardial insufficiency. The introduction of normal saline solution into the circulation must be resorted to only for the purpose of dilution of the toxines in uræmia; I have seen it followed by good results in many instances, frequently by prompt and very marked diuresis. By the introduction of a saline solution into the blood the dropsy will be increased, so that care must be taken in this direction.

From these statements the conclusion can be drawn that we have many methods by which nephritis can be favorably affected; the fact must not be overlooked that in nephritis our therapeutic measures cannot be applied with the same amount of accuracy and with equally good results as in diabetes mellitus. The reasons for this are obvious: in diabetes we have a more definite index as to improvement—the quantity of sugar and of acetone in the urine; this is largely absent in nephritis. The chemical processes in nephritis are very much more complex than in diabetes; in the former we practically have all the results of metabolism represented, and more or less affected; in the latter those upon carbohydrates alone play a rôle. In nephritis all the processes that go on in the kidney are most complex; indeed, we are not at all absolutely certain as to all the processes that do go on within them in the condition of health; how much more uncertain must we be, then, as to the action of diseased kidneys. We know enough to be able to state that the functional activity of diseased kidneys is widely different from that of healthy kidneys; this can be readily demonstrated by so simple an experiment as the giving of large quantities of fluid to a patient with Bright's disease and to a healthy individual; for this reason the action of diuretics is so unreliable in nephritis, as our conclusions have been drawn from their action in healthy individuals. Except in acute nephritis, and sometimes not in this form, we have no means of determining what quantitative or qualitative changes are going on in the kidney; we are therefore frequently dependent upon remote symptoms for our therapeutic indications. For these reasons an exact therapeutic procedure cannot be laid down for nephritis; the consideration of all the various factors and the treatment of symptoms are absolutely necessary. The results of treat-

ment are immeasurably better than they were—in the acute cases for cure, in the chronic cases for prolongation of life.

In the treatment of *acute nephritis* the following may be taken into consideration. Here we have an index as to the results of our treatment in the quantity of urine secreted and the degree of albuminuria; the greater the quantity of urine and the less the amount of albumin the greater the progress toward cure. Yet the fact must not be overlooked that fatal nephritis has been found post mortem where there have been no evidences of it *intra vitam,* but these cases are decidedly exceptional. In acute nephritis the principle of rest for the kidneys should be carried out to its extreme limit. In every case the patient should be put to bed, and kept there until albuminuria has disappeared. If after five to six weeks this does not occur, and in the absence of all other symptoms, the patient may be allowed tentatively to get out of bed for a short time. The effects of this must be thoroughly studied; if no evil effects follow, such as increased albuminuria, increase in the number of casts, or diminution in quantity of the urine, the time of sitting up may be gradually increased. When evil effects follow, the patient must be put to bed again. The first attempt at getting up should not be allowed before five or six weeks have elapsed from the beginning of the illness; exceptions can be made under favorable conditions. While the patient is in bed his room should be well ventilated; he should be warned not to exert himself, either mentally or physically; it is not necessary for him to use the bedpan unless for special indications. We wish at this time to take advantage of increased activity of the skin, therefore the patient should be well covered; not too heavily, as constant sweating debilitates, but sufficiently, so that perspiration may be favored.

Not only the temperature of the air under the bed clothing, but also the temperature of the room, should be equable, because the blood vessels of the skin are easily affected by changes in temperature; these changes will have a tendency to counteract our therapeutic purposes. The skin should be kept thoroughly clean, warm baths or warm sponging being used for this purpose, the latter under the bed clothing. In patients in whom there are oliguria and large quantities of albumin, dropsy increasing rapidly with uræmia threatened, the principle of rest to the kidneys should be carried out to its fullest extent. In my opinion it is here that most frequently errors are committed as to treatment. The idea seems to have possessed us that especially here we must flush out the kidneys by giving large quantities of fluid; a glance at the condition of the kidneys will show that this is physically impossible. When the uriniferous tubules are thoroughly plugged up an increase in pressure in the renal artery would increase the difficulty in secretion, just as increase in arterial pressure with a ligated ureter diminishes urinary secretion. When the blocking of the uriniferous tubules is incomplete a sufficiently great increase in arterial pressure cannot be obtained to wash them out; there always results water retention and increase in dropsy. When these symptoms are present as little fluid as possible should be given—just enough to quench the patient's thirst; this can be done by giving small quantities of cracked ice, allowing the patient to gargle with water or to swallow small quantities of water. The quantity of food should be diminished to a minimum; not only is kidney rest assured in this way, but also harmful metabolic

substances are prevented from being stored up in the circulation. The best food that can be used is milk to which lime water or prepared chalk has been added, but the quantity should be small; as a rule, one liter of fluid in all during the twenty-four hours would be sufficient for an adult, one half or three quarters of which may be milk. Usually the taking of food in this stage of acute nephritis is limited by the presence of nausea and vomiting, but even in the absence of these (as occurs when the condition arises, not in the beginning but during the course of the nephritis), this method of feeding should be pursued. It represents decided underfeeding, as at best not more than about 600 calories are represented in twenty-four hours; it cannot be continued for any great length of time, as it will of necessity be followed by debility. As soon as the uræmic symptoms begin to disappear and the quantity of urine increases, the quantity of food must be increased.

But in addition to the principle of rest, the retention should be attended to. This is done by diaphoretics (v. *supra*); the removal of œdematous conditions is just as valuable in nephritis as in chronic myocardial insufficiency; in some respects more valuable, because not only conditions of blood pressure are changed by it, but also waste and toxic products of metabolism are removed from the body by withdrawal of dropsical fluid. Whenever possible, therefore, œdema should be treated at the earliest moment by the introduction of Southey's cannulas. In addition, cathartics should be given when it is possible to do so; elaterine may be given hypodermically when the symptoms are urgent; otherwise calomel and jalap or a saline cathartic—Rochelle salts in lemonade or potassium citrate are favorites, especially with children.

The other methods that have been referred to before should be used as necessity requires them. Diuretics are without value in this stage of the disease unless the condition of the heart requires the administration of digitalis. We are accustomed to pay some attention to the condition of the heart in chronic nephritis; it is just as important to do this in the acute form where the heart does not obtrude itself by evident manifestations. When the heart is much dilated digitalis, given for a day or two, changes the whole clinical picture, as has occurred repeatedly in my clinical experience.

When the quantity of urine is increased and that of albumin diminished, when the symptoms of uræmia disappear and the œdema diminishes or is gone, the treatment will of necessity be changed. It is immaterial whether this stage develops from the former or the patient never gets beyond it, the diet must now be so arranged that it has sufficient caloric value to keep up nutrition and at the same time not to make too great a demand upon the kidneys. This diet is milk, to which must be added carbohydrates or fats. von Noorden prefers fat, in the form of sterile cream; for myself I have always preferred carbohydrates in some form unirritating to the kidneys containing comparatively little albumin, and being palatable and easily digested. I choose strained oatmeal in the form of oatmeal jelly, rice, farina, arrow root, or wheat flour, but only the finest sort; sugar, crackers, rusks may also be used. My own diet is represented by the following:

Oatmeal jelly made from 120 gm. (℥ iv) of oatmeal	932 calories.
Milk, 1,500 c.c.....	893 "
Sugar, 50 gm.....	205 "
	2,030 "

In the beginning this is sufficient for a patient of average weight when at rest. The milk may be given with the oatmeal or alone, the sugar added to either of them. With some patients rusks, stale wheat bread, or any of the other carbohydrates before mentioned may be substituted for the sugar when the latter is not agreeable to them. The quantity of fluid to be given at this stage can be usually determined by the quantity of urine secreted; an increasing quantity of urine permits an increase in the quantity of fluid to be taken. When there is retention of fluid or œdema, the quantity of fluid should be reduced. These rules may be followed, but notable exceptions are found to them. Many observers have shown that when diuresis begins in the normal course of an acute nephritis it may be increased by the administration of fluid or diuretics. Here alone is the indication for flushing the kidneys, as at this time, undoubtedly, the œdema may be made to diminish more rapidly by "flushing the kidneys"; this is best accomplished by the giving of large quantities of water—the mineral waters of Waukesha and Poland Springs are especially efficacious—the administration of citric or tartaric acid in the form of lemonade, or the giving of a larger quantity of milk, not to exceed two liters, in combination with water. If œdema does appear the ordinary methods of retention should be used. As a rule the disappearance of œdema—"the stage of compensation," as it is called—marks the end of this stage, when proper treatment is continued, provided no relapses occur. When the latter do occur the first plan of diet should again be resorted to; but with all our methods, for reasons unknown a certain percentage of these cases will become subacute or chronic.

In the last stage, that of *convalescence*, the diet may be considerably enlarged, although milk must still be the principal source of albumin. We now give all forms of vegetables, those of fruits that are not irritating to the kidney (v. *supra*), also sugar, the finer carbohydrates, and the desserts made from them, and easily digested fats. The arrangement of a diet list depends upon the individual taste and choice of the patient. Care even here must be taken not to increase albumin too rapidly, but eggs may be given after convalescence has been well established, the giving of fluid being continued as in the former stage. When normal quantities of urine free from albumin are found, the white meat of chicken should be given; if no change for the worse occurs after two or three days, red meat may be tried always with proper supervision of uranalytic results. The climatic treatment will be referred to in connection with chronic nephritis.

The *treatment of symptoms* follows the general rules that are laid down for them. For the *fever* hydrotherapy should be tried; if antipyretics are necessary, antipyrine and not the acetanilide group should be prescribed. All hydrotherapeutic measures should be so arranged as to give relief to the kidneys, and not to embarrass them. If there is high fever, it is better to use antipyrine than cold externally applied. It is difficult in these cases to stop the vomiting; as this is partly due to the elimination of toxic material by the gastrointestinal tract, it may be relieved by lavage of the stomach. Minute doses of calomel are valuable in and of themselves; when given dry upon the tongue, they control vomiting; their action upon the bowels is of value in removing the toxic material from the body. Milk and lime water (equal parts), waters containing CO_2, small doses of ice-cold champagne may be given.

Anæmia, which develops very rapidly and may become very great, requires the administration of iron; the tincture of the chloride of iron has been used for a long time, and with excellent results; it may be given at any time when the condition of the gastrointestinal tract warrants its administration; as a rule, this agent is not required until the febrile stage has passed. Its action upon the kidney itself is not thoroughly understood, but more than once I have seen diuresis follow its administration.

The *heart dilatation* should be watched, and when symptoms occur it should be treated as in acute myocardial insufficiency due to dilatation (q. v.). The albuminuria, when it persists, should be treated by a diet free from NaCl (v. Chronic Nephritis).

The symptom-complex, uræmia, will be considered in connection with the treatment of chronic Bright's disease, where also will be found the indications for Edebohls's operation.

CHRONIC BRIGHT'S DISEASE

Subacute or Chronic Parenchymatous Nephritis.—The TREATMENT is the same as that of the acute form. The diet may be more liberal, including all those substances which do not irritate the kidneys, or irritate them only to a minimal degree. When the stage of the small white kidney has been arrived at the treatment is that of the chronic interstitial form. The climatic treatment of chronic Bright's disease is dependent upon the principle of producing increased elimination by the skin and lungs, which also gives rest to the kidney in conjunction with the absence of disturbance in renal circulation. In order that a climate may be suitable to patients with chronic Bright's disease it should be warm, dry, and equable. There is no difficulty in finding dry and warm climates; the equability is harder to find. The temperature should not be too high, otherwise the patient may suffer from debility. In order to fulfill all these requirements, it will be found that the climate of Egypt, North Africa, or Algiers is best suited for these patients. In this country the northern part of Florida and southern California may be tried.

The drinking of mineral waters is the same here as in the acute form; for the contracted kidney the indications are somewhat different, as will be seen. We possess in this country two springs that are especially valuable in this form of trouble: Waukesha, Wis., and Poland, Me. I mention these especially, although there is a great number of other springs and waters probably of equal value, because in these two places, in addition to the assurance of comfort for the patient, the summer climate is favorable.

Chronic Interstitial Nephritis (including small white kidney).—The TREATMENT is based upon the maintenance of renal compensation; this involves the proper treatment not only of the kidney itself, but of the circulatory apparatus as well. As this form of disease is incurable, our object must be to prolong life and make the patient comfortable as well as useful. It is certain that with favorable conditions this form of disease may last a very long time; one of my patients, a grocer, has had what seems the chronic parenchymatous form for twenty-five years and still pursues his occupation, which is not an easy one; one of my medical friends has had chronic inter-

stitial nephritis for fifteen years, and continues to follow his calling—that of a specialist, it is true.

The *psychic* treatment of all these patients is of enormous value; as it is in chronic myocardial insufficiency, so also is it in chronic renal insufficiency, all those measures that tend to maintain compensation are useful; therefore the maintenance of bodily health, which includes normal psychic and nervous conditions, is also of great value here. The proper attitude of the physician toward his patient is of paramount importance in this disease. One thing should be especially avoided—the making of frequent uranalyses. The determination of the quantity of albumin is useless in this disease; it is the general condition of the patient that counts, and the development of symptoms of chronic renal insufficiency. In chronic nephritis of the interstitial type there is no difficulty in reducing the albumin by dilution—i. e., by giving larger quantities of fluid; this is only a relative diminution, it is true, but it is the only determination usually made in practice. But even the absolute quantity of albumin may diminish and the patient yet become worse and worse. Under no circumstances should the patient be allowed to examine his urine himself; this occurs not infrequently, and the results are always bad. In one of my cases, in which the son was affected by a chronic parenchymatous nephritis, the result of an infection, both he and the father made examinations for albumin daily for eighteen months; the condition of both of these amateur scientists was pitiable in the extreme; the happiness of their days and nights depended upon increase or diminution of albumin. Both of them became neurasthenic, and finally, after almost coercive persuasion, they began to realize that immediate dissolution was not at hand; they desisted from their chemical experiments—which, however, had developed to such a degree that they were no longer satisfied with the coarser tests for albumin, but made use of those refined methods by which albumin can be found in any urine. When all the chemical apparatus had been sent to the garret the neurasthenia disappeared, and now both father and son, four years after the beginning of the nephritis, are attending to their business, the father being a manufacturer, whose occupation requires much mental activity, and the son being one of his traveling salesmen, not rid of his nephritis, but fully able to cope with all the annoyances and deprivations necessary in his vocation. In all these cases even the physician should not insist on too frequent examinations of the urine; when he finds it necessary to do this, his manner of asking for a specimen may be that of expressing more of curiosity than of interest in the result.

The principles of *diet* are the same as those in acute nephritis, but they need not be carried out with the same degree of accuracy; indeed, this would make life unbearable in a chronic case, even if it were necessary, which it manifestly is not, as it is in acute nephritis when the question of life and death is always present. But here much latitude is permitted as to the individual patient; in some forms the dietetic treatment must be just as severe as in the second form of acute nephritis; in others it may be that to be described; and, again, in a limited number of cases no treatment seems to be of avail. After repeated attempts have been made to improve the condition of the patient by rigorous dieting, or when the patient is in the last stage of the disease, all efforts having failed to give relief, it is cruel to persist in

measures that annoy and make the remainder of the patient's life unbearable. His days will, if anything, be prolonged by general improvement; the result of giving an exclusive milk diet, the most common way of treating these patients, now shortens rather than lengthens their lives. In such cases it is my habit to consult the wishes of these patients, and then to let them eat those things which are least harmful to the kidneys.

For the constant treatment of patients with chronic nephritis, during the stage of compensation, the following rules may be followed: In regard to albumin the quantity allowed should not be too great. The exact quantity can only be worked out for the individual case by determination of nitrogen retention and nitrogen elimination—a process that can rarely be used on account of external conditions, so far as the practitioner is concerned; fortunately, the general condition of the patient frequently gives us an index as to the necessary diminution of albumin foods, which should be given in the form of milk, eggs, the white meats, and vegetables. The giving of fluid should on the whole be restricted, but there are notable exceptions in which the kidneys react by increased diuresis, which can be easily computed by determining the whole quantity of urine passed in twenty-four hours and the quantity of water introduced as food, making allowance for the normal quantity of water lost by the skin and the lungs. When diuresis does occur, more solids are eliminated; the quantity of fluid must be determined for the individual case, and an increase should be prescribed only when required. As a rule, it can be carried out, not as a permanent procedure but temporarily, to give relief for renal insufficiency as to solids. On the other hand, it is not necessary, as long as the patient is doing well, to reduce the quantity of water below the normal demand, which varies, but is in the neighborhood of 2,500 c.c. in the adult. Frequently we must look for special indications as to the limitation of fluids to the condition of the heart and the blood vessels (v. Chronic Myocardial Insufficiency). The retention of NaCl is of the greatest importance, because it produces dropsy and irritation of the kidneys, thereby increasing albuminuria. As a rule, nephritic patients eliminate only half of the daily quantity of NaCl normally contained in urine; the rule can therefore be followed of allowing the patient to take not more than 7.5 gm. of salt (gr. cxx) in twenty-four hours.

In order to reduce albumin and to cause the disappearance of œdema, a more radical course is necessary; it is especially valuable for chronic parenchymatous nephritis, but is also to be recommended in the interstitial form. I have done this in the following way: the patient is allowed no salt for seasoning purposes; his albumin is derived from milk and vegetables; he is allowed to eat as much of carbohydrates and fat as he chooses. Depending upon the patient, this method of feeding can be kept up for months, as was done by one of my medical friends, the result of the method being very satisfactory as to reduction of urinary albumin, though the nephritis persists. Under all circumstances it may be used for intercurrent remissions, and from my present experience I am inclined to consider the reduction of NaCl as the most important contribution that has been made to the treatment of chronic nephritis, as far as positive and tangible results are concerned. As meats contain much NaCl, it will be seen that from this point of view vegetarianism may be of value, as has been repeatedly shown to be the case.

With these statements we have arrived at that form of diet which for continuous application is the best in chronic nephritis; the question of the introduction of too much water, however, must be taken into consideration in individual cases, as it is thoroughly well known that vegetables contain large quantities of water. There remains the discussion of the addition of other articles of food.

Alcohol is absolutely forbidden; if the patient cannot live without it, light white wine or whisky may be given; champagne is very bad in nephritis. For symptomatic use alcohol is frequently indispensable.

We have been in the habit of warning our patients not to season their food too much; the effect upon the kidneys of seasoning has not been worked out; it is well, therefore, before this is done, to be guided by the experience in the individual case; vinegar and salt have already been referred to. Those vegetables should be excluded which irritate the kidneys (v. Acute Nephritis); in regard to asparagus, I have seen no bad results follow its use. v. Noorden reports a case in which radishes seemed to do much harm.

Coffee and tea should be taken only in small quantity; the use of tobacco should be limited to the smallest possible quantity consistent with the comfort of the patient; these substances produce a certain amount of increased heart and blood-vessel activity when particular quantities which depend upon individual peculiarities are exceeded. Soups made from meat are forbidden; vegetable soups may be allowed. Fats may be given in large or small quantity, again depending upon individual peculiarities.

With these general indications the special one is that the patient shall improve; under no consideration can any form of diet be accepted which affects the patient's general condition in such a way that it is reduced. No patient with chronic nephritis should be underfed; in a general way this is expressed by the statement that he should receive a sufficient number of calories, but this, however, must be modified, because the relation to one another of the various foods for continuous feeding must be normal, so that he gets the proper quantity of each kind of food. This is necessary not only for general metabolism, but especially for the nutrition of the heart muscle. A very brief reference to the heart will show of what enormous importance it is in chronic nephritis; by the heart conditions of pressure in the kidneys are regulated, one of the determining factors in the production of secretion of urine; an adequately strong heart may overcome any resistance to pressure that may occur in the renal artery; it may also remove resistance to outflow from the renal vein. It is only when the organic changes in the kidney become so great that secretion can no longer take place that the heart, by producing changes in pressure, cannot overcome deficiencies in secretion. It may be said, then, that the heart keeps up renal compensation; this is the more difficult of accomplishment inasmuch as the heart is affected by chronic nephritis, but the statement may be unhesitatingly accepted that the length of life of a patient with chronic nephritis depends principally upon the innate strength of his heart. It becomes necessary, therefore, in all cases to conserve this organ, to strengthen it, and when necessary to treat it as in chronic myocardial insufficiency. Patients with chronic nephritis may be subjected to all the physical methods there recommended, but the contraindications for chronic nephritis are somewhat different. The Nauheim method should not

be used, according to Groedel, when there is increased secretion of albumin or blood from time to time; also not when circulatory changes are so great that venous stasis already exists. Advanced arteriosclerosis is also a contra-indication. The indications for gymnastics are the same as in chronic myocardial insufficiency (q. v.). For the arterial condition the use of iodides has been suggested; they may be tried, and in some instances I have seen good results follow. Nitroglycerine certainly acts most favorably in arteriosclerosis; by change in intrarenal pressure it frequently sets up diuresis; its long-continued use may be recommended in those cases in which the hardened arteries seem to be the determining factor for renal insufficiency. In both heart and arterial disease the limitation of fluid is of the greatest importance.

Symptomatic Treatment.—A cursory review of the remedies that produce bad effects on the kidneys will be of importance before giving a description of this form of treatment. All such remedies should be discarded as have a direct action upon the kidneys unless their administration becomes absolutely necessary; also those which, because of their retention as the result of faulty renal function, may be followed by bad results. The continuous use of diuretics should not be countenanced, their use being limited by individual indications. Whenever normal diuresis has been produced by them it is well to discontinue them, at least for a time; this holds good for the direct diuretics, not always for the so-called indirect ones, where discontinuance may become necessary on account of the condition of the heart. The metals lead, silver, mercury should be used only with reference to temporary conditions. Opium and its preparations may be used in chronic nephritis in medicinal doses for their proper indications. There is very little theoretical basis for the statement that opium does harm in nephritis; the addition of another poisonous substance to those already contained in the blood can be prevented by dosage; it has very little or no effect upon the kidneys, as neither quantity nor quality of urine is appreciably affected by it when given in proper dosage. Atropine should be used cautiously because of its effects upon the heart and blood vessels; it is more than likely, also, that like all other secretions the quantity of urine is diminished by its use. For general anæsthesia chloroform should be used, unless contraindicated by the condition of the heart; then it becomes a nice question to determine whether the greater risk to the patient lies in the harm done to the kidneys by ether or the chance of death from chloroform; unfortunately we are not in a position to answer this question. Potassium chlorate should be given with the greatest caution; it is better not to use it at all. The same may be said of all the other remedies producing methemoglobinuria or hemoglobinuria (q. v.). Direct irritants of the kidneys, such as cantharides, copaiba, carbolic acid, and tar preparations, are to be used only with the greatest care. All such remedies as have cumulative effects, like digitalis, must be used with this fact in view; the dosage should be carefully watched; it must not be given in nephritis combined with cardiac insufficiency as it would be given in cardiac trouble alone.

Uræmia.—Here we have a combination of symptoms, due to retention of some toxic body or bodies in the blood, and in its TREATMENT we must for the time being often leave out of consideration the secondary damage that may be done to the kidneys by our methods. In conditions of subacute uræmia the kidney should deserve consideration; in acute cases this may not be pos-

sible, especially when it is a question of life and death. The first principle to be accepted is that little can be expected by calling upon the kidneys for unusual work; the elimination will therefore have to be effected by other outlets—the skin and the bowels, which have already been referred to in connection with kidney rest. The remedies that we rely upon in severe cases are elaterium or its active principle, elaterine, the latter of which can be given hypodermically—0.001–0.005 gm. (gr. $\frac{1}{60}$–$\frac{1}{10}$); but its dosage and activity are very uncertain, on account of differences in preparation. Croton oil can be given only by the mouth, and its dosage is equally uncertain with that of elaterium. When elaterium or elaterine acts, it produces copious watery stools and enormous elimination by the intestine; in the severest cases it is all that we can use to effect bowel eliminations, as the patient is comatose and cannot swallow. The dropping of croton oil upon the tongue has, in my experience, proved very unsatisfactory, but it may be tried. For elimination by the skin the dry, hot-air bath is the best; the patient may be left in it for an indefinite length of time. Jaborandi or pilocarpine is also very valuable; pilocarpine hydrochlorate, 0.003–0.03 gm. (gr. $\frac{1}{20}$–$\frac{1}{2}$), may be given hypodermically, or when possible by the mouth; there is no doubt of its efficacy as to elimination from the blood, for it acts upon the whole secretory apparatus of the human being, and those who have used it in a routine way speak most highly of its action. The danger in its use, especially in children, has prevented me from administering this drug in a routine way, and I reserve it for those conditions in which the other diaphoretics and the cathartics do not produce the required effects. I should certainly hesitate to give pilocarpine when there is any danger of development of pulmonary œdema, nor should I be consoled if such œdema did occur, even though I had added atropine to it. It seems to me that it is safer not to give it at all when there exists any evidence of conditions that may lead to œdema of the lungs, for we have in the measures to be referred to such as do not produce œdema of the lungs or collapse; indeed, some of them act absolutely as preventive measures.

To remove the bad effects of the toxic condition of the blood two other ways may be followed: by bleeding from the arm we distinctly reduce the toxicity of the whole blood, and in addition may give the kidneys enormous relief by changing intracardiac conditions and pressure in the blood vessels; in adults this should be done without hesitation. By the injection of large quantities of normal saline solution, also, the toxicity of the blood is reduced by dilution, and the patient may be tided over by this alone, and frequently copious diuresis may result from its use. In two apparently hopeless cases of uræmic chronic nephritis I used a combination of bleeding and transfusion, Sahli's lavage of blood, with excellent results. When the patient is dropsical the fluid should be removed wherever it may be.

Symptomatic Treatment.—But whatever we may do for the removal of the cause of the uræmia, there remain certain symptoms which must be met by special treatment. First come *convulsions*, which must be stopped. Here the use of morphine should be considered; Dickinson, in Allbutt's "System of Medicine," states that it should be rigidly avoided in all forms of organic albuminuria except in the lardaceous kidney. This is the theory taught by Alonzo Clark, but, thanks to A. L. Loomis, it has been given up in this country for uræmia in acute nephritis. In chronic nephritis, especially in the con-

tracted kidney, Tyson, for instance, still prefers some other sedative, such as bromides or chloral; but when other measures fail, "it should be used cautiously." I also prefer other means, especially chloroform, not because of the danger of opium or morphine, but because it acts more promptly and more decisively; but given a patient whose convulsions are only temporarily controlled by chloroform and return when it is removed, it is obviously impossible to keep him under the anesthetic for a great length of time. The bromides do not control uræmic convulsions, in my experience; chloral is invaluable in children, but in adults its efficacy is very limited, so that nothing else is left us but the use of morphine. Caution in the use of morphine cannot be too strongly inculcated whenever that drug is used; we often see that the importunity of the patient or the seriousness of the situation causes the physician to repeat the injection of morphine before sufficient time has elapsed for the first injection to produce its normal effects. It is not necessary to use extraordinary precautions in chronic nephritis; ordinary care is sufficient.

When there is danger of heart failure we can usually be guided by the arterial tension as to the measures to be used; stimulants—nitroglycerine, digitalin, caffeine—should be given hypodermically as indicated.

Much can be done by the ordinary treatment of nephritis to prevent uræmia; if necessary, the additional measures for elimination must be resorted to. The treatment of all symptoms must include the removal of the cause. For the *headaches* this is usually sufficient; if necessary, caffeine preparations, the bromides with or without ergot, even morphine, may be prescribed. The *psychoses* may or may not require special treatment; they vary much, and when they take the form of persecution or melancholia the patient must be carefully watched. *Renal asthma* is best relieved by morphine, but the condition of the heart must be taken into consideration, so that the treatment of myocardial insufficiency is frequently of great importance, for in a large number of cases of chronic nephritis the asthma is a cardiac asthma. Inhalations of oxygen are valuable, especially in those forms in which the asthma is continuous, even with the Cheyne-Stokes type of breathing. The *gastrointestinal symptoms* should be treated with great caution, as they frequently represent attempts at elimination. The *vomiting* is best treated by lavage; small doses of calomel, when there is no diarrhea, are very beneficial, as the bowel is called upon to exert itself for elimination. The eliminative diarrhea should not be checked unless it does harm to the patient; the ordinary methods used for this purpose may be employed. When these symptoms are due to toxic effects upon the nervous system, elimination going on fairly well by the other means employed, vomiting may be checked by morphine. *Bronchitis* should be treated with the greatest care; a tendency to hypersecretion should be prevented. The *fever* of uræmia, which may be high, may require special attention by hydrotherapy; when it is not thus controlled and its existence seems to endanger life, hypodermic injection of antipyrine combined with a double salt of caffeine may be given.

All complications of chronic nephritis should be treated according to their indications.

Operative Treatment.—Before proceeding further it is necessary to state that my own experience with this treatment is limited to a small number of

cases, so that I cannot permit myself to express a decisive opinion upon its value. Moreover, experimental investigations have not thrown any light upon the *modus curandi* of the operation. That decided results are obtained by means of the operation cannot be questioned, this fact having been verified by all those who have performed it. The most common result reported is upon secretion of the urine, and it has occurred to me that its effect may be compared with that produced by splitting the capsule of the thyroid gland in Graves's disease to facilitate internal secretion, if such exists in the kidney. The first publication made by George M. Edebohls was in 1899, in which he reported the first operation which was performed "with the deliberate purpose of bringing about a cure of chronic Bright's disease." In this publication fixation of the kidney and decapsulation were the methods employed. In 1901 this author reported 19 cases of chronic Bright's disease, in 8 of which a cure was effected. In 1903 he had operated upon 51 patients; of these, 48 have been more or less directly under observation and the operative mortality has been thirteen and two thirds per cent. His conclusions as to his results are as follows: In 51 cases, 47 were on both kidneys, 4 on one only; 7 patients died within seventeen days after operation, 7 between two months and eight years, 2 were unimproved, 22 "are in various stages of satisfactory improvement," not having passed the "probationary period of six months of normal urine"—i. e., not cured; 1 has had a relapse; 9 are cured at periods varying from thirty-three months to ten years after operation; 3 patients disappeared from observation.

Decapsulation of the kidney as thoroughly as possible is the operation performed, and Edebohls asserts that the results are due to changes resulting in the circulation in the kidneys. The contraindication, according to him, must depend upon the individual condition; patients over sixty years of age should "be carefully investigated"; the condition of the heart and the blood vessels must be taken into consideration, as well as the general condition of the patient.

It will be well to compare these results with those derived from a collection of cases by Guitéras in which the operation was performed by a number of surgeons. There are 120 cases, in which sixteen per cent were cured, forty per cent improved, eleven per cent unchanged, and thirty-three per cent died. Guitéras comes to the following conclusions as to the operation: (1) In chronic nephritis operation should not be performed until medical treatment has proved of no avail. (2) The best time for the operation is when the process advances rapidly, and danger of overtaxing the heart exists. (3) The best results, accompanied by the least danger, are obtained in combination with unilateral nephropexy. (4) The most unfavorable results follow in diffuse nephritis. (5) When anasarca and a bad heart are present, the operation should not be done. When the heart is good the operation "may give the patients a few extra months, provided they survive it." (6) When marked destructive processes, due to nephritis, exist in the kidneys, relief may be obtained for a number of weeks, but in these patients the kidneys generally give out again, and death takes place when the new capsule contracts.

It may be said of this collection of cases that as to mortality it possibly represents a low percentage, and as to recovery a high percentage, because not all cases are reported, and there is a not unnatural tendency to report

favorable cases. A widely different report comes from Israel's clinic in an article by Rosenstein (1904). He reports in six cases one death, one made worse, two unimproved, two improved in some respects, none cured. He affirms that Edebohls's results are due to his having operated on movable kidneys and not on those affected by true Bright's disease, and he comes to the following conclusions: (1) Decapsulation is a dangerous operation in severe forms of Bright's disease. (2) No cure has been effected in Bright's disease properly diagnosticated. (3) Improvement has followed the operation.

These results, varying as they do from the previous ones, require some explanation. It cannot be said that they are due to insufficient operative skill, as no one possesses this to a more marked degree than Israel; improvement is admitted, but cure is rejected in the cases properly diagnosticated. The great weight, then, is laid upon the diagnosis; as the diagnostic points of Bright's disease are the same the world over, it is not likely, even granting that Edebohls has erred, that all the men associated with him and all those whose cases have been reported in Guitéras's collection have also erred. So that, under all circumstances, the conclusion that no case has been cured must be wrong. It follows, then, that this conclusion is hasty, the more so as it is drawn from six cases only, whereas the other conclusions are the result of a much larger number (51 and 120). As improvement is admitted on all hands as the result of the operation, and as cures must be accepted, the question for the latter is whether we have not the common solution of *post hoc ergo propter hoc.* In chronic parenchymatous nephritis recovery may take place spontaneously, frequently after a year, sometimes when the disease has lasted a longer time; we are not justified, therefore, in ascribing to this operation any great number of cures which have followed the operation in cases in which the disease has lasted longer than a year. In chronic interstitial nephritis there is no cure, and there can be none, resulting from an operation, unless the causes of the disease can be removed by it; and this is not likely, from our present knowledge of this disease. But we know that periods of improvement occur in this form and may last for a great length of time, during which symptoms are removed, but eventually the interstitial nephritis comes in for its own with the inevitable result. As it must be admitted that we frequently cannot make the differential diagnosis between interstitial and parenchymatous nephritis, both indeed often being present in the same kidney, we cannot in many cases foretell when the operation is going to do good.

The improvement that follows the operation is increase in secretion with corresponding increase in elimination, and in special cases this comes very promptly. All then can unite in accepting as an indication for the operation the presence of severe uræmia in acute Bright's disease. Tentatively we may say that in a number of cases of chronic parenchymatous nephritis a cure may be expected; that in chronic interstitial nephritis symptomatic benefit may be of enormous value. The operation should not be looked upon as a *dernier ressort* in a hopeless condition; it should be performed promptly when all medical measures have failed, but not too much reliance should be placed upon ultimate favorable results. As the operation is accompanied by large mortality, it should not be done without due consideration of this fact, and notably it should not be done by inexperienced operators.

VIII. AMYLOID KIDNEY

PROPHYLAXIS

Lardaceous disease is much rarer than it was thirty years ago; while syphilis has not diminished during this time, modern surgery has resulted in diminution of suppurative processes. But the radical treatment of syphilis now in vogue has also contributed to the rarity of syphilis as a producer of amyloid kidney. The modern surgical methods, the prevention and treatment of suppuration, and the proper treatment of syphilis must therefore be looked upon as the necessary preventive measures.

TREATMENT

For the CAUSAL TREATMENT we also come to that of syphilis and that of suppuration. When we find evidences of syphilis in a patient with amyloid kidney we are relieved, provided we can be assured that a fibroid process has not already developed, as the former can be cured, but the latter always runs its inevitable course. In the treatment, the requisites are patience and endurance. Potassium iodide is the remedy that has produced the best results; it should be given in large doses—0.6–1.2 gm. (gr. x–xx, *ter die*)—with intermissions when necessary, and for a long time—two to five years (Dickinson). Mercury does no good, as might be expected, because of the stage of syphilis in which the amyloid disease develops; besides, as has been noted before, it is a kidney irritant, even when used endermically, and harm may be expected from its use for so long a time as may be required in the treatment of so chronic an affection as amyloid disease. For suppuration all the expedients and resources of modern surgery must be appealed to, for unless the suppuration is controlled the patient inevitably dies of lardaceous disease; therefore the operative risks need not be taken into consideration as with a healthy individual, due allowance always being made for the fact that amyloid kidney patients bear operation very well. When the pus cannot be found or cannot be reached by operative intervention the formation should be counteracted by such general means as are indicated to improve the general condition; we sometimes find suppuration diminished to a minimum and improvement in lardaceous disease following. In lardaceous kidney there is deficiency of elimination, and therefore retention; these should be treated as directed in connection with chronic nephritis (q. v.).

The symptomatic treatment is also the same as in chronic nephritis except that reducing measures are not indicated, and that cardiac and arterial changes do not exist in the pure amyloid kidney. When evidences of this develop by hypertrophy of the heart or hypertension in the arteries, we may be assured that fibroid changes, as well as amyloid degeneration, are going on in the kidneys; reduction in fluid is not so necessary in pure amyloid degeneration, but it is very important when arterial tension increases or when dropsy is well marked.

For the diarrhea little can be done, as a rule, for it depends upon amyloid changes in the intestines; unless the cause of amyloid disease can be removed, the treatment here can only be the usual symptomatic one.

IX. PYELITIS

PROPHYLAXIS

In a large number of cases this resolves itself into prophylaxis of the infectious diseases, and must of necessity be unsatisfactory. As a rule, lower forms of life are eliminated by the kidney without the production of damage to its pelvis. Why, after an infectious sore throat, one individual is affected by pyelitis, the other not, can be explained only by taking into consideration either diminished local resistance or increased virulence of bacteria. For diminished resistance, which may be inherent and structural, and therefore permanent, nothing can be done; for temporary diminution in resistance, those laws that control the general health of the patient are paramount. Prophylaxis is of far greater importance in preventing infection from the bladder than from the blood. All those various conditions that prevent a complete emptying of the bladder should be treated: stricture of the urethra, enlarged prostate gland, or anything producing mechanical pressure upon the bladder or ureter. The proper treatment of renal calculus must be taken into consideration, as a calculus predisposes to infection. As the colon group is the most common form of bacterial invasion, it would seem that a careful supervision of the lower bowel might prevent infection, especially as there is experimental evidence that the colon bacillus may enter the bladder from the rectum. For tuberculous pyelitis little can be done, as it commonly develops in patients who have apparently recovered from their tuberculosis (the infection of the pelvis following a lesion that has become quiescent), in Pott's disease, or as a result of an old pulmonary lesion or of a bronchial gland. The accidental attacks of pyelitis due to turpentine or other irritants cannot be prevented, but in the administration of irritants the fact should not be forgotten that in the presence of a bacterial invasion of the genitourinary organs these irritants may act by producing a local predisposition. Not too much stress can be laid upon aseptic catheterization; my own experience leads me to say that neglect of this is one of the most common causes of pyelitis, for I have seen it follow catheterization, notably where resistance has been reduced by long illness as the result of acute, serious general infection. In old men the local treatment of prostatic enlargement promises much for prevention of pyelitis and pyelonephritis; I have seen a number of patients whose lives have been made more bearable and the number of whose days has been increased by these procedures.

TREATMENT

The cause of the trouble should be removed at the earliest possible moment, and this is the principal indication for the recurrent or chronic forms. The detection of the cause may be difficult or impossible, but certainly much progress has been made in the examination of the urinary organs by cystoscopy and catheterization of the ureters. Yet there will always remain a certain number of cases in which the treatment must be applied to the pyelitis indirectly—i. e., to the symptoms produced by the disease. In the acute cases this may be sufficient, and frequently is so, but even in the chronic cases it acts

curatively. This treatment is directed to the removal of the pus and the prevention of its formation. For the removal of pus we are justified in giving large quantities of fluid, so as to flush out the pelvis of the kidney. For the pelvis of the kidney this is a rational procedure, but in chronic cases, when there is evidence of decided involvement of the kidneys themselves, it must be carried out with the same precautions as in nephritis. When it becomes necessary to "flush" the kidneys, large quantities of fluid should be given; those mineral waters that contain as few solid contents as possible—Waukesha, Poland Springs, even distilled water. It is said that alkaline mineral waters inspissate the pus (Dickinson, Tyson); however this may be, large quantities of fluid should be given: milk in abundance when the patient can bear it; innocuous teas, if the patient will take large quantities of fluid in this form, made from flaxseed, althæa, or triticum repens; or mucilaginous drinks of various sorts. Besides these, some urinary antiseptic should be given; of these antiseptics the most important are urotropine and methylene blue. Urotropine has a decidedly disinfecting action upon the urinary tract because it is there decomposed, so that one of the products is formalin; it should be given in large doses—1.5–2 gm. (gr. xx–xxx) *per diem* rarely producing evil effects; I have had one patient take twenty grains a day for four months without any unpleasant result of any kind being noticed, and in my experience this drug is the best antiseptic that can be used in urinary troubles; its various combinations have not added to its value. Methylene blue is second in importance; it sometimes succeeds when urotropine fails, the reason for which is not apparent. Methylene blue is given in doses from 0.1 to 0.25 gm. (gr. jss. to iij) three times daily, in capsules together with grated nutmeg, which prevents strangury, one of the unpleasant effects of this drug. The other unpleasant effect is the conversion of the urine into fluid that acts as a green or blue dye. Salol is also sometimes used with benefit; great care must be taken in the dosage, especially when there are symptoms of disturbance in the kidneys themselves. In a number of cases I have used sodium benzoate—1 gm. (gr. xv)—three or four times daily, with benefit. The diet should be made up of such substances as irritate the pelvis least (v. Nephritis).

The bacterial cause of the disease should, when possible, be found. In chronic cases the *Bacterium coli commune* is sometimes found; then it becomes necessary to treat the bowel as in chronic intestinal autointoxication, and here the intestinal antiseptics, especially menthol and β-naphthol, are valuable. In acute cases the fever must be treated; as it is of short duration usually, the antipyretics may be used as in acute nephritis. Sometimes the clinical picture of an acute pyelitis is that of septicopyæmia, and here it may become necessary to resort to extreme surgical measures. In the interval between attacks the patient should be well nourished and the necessary tonics should be given.

In children pyelitis presents itself in a peculiar way, simulating intermittent or remittent fever, always, however, a septic fever; the treatment in them is simple and efficacious; in most instances the administration of large quantities of fluid is sufficient; occasionally urotropine must also be given.

When a patient has a dangerous form of pyelitis, a relapsing or a chronic form, surgical measures should be taken into consideration. In the simplest

form the operation is represented by nephrotomy, an operation comparatively devoid of danger, which can be utilized for exploration. By means of this simple operation the cause may be removed, as in renal lithiasis, or the cavity of the pelvis, which represents an abscess, may be treated locally by drainage. When abscesses of the kidney exist, the partition walls should be broken down and the whole cavity be treated as one abscess. According to Fenger, when suppuration persists, secondary nephrectomy may be required. "Primary nephrectomy should be made only when the kidney tissue is filled with multiple abscesses and acute sepsis demands the removal of the organ."

In tuberculosis, nephrectomy should always be done; otherwise the process will extend to the ureters and the bladder; it is said that after nephrectomy the tuberculosis of the bladder also improves. In nephrectomy it is necessary to take into consideration the general condition of the patient; if this is not good, it may be improved by a primary nephrotomy, and after the proper amount of general improvement has taken place a secondary nephrectomy. When both kidneys are affected, nephrectomy should not be done; this seems self evident, but in practice the determination of the functional activity in the individual kidney sometimes cannot be carried out with sufficient accuracy.

X. HYDRONEPHROSIS

TREATMENT

In hydronephrosis the principal object of treatment must be the removal of the cause—viz., all those agents that prevent a normal outlet of urine from the kidneys to the bladder; they may be found in the bladder, in the ureter, or in anything that may act in such a way as mechanically to cause damming back of urine, resulting finally in accumulation of nonpurulent fluid and atrophy of the kidney. In a certain number of cases the condition is a congenital one. The treatment of movable kidney (q. v.) is of great importance for the condition of intermittent hydronephrosis. When the diagnosis of hydronephrosis has been made, the question always comes up how to deal with the condition: whether by intervention or by nonintervention. We have here a condition of affairs that leads to atrophy of the kidney. When no symptoms are produced that do harm to the patient it is best not to interfere, for under these circumstances a condition exists in which the harm has been done, and no further damage may occur as the result of waiting. When serious symptoms develop, however, the question is a difficult one. Aspiration has been frequently done; the objections to it are that the condition returns because the cause is not removed, and that it is an operation not entirely devoid of danger, especially as the work is done in the dark. The operation of nephrotomy is just as safe and it offers the advantage of determining the possible cause, since the pelvis and ureters can be examined, and it may therefore act curatively. When this is not the case nephrectomy will have to be performed, provided always that the other kidney performs functions for both kidneys, as is usually the case in advanced hydronephrosis. When, upon nephrotomy, the kidney substance is found atrophied so that a comparatively thin wall is formed by it for the cyst, nephrectomy should always be done.

XI. NEPHROLITHIASIS

PROPHYLAXIS

It is certain that the primary cause of the formation of the calculus may be looked for in many directions: in the chemism of the urine, in the abnormal accumulations of secretions in the pelvis of the kidney, and in the presence of bacteria there. The prevention of these is of importance more for the prevention of successive attacks than for the first development of the disease, the latter being impossible except for individual cases, and then only in such conditions as result in the production of improper or excessively normal products in the urine. The three conditions that favor stone formation are aggravated by the formation of uric acid, oxalate of lime, and the phosphates. When the diagnosis of any one of these conditions has been made, it becomes the duty of the physician to provide against the possibility of calculus development. That this can be done with success by the treatment of these various conditions (q. v.) there can be no doubt. That, as in all urinary conditions, frequent and careful examinations of the urine are necessary is especially true, since by these alone the precise therapeutic indications can be found. It is perfectly clear that for uric-acid deposit the same method of treatment would not hold good as for phosphatic deposit, disregarding entirely the simple reaction upon them by acids or alkalies. Even for the accumulation of secretions in the pelvis something can be done to prevent the first attack; in pyelitis the proper treatment may be effective. When mucus is present, the dilution of the urine by the drinking of much fluid is of value, although the diagnosis of the origin of the mucus may be difficult. In the floating kidney nephrolithiasis may be prevented by its proper treatment. The prevention of activity of the bacillary causes is the treatment of pyelitis. How much good may be accomplished by the routine use of urotropine in all those conditions in which bacillary causes produce renal disturbance, as has been suggested for the prevention of scarlatinal nephritis, remains to be seen. In nephrolithiasis it would be impossible to do this except in the presence of pyelitis, as the urine normally always contains lower forms of life.

TREATMENT

Medical.—During the attack of renal colic the immediate indication is to give relief for pain. Some patients get relief by change of posture; in one instance that came under my observation the patient found relief by lying on the floor face downward, with outstretched hands and bent knees. Warm or hot applications, applied to the abdomen, also give some relief, either in the form of poultices or the hot-water bag. Some patients prefer a hot bath; this frequently produces relaxation and gives temporary relief. As the pain is the result of the calculus passing through the ureter, nothing can be done except to give relief, so that in the majority of cases the use of opium or morphine is indispensable. Morphine should be given hypodermically, not less than 0.015 gm. (gr. ¼), which may have to be repeated if it does not give relief. When patients do not bear opium, belladonna frequently serves

as a substitute. Belladonna and opium combined, given by suppository, is valuable when the pain is not extreme, but in extreme pain even hypodermic injection of morphine may be without effect; in such cases it may become necessary to use some form of general anæsthesia. The patient should be kept in bed during the attack; hot drinks, lemonade, or demulcent drinks may be given; they are very grateful to the patient; that they facilitate the passage of a stone through the ureters is doubtful; at times large quantities of fluid may increase the pain. The condition of the patient's stomach should be our guide for diet during an attack of renal colic; as a rule, this question is easily solved, as in any attack of even moderate severity the patient refuses food altogether. When the attack is over the urine should be carefully collected and examined; the calculus, when found, should always be analyzed, attention being given to the structure of its nucleus, as by these means we receive valuable information as to the treatment of the period between attacks. In this period the various causes referred to in connection with prophylaxis must be taken into consideration. When the urine and the calculus have given us definite knowledge as to the chemical cause for the development of the stone, the patient should be treated accordingly (uric acid, oxaluria, phosphaturia, q. v.). When there is a blood calculus, the condition producing hematuria (q. v.) must be treated. That which does good for one form of nephrolithiasis may not be good for another, but the contraindications, as far as taking alkalies are concerned, cannot be given with any degree of certainty. Because alkalies produce precipitation of phosphates in a test tube, it does not follow that the administration of alkalies by the mouth will produce this precipitation in the pelvis of the kidney. Indeed, the administration of one form of alkali—calcium carbonate—is one of the best methods we have for preventing the elimination of the phosphates by the urine. The administration of alkaline waters has been sanctioned by the experience of ages; it is doubtful if phosphaturia is a contraindication to their use; certainly those waters that contain appreciable quantities of lime may be of decided value to these patients. The patient then should drink some form of mineral water for the purpose of alkalinization of the urine, but notably for the purpose of diluting it; in this country we have a number of mineral waters—Poland, Saratoga, Bedford, Waukesha; the number can be indefinitely extended, especially as to those containing lithia, either before or after they are bottled. When lithia is given I prefer the benzoated lithia; it should be especially prescribed unless there is no doubt concerning the presence of an adequate quantity in the mineral water that is taken by the patient. The exact action of lithia compounds is not understood; that they are of value in increasing the alkalinity of the urine cannot be doubted; that their administration is followed by good results is also without question; they should be given in large doses and in large quantities of water. They are of special value in uric acid; here, as elsewhere, in the treatment of uric-acid conditions, the question of the solubility by lithia waters is probably one of minor importance. Other alkalies, such as potassium citrate, have also been added to water and given with benefit. The whole question of exact indications of alkalies or nonalkalies in nephrolithiasis requires careful revision by research work; at present, on account of the crudity of experimental evidence, we can only rely upon those which experience has taught us to be valuable.

Many attempts have been made at dissolving the stones when they remain in the kidneys; many substances have been proposed for this purpose: piperazine and its compounds, piperidine, lysidin, lithium combinations of various kinds. Clinical evidence shows that it is impossible to dissolve a calculus inside of the human body; that some of these remedies may do good in other directions cannot be denied; I have seen some benefit follow the use of piperazine. The use of quinic-acid combinations is based upon the fact that this acid produces hypoleucocytosis, and consequently theoretically a diminished production of uric acid; the preparations now in use are urol, quinate of urea; urosin (6 to 10 gm. of a fifty-per-cent solution *per diem*), a combination with lithium citrate; chinotropine (0.5 gm. two or three times daily), quinate of urotropine; sidonal, quinic acid, and piperazine, and the new sidonal, anhydric quinic acid, of which 2 to 3 gm. are given in a day.

Surgical Treatment.—Operative intervention should be resorted to after medical treatment has failed; the indications may be summed up as follows: When the patient is prevented from following his vocation on account of constant pain, the frequency of the attacks, the hematuria, or pyelitis; when the patient is in danger of his life from suppression of urine. The operations to be taken into consideration are: Nephrolithotomy, the finding of calculi by sounding with aspirator needles, then cutting down upon them through the kidney substance with the needle as a guide and extracting them (Morris); pyelolithotomy, the extraction of a stone from the pelvis by an incision made into it; nephrotomy, which is done in the usual way; finally nephrectomy, only for special reasons, now no longer used for the nephrolithiasis *per se*. Nephrotomy seems to be the favorite operation, always when there is a suppurating kidney; the great objection to its use, under all conditions, is that stones may be overlooked. When nephrotomy is performed, however, the pelvis and ureter may be carefully examined.

The treatment of uric-acid infarct in the newly born requires, as a rule, very little attention; when the deposit is not too great it is generally removed, and disappears, at least as far as outward evidences in the urine can be depended upon, in about two weeks. But renal colic in the newly born and in children must be treated. The principles are the same as those in adults: their application must depend upon the particular case. At all events, great care must be taken as to the use of opium; it should be dispensed with in the newly born altogether; at later periods it may be given cautiously. In the newly born, hot baths, the giving of hot water, and warm applications have been sufficient in my own experience.

XII. TUMORS OF THE KIDNEY

Here the nature of the tumor should be decisive as to the kind of surgical intervention necessary. In malignant tumors Röntgen-ray therapy may be tried, as the ultimate mortality with operative intervention is enormous (ninety-five per cent). We are not in a position to do anything by the administration of drugs, except symptomatically.

SECTION X

DISEASES OF THE BLADDER

I. CYSTITIS

PROPHYLAXIS

As urine always contains bacteria and as cystitis is usually the result of bacterial action, it follows that two methods of prevention are open to us: the prevention of entrance of pathogenic bacteria into the bladder and the prevention of activity of predisposing causes. The first end can be attained to a limited extent only by the proper treatment of gonorrhea, of retention of urine, and by care taken to introduce aseptic instruments. In those conditions in which pathogenic bacteria are found in the blood and are eliminated by the kidneys, finally affecting the bladder, urotropine may be given; this is done in typhoid fever.

For the second end much may be done; by the proper treatment of prostatic enlargement, cleanliness of the bladder in certain nervous conditions, spinal and nerve affections, the prevention of infection from the rectum, the proper treatment of stricture of the urethra, the prevention of the introduction of irritating substances with food, improperly or imperfectly fermented drinks, or drugs such as cantharides, capsicum, and others, and the prevention of mechanical irritation of all sorts.

TREATMENT

Acute Cystitis.—The patient should be kept in bed, his diet should be of the most unirritating kind, and his bowels should be kept open. As it is an object to keep the urine diluted, large quantities of fluids should be taken; to this may be added a number of diuretics, the alkaline diuretics, turpentine, spirit of nitrous ether. Mucilaginous drinks have been used almost since the beginning of therapy; it is doubtful whether their action is better than that of any other form of drink, but they are useful in practice because certain patients will take them when they will not drink ordinary water. The administration of large quantities of water is necessary only in that stage when the secretion of urine is diminished and there is frequent and painful micturition. When this is over, the ordinary quantities of fluid should be administered. At present we need no longer depend solely upon the indirect method of rendering the urine less irritating, for in urotropine and methylene blue we have antiseptics which frequently change the clinical condition after they have

been administered for a few days. These two remedies have rendered all other internal medication practically superfluous. It is therefore no longer necessary to use the copaiba series, uva ursi or salol; I would again call attention to the dangers of potassium chlorate when given internally (v. Stomatitis Ulcerosa), a remedy in cystitis that has found so many adherents. In gonorrheal cystitis the fluid extract of Herniaria glabra has seemed to me to form an exception to the general rule just laid down, for I have frequently obtained good results from its administration (℥ x every four hours). In the beginning of cystitis external applications give relief—e. g., poultices applied to the perineum and the lower abdominal region. The pain and frequency of micturition become so great that direct relief must be given for these symptoms; this can be done effectually by the use of rectal suppositories of opium, 0.05 gm. (gr. $\frac{5}{6}$) of the extract, or a corresponding quantity of morphine. Belladonna, given internally in the same form, is sometimes more valuable than morphine, especially in very neurotic individuals. Additional measures are hot sitz baths, hot whole baths; occasionally ice-cold applications to the perineum are valuable. The most efficient method of treating cystitis is the direct one: the application of remedies by means of injection into the bladder through a catheter. In the onset of acute cystitis this is not advisable, as a rule, because of the pain produced; but even here, when the condition of the urine leads us to suppose that there is an inflammation of unusual violence, it should be done. Injections of cocaine into the urethra or into the bladder should be used only when absolute necessity demands it, for even with small doses they have been followed by unaccountable fatal results. All injections into the bladder in this form of disease should be made by the introduction of a soft elastic catheter, as this, when well lubricated, thoroughly softened by heat, and introduced gently, is accompanied by the least pain, provided always there are no obstructions in the urethra. The introduction of a catheter should always be gently done, especially as in this condition there is great irritation; no force should be used and no hurry. The catheter must be absolutely aseptic, which is easily effected; it is only necessary that the fact be borne in mind of its being imperative. The catheter should be connected with an irrigator containing the fluid to be used for irrigation. The irrigator should not be hung too high, a great pressure being unnecessary, and possibly harmful. In the acute form, normal saline solution at about the temperature of the body is usually all that is required. When this is not sufficient boric acid, creosol, or potassium permanganate may be used. The fluid should be allowed to flow slowly into the bladder, and a sufficient quantity should be used for the bladder to become more or less distended. The fluid should be retained in the bladder by pressure upon the catheter for from three to five minutes, and should then be allowed to flow off through the catheter. I no longer use the double-current catheter on account of the difficulty of sterilizing it. These injections should be given daily; not infrequently it is necessary to give them morning and evening.

Chronic Cystitis.—Here the therapeutic problem is a more difficult one, so much depending upon the causal treatment for its success. By far the most common cause of chronic cystitis is chronic enlargement of the prostate gland. As chronic cystitis sooner or later is followed by complications which end fatally, and as the condition of the patient is that of invalidism, the most radical measures have been adopted in the treatment of hypertrophy of the

prostate gland. I do not believe that direct results can be produced in causing diminution of this gland by medication, although I have faithfully used strychnine, the iodides, ergot, and other remedies recommended.

I have been much impressed by the benefits that have followed the *massage of the prostate,* so that in every case this should at least be given a trial. At the first examination it is impossible to state, on account either of the size or of the consistency of the prostate gland, what results will be obtained by this measure; but after two or three sittings the effects of the treatment become apparent in that the gland becomes harder and smaller. When after a week's treatment no result is obtained, the method may be discarded as offering no chance for the patient. With the use of rubber gloves the method is not an objectionable one to the physician; the patient sometimes objects to it in the beginning. The patient is put in the knee-elbow position and the manipulator then introduces the finger and uses gentle friction of the prostate; the first sitting must be very short, after that the sittings may be prolonged from two to five minutes' duration; those parts of the prostate gland that are especially enlarged require most attention. Much time is not needed, certainly no force, as it is remarkable how little irritation is required to reduce the prostate gland when the pathological process is not too far advanced; it diminishes in size under the finger of the manipulator. The result of the treatment is not radical cure, for relapses always occur; these, however, yield to the same treatment, and the individual is made comfortable for years. One of my patients has now been under observation for eight years, the residual urine is normal, as also is its chemical composition; microscopically there is nothing found, and the patient is so thoroughly comfortable that he no longer gets up at night, and passes his urine five to six times in the day. But he has to come back for treatment twice every year.

The objection to this method—that it does not affect the middle lobe of the prostate, which is the one that by its enlargement does most harm—is not found valid as the result of experience; theoretically the muscular substance of the middle lobe would be affected, directly or indirectly, by the manipulation; to what extent this occurs, and when this no longer occurs, can only be established by the method itself.

Vasectomy and castration have not proved so valuable as was first expected. The various operations for enlarged prostate—the Bottini, prostatectomy—are still on trial as to their comparative merits; that excellent permanent results may be obtained from them can be testified to by all those who have had occasion to watch the results.

The *daily use of the catheter* is no longer the method of treatment that we adopt from choice. It should not be used as a routine method, as we now thoroughly understand its limitations in prolonging life and its dangers. But there will always be a number of patients who will prefer it to operative intervention, and in these the physician should be very careful to give the reasons why the method is objectionable and to present the comparative chances of operative measures. From my experience, however, I am of the opinion that the average duration of catheter life is longer than is usually stated—viz., from one and one half to two years—when the patient is carefully taught the necessity of asepsis, and is intelligent enough to carry it out. The best result I have ever obtained is in a patient, now eighty-nine years of age, who

began to use the catheter fourteen years ago and is now so well that he sometimes goes for a week without having to introduce it; this, however, is an exceptional case, the individual being of rare physical and mental vigor.

The treatment of other obstructive forms of chronic cystitis is successful in so far as the cause of the obstruction may be removed in stricture of the urethra, in pressure upon the bladder by contiguous organs or neoplasms, in displacements of the bladder from various causes. The latter form is not infrequently found in old women in whom the posterior wall of the bladder is displaced because of atrophy of the vaginal walls and old perineal tears; here the urine collects in the displaced portions, undergoes alkaline fermentation, and produces a constant irritation. In these cases the introduction of a mechanical support frequently results in a cure of the vesical condition.

In the treatment of the other forms of chronic cystitis cystoscopy may be invaluable; not only can we make a diagnosis of the condition of the bladder, but direct topical medication may be used by its means. Special training is required for this method; for the present, at least, it cannot be carried out by the general practitioner. In the hands of those who use this method I have seen the most brilliant results when the general methods have failed; especially is this the case in females. The treatment of trigonitis and of abrasions or small ulcers of the bladder has been especially successful. Even in tuberculosis, local treatment occasionally produces excellent results when applied early enough; but here suprapubic cystotomy offers better chances for local treatment when the process is at all advanced.

When, however, topical treatment cannot be applied through the cystoscope or when the inflammation is general, we must resort to measures comparable with those recommended for acute cystitis. The urine should be kept well diluted by the use of indifferent waters or by drinking-water, but it is unnecessary to go to the extent of giving the patient such enormous quantities of water as is frequently done; as a rule, two liters daily will accomplish as much as is necessary. The reaction of the urine is no index as to the necessity of abstaining from the addition of alkalies; even when it is very alkaline and contains triple phosphates, alkalies may not be harmful. When, however, much pus is present, alkalies should not be used in large quantities, as the pus is changed by very alkaline urine in such a way as to be no longer removable from the bladder so easily as before. The use of larger quantities of alkalies can usually be dispensed with entirely in chronic cystitis; their action upon the kidneys is all that is important, and this is accomplished by the administration of large quantities of fluid.

The *diet* of the patient should be arranged in such a way as to cause no irritation of the bladder; upon the whole, all those substances that irritate the kidney also irritate the bladder (v. Nephritis).

The *medical agents* besides those mentioned for acute cystitis are many. We have here the group containing volatile oils that act as genitourinary disinfectants. Copaiba and cubebs are rarely used nowadays, as sandalwood oil is not only better borne in ascending doses, but is also less irritant. Sandalwood oil is given in capsules containing 0.5 gm. (℥ vijss.); they should be given in ascending doses until as many as eight or ten are taken daily; this remedy has no special effect—indeed, none of this group has—upon the gonococcus.

Buchu and uva ursi are preparations that owe their value to other antiseptics besides volatile oils; either may be used in infusion—15–30 gm. (℥ss.–j)—three times daily; the uva ursi seems to be more actively disinfectant than the buchu. Benzoic acid and boric acid preparations, also salicylic acid, are also used; I have never been able to satisfy myself that they possess any special value. Indeed, all internal medication is of little account when compared with direct medication of the bladder by irrigation as described for the treatment of acute cystitis. In addition to the substances recommended for the acute form, silver nitrate (one-quarter- to one-half-per-cent solution) is possibly the best. Before it is used, as in all useful medication of the bladder, the bladder must be washed out with tepid water—not more than 100 c.c. should be used for an injection. For the purpose of disinfection, a solution of corrosive sublimate (1 : 10,000) is probably the best; in order to prevent absorption it may be followed by an injection of a common salt solution. Astringents are still used—e. g., alum, lead acetate.

II. NEUROSES OF THE BLADDER

CYSTOSPASM

This presents itself in the form of spasm of the sphincter, of the detrusor, or of both combined.

TREATMENT.—For the *causal treatment*, the condition of the urine, that of the patient's whole urinary tract, of the rectum, and of the nervous system must be taken into consideration. The most common condition is possibly an increased excitability of the nervous condition, by which reflexes are elicited that otherwise would be inhibited, or a diminution in general inhibitory force. Here, then, the treatment must be of a general nature. The frequence of cystospasm in hemorrhoidal conditions must be taken into consideration; it may recur with every change in the hemorrhoids—e. g., congestion, inflammation; a removal of hemorrhoids usually prevents the development of symptoms on the part of the bladder. Slightly enlarged prostate glands sometimes produce this condition as well as posterior urethritis. Anything abnormal in connection with the genitourinary tract should, when possible, be removed. The condition of the urine as to its acidity and abnormal contents must also be taken into consideration. One of my patients, who was operated upon for stone when a boy, always gets attacks of cystospasm when he drinks anything except indifferent waters. But in most of these cases no cause can be found, and the symptomatic treatment must be resorted to.

Symptomatic treatment is very unsatisfactory; hot or warm applications, the warm sitz bath or whole bath may be tried. Bromides may be given in large doses; at times valerian preparations or asafetida are valuable. Belladonna or atropine may be of service, especially when there is spasm of the sphincter. In many cases we cannot do without opium or morphine given by the rectum, or even hypodermic injections of morphine. All these should be reserved, however, for those cases in which there is much pain.

PARALYSIS OF THE BLADDER

The causes of this disease are diseases of the spinal cord, comatose conditions, overdistention, and injury.

TREATMENT.—The principal object of treatment is to prevent damage to the bladder; this may occur as the result of retention of urine, cystitis developing, or rupture of the bladder taking place. The physician should always bear in mind the possibility of occurrence of paralysis of the bladder in connection with the causes before mentioned, notably in comatose conditions.

The remedy against immediate danger is aseptic catheterization; this should be performed twice daily; in exceptional cases, as in diabetes, it may have to be done oftener; for the individual case the frequency is determined by external examination of the bladder. With careful asepsis no damage need arise to the bladder. Catheterization is also an attempt to secure permanent results, for by the prevention of distention and retention the muscular coat is prevented from becoming affected.

For the cure of this disease local electric treatment (v. Enuresis), strychnine, and ergot have been recommended; it is doubtful if any of these is followed by good results. When the cause of the paralysis has been removed or the disease which produces it continues to improve, these measures may be of some benefit; otherwise therapy as applied to the bladder alone is powerless.

ENURESIS NOCTURNA

The TREATMENT of this condition may take many directions. As the ætiology of this affection, as a rule, is in doubt, causal therapy can only exceptionally be applied. In a certain number of cases, and it is not a small one, no therapy can avail, because we are dealing with a developmental condition, deficiency in development of the sphincter urinæ, which disappears with the development of the rest of the genitourinary tract during puberty. Under all circumstances, the disturbance between the relative power of the detrusor and the sphincter is the cause of the trouble. When the sphincter is undeveloped the mechanism is self-evident; but the sphincter may be incompetent on account of lack of inhibition, and here probably is found the reason why in practically all these cases the condition disappears during puberty, the inhibitory force being much increased during this period. It would seem, then, that this condition might be compared to hysteria; this comparison has been made by Thiemich, who maintains that enuresis is a monosymptom of infantile hysteria. In some instances this may be accepted as correct, as is especially proved by the effects produced by suggestive treatment; I have seen one child with diurnal and nocturnal enuresis which had continued for years, absolutely cured by one rather strong application of electricity. If this fact is fully recognized, it will be seen how in many instances a therapeutic result obtained by one method or another may be explained.

In order to get the best results it is necessary to examine the individual case most carefully for general, local, or reflex causes of the condition.

The *general treatment* resolves itself into a consideration of all those conditions that stand for impairment of general health as well as for the production of neuroses—anæmia, rickets, constitutional syphilis, tuberculosis, diseases of the gastrointestinal tract.

The *psychical treatment* of all children with enuresis is of enormous importance, and can only be carried out by intelligent and sympathetic management of the child. Punishment should never be administered; I have frequently seen children reduced to a condition of pitiable nervousness and mental suffering by parents and teachers who have not understood the condition or who, when matters were explained, were even too brutal to make allowance for it. When it is possible to stimulate indirectly the inhibitory force in a child, this must be done; under all circumstances the fact should be understood that the average child feels the disgrace of wetting itself without having its attention called to it or being punished for it; the psychical cripple soils himself because of improper impulses; all the punishment that can be applied will not remove these impulses, but will make the child worse.

The *nutrition* of these children should be carefully supervised, sometimes in special directions, as will be seen. Heavy meals should not be given at night, and it is important not to give fluid immediately before the child is put to bed. The rule may be followed not to use too much bed clothing, as it has been shown that the heavier the covering the deeper the sleep, therefore the more chance of bed wetting. On the other hand, there will be found cases in which enuresis occurs only in the winter; here the extra work of the kidneys is the predetermining factor for emptying the bladder; in these cases the bed clothing should be increased. It has been recommended to have the children sleep with elevated hips; this can be done fairly well with some older children by elevating the foot of the bed, but it is absolutely impossible in the case of younger ones. In a number of cases this procedure has seemed of value. Hydrotherapeutic measures should be used as with all nervous children.

While in a great number of cases there is general disturbance, the fact must not be lost sight of that enuresis does occur in robust and perfectly healthy children. It is the habit of many parents to arouse these patients after they have been in bed for a few hours and have them empty their bladders; but notwithstanding this great care and attention, it frequently happens that the child wets the bed, sometimes a few hours after having been aroused, more frequently toward morning. All that can be said for this procedure is that the number of bed wettings is diminished; the condition does not improve, and the conscientious mother has another duty added to the many others demanded by the modern methods of bringing up children.

For the *local treatment* the rule can be laid down that everything that leads to increased reflex activity should be removed. The urine should be examined; in some instances it will be found to contain an excess of uric acid; then the proper diet should be recommended; or there may be evidences of organic disturbance in the bladder which requires attention. In boys there may be an irritability of the urethra, which can be relieved by the introduction of sounds. Circumcision may have to be performed, but only when it is indicated *per se*, as I have never seen circumcision cure enuresis. Neither do I believe that masturbation is a cause of enuresis, as I have seen mastur-

bators with enuresis relieved from the latter during or after puberty, notwithstanding the fact that they continued masturbation. Rectal irritations should be avoided by the treatment of constipation, anal fissures, prolapsus ani, and pinworms. In girls, vulvovaginitis or papillomata of the orifice of the urethra may require attention. For the treatment of enuresis the removal of adenoids is rapidly displacing routine circumcision. The removal of adenoid vegetations may be expected to do much good when their presence produces general conditions, as it so frequently does; when this is not the case their removal is not followed by any favorable results as regards the enuresis.

Many ingenious apparatuses have been devised to be worn by the patient; the attempt has been made so to arrange them that when the patient lies upon his back he is awakened; a trial of one or all of these will be sufficient to show how ineffectual they are.

Local treatment by *electricity* has been used for a long time, but especially recommended by Ultzmann, who used it thirty years ago, and for a limited number of cases it is of value. The faradic current is used; in girls one pole is introduced into the vagina, in boys into the rectum; the other pole is placed over the region of the bladder. Care must be taken not to use the current of too great strength; for these many years I have always begun with the weakest induction current, giving long sittings and gradually increasing the strength. Daily sittings should be used at first, then every other day; when a result is produced it follows early in the course of the treatment. After a long experience in the treatment of enuresis, I have come to the conclusion that all the various local methods are beneficial in only a very limited number of cases.

Medicinal Treatment.—The treatment that is most successful is one that was first introduced by Trousseau because of the effect of belladonna on sphincteric muscles; this remarkable clinician made a method of its use which consisted in the giving of ascending doses for a great length of time—one to two years in all—increasing or diminishing the dose as required by the presence or absence of physiological effects. As a matter of fact, this method is the best, and gives good results in a greater number of cases than any other; at present atropine is substituted for belladonna. The rationale of this method depends upon the fact that atropine diminishes motility of organic muscle; when this diminished motility does not prevent enuresis the method fails; as it is, after all, only a symptomatic treatment, it must be continued, as Trousseau found by experience, for a long time until something occurs to remove the cause. In a certain number of cases it succeeds, inasmuch as the prevention of bed wetting alone produces sufficient psychical effect to improve inhibition; in these cases, however, relapses are not uncommon.

Nux vomica has also been recommended, on the principle that muscle is strengthened by its use; if it acts at all, and I have never been able to convince myself that it does, it is not by its action upon muscle, but on account of its general tonic effect upon the nervous system. The more I see of enuresis in children the more I come to the conclusion that my therapy, which I published many years ago, does not warrant the sanguine expectations I then held.

SECTION XI

DISEASES OF THE MALE SEXUAL ORGANS

I. SPERMATORRHEA

In practice the treatment of this condition assumes great importance because a normal condition is confounded with one that is abnormal, and especially on this account it has been exploited by unscrupulous, irregular practitioners as a source of never-failing income. If to this is added the constant suggestive effect resulting from the widespread publication in journals and newspapers of the dire effects of this condition, there results a number of patients altogether out of proportion to the importance of the subject. We must in every case that comes to us try to find out whether we are dealing with a true spermatorrhea or simply with a loss of fluid from the prostate, Cowper's, or Littré's glands. This can be established only by microscopical examination of the secretion; in case there are no spermatozoids present, this alone usually suffices to quiet the patient and relieve him of his nervous symptoms. When true spermatorrhea is found, we are bound to ask ourselves the question how much harm does it do to the individual under consideration. As there is only one answer to this, as the baneful effects of spermatorrhea cannot be explained in any other way than by some more or less direct effect upon the nervous system, the general condition must determine whether it does harm or not. The frequency or time of the emissions need not be taken into consideration; there are individuals who look upon the sexual functions in a natural way; there are others in whom the least evidence of abnormality produces most decided general reaction. Among the first, spermatorrhea does not occur; among the latter, few will be found who will not, at some time or another, suffer from spermatorrhea or, what is more common, "loss of power."

One of the first duties of the physician is that of teacher; he should see that the children under his charge are properly taught as to sexual functions. This does not mean that they should be given books to read on the subject or should receive a course of lectures. In our present state of civilization children are expected to learn too much, with the inevitable result that they know too much, or more commonly too little. The teaching as to sexual function should be done by the parents—father to son and mother to daughter. When, as is frequently the case, the father objects to taking this in hand, the physician may, even with greater authority, undertake it. The principle to be adopted is to divest the functions of the sexual organs of all that is

supposed to be supernatural, to reduce them to the laws of physiology. It is manifestly injudicious and useless to give a lecture upon this subject to a young boy; here the authoritative statement that any manipulation of the sexual organs will do harm is sufficient, and usually efficacious. When this admonition is made in the proper way no harm can be done by calling the child's attention to his sexual apparatus; indeed, in the great majority of instances the boy has already given much thought to the subject. The proper way is to place the abnormalities of sexual function upon the same basis with other diseases which are easily prevented by the measures to be applied by the boy himself; there is no need of frightening the boy, but normal children have sufficient inherent fear of illness for judicious advice in this direction to be always followed by good results. The lack of knowledge as to the normal functions of the sexual apparatus is sometimes pitiful in adults. A little talk on physiology usually suffices to cure those who come for the treatment of spermatorrhea, which here consists of occasional emissions and the symptoms which will be found in the advertising columns of most of our newspapers.

TREATMENT

The treatment of spermatorrhea is general and local. The GENERAL treatment should be largely psychical, as in neurasthenia, hysteria, or hypochondriasis (q. v.). It may be stated here that in spermatorrhea the utmost tact is required by the physician; it is a good rule to study every case thoroughly before prescribing, especially as to the application of psychic methods. I cannot, however, admit that hypnosis is necessary, even if it does cure onanism, which in common with all sexual excesses is the most usual cause of spermatorrhea. As these patients are easily hypnotized, just so easily do they respond to suggestion without hypnosis, so that the former is unnecessary. In many of these patients it is necessary to give general directions as to the prevention of sexual irritation, the details of which are self-evident. Athleticism has done much good in college life to contribute to sexual cleanliness; it may be used as a valuable adjunct in the treatment of spermatorrhea. Hydrotherapy in the form of cold baths, douches, and sponge baths is valuable; many authors assert that the cold water should be applied to the spine; if it does no other good there, it acts by suggestion, in that the sexual functions and the spine are connected in an indefinable way in the minds of the laity.

The use of tonics—iron, strychnine, the bitter tonics—is indicated here as everywhere else. In reduced conditions of the nervous system hypodermic injections of sodium glycerophosphate are followed by good results (v. Neurasthenia). The use of bromides should be restricted to those cases in which there is great nervous excitability; with proper supervision they may be given for a long time. Constipation should be treated, as indeed should all conditions which tend to increase local or general nervous irritation.

A careful local examination is required in most of these cases; when prostatorrhea exists, massage of the prostate or local application of silver nitrate to the prostatic urethra usually gives relief. In vesiculitis, the stripping of the vesiculæ seminales is of great value; it is not easy, but is more readily accomplished when the patient is placed in the proper position, which varies, being sometimes better on the side, at others on the knees and elbows, etc.

When the whole urethra is irritable, the introduction of a cool sound of large size, which may be allowed to remain *in situ* for from five to ten minutes, is valuable, or the cold-water sound, the psychophore, may be used. When inflammatory conditions are found in the urethra, they should be treated by the ordinary methods—the use of mild caustics, astringents, antiseptics, anodynes, as the case requires, applied strictly to the affected part.

In common with many, I have obtained good results from ELECTRICITY; it may be applied as galvanism or faradism, either externally or by the method of Ultzmann. Galvanism does most good in the larger number of cases; the sittings should be had daily or every other day; strong currents are not necessary, but the sittings should be long. It is best to apply the cathode to the genitals, as it produces more local effect. I am of the opinion that here, as in many instances, the effect of electricity is largely, if not entirely, that of suggestion: the more formidable the apparatus the better the results; when the apparatus is equally large, faradism or galvanism acts in the same way.

II. IMPOTENCE

For therapeutic purposes this condition may be considered as due to functional or organic causes, of which the first is fortunately the most common. As the condition is followed or accompanied by exceedingly grave results to the patient, it is justly entitled to serious consideration on the part of the physician.

TREATMENT

In order that these patients may be treated with success it is necessary that they be treated in a purely objective manner. The first thing is to examine the patient thoroughly. When no physical evidences as to cause can be found, the history of the patient agreeing with the results of the examination, we are justified in concluding that we are dealing with functional impotence. All these forms are curable except that one in which the patient has never had sexual desire or erections; it is quite possible that in this form there is some organic change which eludes detection by our present modes of examination. In all the curable forms the cause will be found in disease, in disuse, or misuse of the sexual act. In disease it is principally the psychic influence which causes imperfect erections, premature ejaculation, and all those refinements of semiology due to rapidly growing specialism. But in addition, the physiological law that disease leads to diminution of function must also be considered. Upon these two principles is based the treatment of this form of impotence.

The *psychical treatment* is the most valuable, whether by suggestion, by reasoning, or by any other means. The physician must be the judge of what measures are applicable to each case; in one the explanation of the cause may be proper; in another direct or indirect suggestive measures may be used; in a third medical means must be added, or all these may have to be combined. All those remedies and measures to be recommended in organic impotence may have to be applied here. In the *roué* who breaks down sexually during the early period of matrimony the treatment must be begun with drugs

or measures that are followed by more or less direct positive effects. In virtuous men or in such as have always gone to excess the results of sexual failure are most pronounced; here, then, positive measures are necessary, such as electricity or local treatment to be recommended hereafter. The suggestive effect of the treatment can always be added to by the positive assertion of the physician that the patient can be cured, an assertion which is based upon facts. However much the physician is tempted to make light of, or even ridicule, the patient's condition, let this be done after the patient is restored, for then, when a relapse comes, as is frequently the case, this will act beneficially, although even here I have seen exceptional cases.

In all patients belonging to this class the excessive use of alcohol or tobacco should be forbidden; not a few cases are the direct result of alcoholic excess, coming logically in connection with the festivities of the prenuptial days or because the frightened matrimonial candidate seeks courage in drink. In the adult masturbator, matrimony usually acts curatively; when such a one becomes married, it is self-evident that he is attracted by the opposite sex. The discussion whether a masturbator should be advised to marry or not is superfluous; the tone of high moral responsibility assumed by some writers is veritable bathos; when the patient is under our treatment for masturbation and gets well, there is no necessity for this advice; if he does not get well he will not ask for such advice, and surely no physician is going to suggest matrimony as a cure for masturbation that requires treatment. Sexual perversion, of which so much is made by certain psychopathists, rarely comes into consideration; when it produces marital impotence, the courts are usually called upon to give relief; above all, it has not been shown that impotence is its result unless the pervert acts are carried to excess. Impotence, temporary only as to individual women, can rarely be relieved; in matrimony it is usually followed by its logical sequences.

There is a class of cases that are on the border line between functional and organic impotence, due to general causes. In the debility arising from prolonged or even acute illness, the impotence disappears with the return of general health. To this class belongs the impotence of obesity, which I have seen removed by proper treatment of the cause just as I have seen sterility in women cured in the same way. Some drug habits also may lead to impotence; of these opium, cannabis indica, and chloral may be mentioned; when the drug habit has not made too much impression upon the general physical and psychic activity the cure of the habit results in cure of the impotence. The constant use of bromides also leads to functional impotence, easily removed as a rule; that produced by iodine or its compounds, on the other hand, is commonly the result of atrophic changes in the testicle, and is of bad prognosis.

For organic impotence many conditions must be taken into consideration, and the therapeutic result depends upon the possibility of removal of the cause. Among the many conditions in the penis, tumors, cicatrices, osseous changes, anomalies of development, and in the testicles, absence, atrophy from any reason, and tumors may be mentioned. For remote conditions, diseases of the brain or spinal cord, especially locomotor ataxia, and incurable cachexias may be taken into consideration. In the impotence due to irritable weakness (Ultzmann), large urethral steel sounds, electricity, or direct medication succeeds. The so-called paralytic impotence cannot be cured. In a number of cases

the exact cause cannot be determined, so that we must fall back on the various methods that have been recommended for male impotence, regardless of the cause.

Aphrodisiacs have been used from the age of fable; practically, except possibly cantharides, they act only suggestively; if they are used at all, only those should be recommended which do no harm. On the other hand, sedatives are sometimes required; when the patient is in a condition of great excitability, rendering coitus impossible, I have frequently seen good results from the administration of the bromides. Ergot, for a possible effect upon the muscular function of erection, is also given; strychnine for its general tonic effects. The local treatment consists in the use of the cold sound, electricity, and in the local treatment of posterior urethritis, of vesiculitis, or of enlarged prostate. Even in functional impotence they are of value; the cold sound should be the first method to be applied. Electricity may be applied to the urethra, which is not necessary, or the cathode to the perineum and over the spine. Its use here corresponds in every way to that in spermatorrhea.

In functional impotence the results are excellent; in organic impotence the results depend upon the nature of the cause.

SECTION XII

DISEASES OF THE NERVOUS SYSTEM

I. DISEASES OF THE MENINGES

LEPTOMENINGITIS

Simple Meningitis (Meningitis Acuta).—PROPHYLAXIS.—As this form of disease is due to pus producers, the prophylaxis consists in the proper treatment of remote purulent processes, and of the predisposing local cause. In the first instance we must take into consideration all suppurative processes, especially those about the head. Here must be remembered the proper treatment of otitis media purulenta, of purulent collections in the sinuses (frontal and maxillary), of phlegmonous or erysipelatous processes. The proper treatment of bacteriæmias, as in sepsis, typhoid fever, and so many of the acute infections, may possibly also have to be considered prophylactically by proper treatment; it is certain, for instance, that to-day meningeal and cerebral complications are rarer in typhoid fever than they were thirty years ago. For the local predisposing cause the proper treatment of trauma is invaluable as a prophylactic measure. Every injury to the head should be treated with the greatest care by rest, proper diet, external applications, and the proper medicaments; special attention should be given to keeping the patient in bed long enough. All wounds of the head should be treated with the greatest care as to sepsis.

TREATMENT.—(*a*) *Causal Treatment.*—Whatever the condition or disease to which the meningitis is due, its treatment should be continued. In the early stages in meningitis the result of middle-ear processes, mastoid operations should be performed; when, however, the last stage develops, nothing can be expected from this operation. Many symptoms are attributed to meningitis that are due only to conditions of the middle ear; under these circumstances an operation may have to be taken into consideration.

(*b*) *Symptomatic Treatment.*—As there is no specific treatment that has been successful, symptomatic treatment must be followed in every instance for the present. The patient should be put into a dark room, which should be kept as quiet as possible. The food should be as light as possible—milk, albumen, water, broths, the finer carbohydrates. In children a leech or two over the mastoid region frequently gives relief to some of the cerebral symptoms; in the adult venesection may be used in robust individuals, provided it is not contraindicated by the cause of the disease.

External Applications.—The favorite form is the ice bag; the recommendation to shave the head may be carried out in adults, but cutting the hair is sufficient in children, and in infants even this is not necessary. In a disease so fatal as acute meningitis, everything that disfigures the patient should be avoided. Counterirritation adds to the suffering of the patient: it gives pain directly and increases reflex irritability. Mustard, cantharides, iodine, croton oil, tartar emetic, have all been recommended. I have seen them used, but without effect upon the disease. Inunctions of various substances have also been recommended—Unguent. hydrarg., iodoform, iodine—but my experience with them has been the same as with the counterirritants.

Fever.—Either hydrotherapy or antipyretics may be used. For the former the reader is referred to the chapter on typhoid fever. For the latter, antipyrine is the best representative of the group; not only does it reduce temperature, and consequently irritability, restlessness, and other nervous symptoms, but it also gives relief from pain. The prolonged warm or even hot bath also acts favorably. It is especially valuable in infants and young children.

Pain.—Antipyrine or opium preparations are the most efficacious. Opium preparations may be given as such or by hypodermic injections of morphine, depending upon the exigencies of the case. In some cases it is a good plan to keep the patient well under the influence of opium all the time—i. e., until the stage of coma sets in. Nothing gives so much relief from pain as lumbar puncture; this may be done as recommended in tuberculous meningitis (v. Tuberculosis).

Sleeplessness.—Here the removal of the cause frequently removes the symptoms—pain, fever, restlessness; when this cannot be accomplished soporifics must be administered. The bromides are used for controlling the cerebral circulation; they are valuable in the treatment of the disease, and may be given alone or in combination with ergot preparations. Bromides should be given with a liberal hand, especially in children, where large doses can be administered with benefit. They produce sleep only when the insomnia is due to the irritability of the patient—i. e., principally during the first stage. After this opium or chloral preparations are necessary. Chloral hydrate may be given to children by the rectum if it is not possible to give it by the mouth; it may be given to them also in large doses. Chloral hydrate is invaluable in the treatment of convulsions.

The Gastrointestinal Tract.—The bowels should be kept well open; whenever meningitis is suspected, small doses of calomel should be given immediately. During the course of the disease croton oil may be dropped upon the tongue. Aside from any other possible effect of calomel, the keeping of the bowels open has a most decidedly beneficial effect upon the cerebral circulation.

The value of the internal administration of the iodides is variously estimated by different authors; my own experience with them does not permit me to speak favorably of their routine use during the course of the disease. It is possible they may be of value after the acute stage has passed off.

(*c*) *Operative Treatment.*—For the present the best results have been obtained by lumbar puncture in giving relief to symptoms; occasionally it also acts curatively (v. Tuberculosis). Trephining is the other operation that has

been recommended and frequently carried out. It certainly is a rational recommendation, as with it we do to the pia mater what we do to a collection of pus in any other part of the body—evacuate it. Practically few good results have followed this operation, for the following reasons: the operation has not been performed early enough; it is difficult to localize the area of inflammation, and frequently the inflammation has extended to the spinal meninges, and then the operation is useless. It is to be hoped that with larger experience of this operation, performed at the right time and in the right way, more favorable results may be obtained.

(*d*) *General Management.*—For the routine treatment of all forms of meningitis we must accept the following: the removal of any possible cause; absolute rest, absolute quiet; proper attention to the gastrointestinal tract; the relief of symptoms; to those already described may be added heart conditions, retention of urine, the prevention and treatment of bedsores, proper precautions as to the eyes, ears, nose, and mouth (asepsis), and proper feeding. In every form the advisability of operative intervention must be taken into consideration.

(*e*) *Convalescence.*—The patient should not be allowed to get up too early. As soon as convalescence begins the quantity and quality of food should be increased. Exercises should be gradually introduced, their character depending upon the sequelæ. Not only should the general health be carefully looked after, but these patients should refrain from mental efforts of any intensity for some time; children should not be sent to school, adults not allowed to resume their vocation. If the latter injunction is not heeded, the patient may remain a sufferer as long as he lives.

CEREBROSPINAL MENINGITIS (v. page 61)

TUBERCULOUS MENINGITIS (v. Tuberculosis)

SEROUS MENINGITIS

Acute Serous Meningitis.—The causal treatment is the same as that of the purulent form, with which it is frequently combined. In the milder cases, in connection with the symptomatic treatment given in the preceding chapter, Quincke recommends the use of mercury by inunction or by the mouth. When the severe form develops, it is a loss of time to depend upon drugs for the cure of the patient. Here operative intervention is absolutely necessary in order to save life, as the patient will inevitably die of pressure upon the brain. Lumbar puncture should be tried first; if it does no good there must be trephining, with incision of the dura mater or puncture of the ventricles.

The treatment of *alcoholic meningitis serosa*, which is frequently associated with a wet brain, is difficult, for it is hard to distinguish between the symptoms produced by serous effusion into the subarachnoid space and into the brain substance.

The general treatment consists in plenty of nutritious food; the administration of some stimulant suited to the individual indications; the withdrawal of fluid from the circulation without debilitating the patient (calomel,

followed by salines, or salines alone), and the treatment of symptoms. Operative intervention, except lumbar puncture, which is very valuable in these cases, may be used only in exceptional cases.

Chronic Serous Meningitis.—The treatment of the diffuse form will be considered in connection with chronic hydrocephalus. For the circumscribed form we must take into consideration the formation of cicatrices and the resultant symptoms. Surgical intervention—trephining, removal of cicatrices or cysts—is indicated. In a number of cases the internal administration of the iodides has been of benefit, especially when there is a syphilitic history. Otherwise only symptomatic treatment remains—the treatment of headache, Jacksonian epilepsy, etc.

HYDROCEPHALUS (Chronic)

PROPHYLAXIS.—This is that of alcoholism, syphilis, rickets, the acute and chronic infections. This refers principally to the chronic form of external hydrocephalus. In the congenital form prophylaxis is practically out of the question. In that form of hydrocephalus due to malformations, neither prophylaxis nor treatment need be considered; treatment need not be taken into consideration, because of the fact that the hydrocephalus is a hydrocephalus *ex necessitate*, just as we have a pleuritic effusion *ex necessitate*.

TREATMENT.—The treatment of chronic hydrocephalus is very unsatisfactory. The *causal* treatment is like that of syphilis and rickets (q. v.); in the latter disease the results are better than in the former. The *symptomatic* treatment must take into consideration the child's general nutrition, the condition of the blood and of the various organs. In suitable cases muscular tonicity may be preserved by exercise, massage, movements, etc. Decubitus must be prevented when possible; when the head is very large, all kinds of devices must be made use of for this purpose, and to keep the patient comfortable. The patient should be kept out of doors as much as possible, proper arrangements being made for this purpose.

The principal symptomatic treatment consists in the various means used to remove the fluid. These methods must *under all circumstances* be looked upon as purely symptomatic, because only rarely can we hope to remove the cause of the disease; and even with regard to its reported accomplishment, rare though it is, further evidence is necessary before it can be acknowledged as a fact. I do not say that certain cases have not been cured simply by the removal of the fluid, but this has been the result either of an unwitting removal of the cause or of a *circulus vitiosus* having been destroyed.

Medically mercury, the iodides, cathartics, diuretics have been used; unless the first two are especially indicated, nothing can be expected from any internal medication. Strapping of the head with medicated plasters was in vogue for a time; I never obtained from it any results, either bad or good, but it is still recommended. Operative measures have been resorted to as follows: Withdrawal of the fluid by means of a trocar introduced through the fontanel into the ventricle; when performed aseptically this operation is without much danger unless too much fluid is withdrawn, when sudden death may occur. This operation, followed by injections of iodine into the lateral ventricle, was formerly often made use of; the cures were rare and the deaths

frequent. Lumbar puncture is the safest of all the operations that have been recommended; it gives relief for symptoms, and some cures have been reported, but it may be entirely inoperative for anatomical reasons. The only operation that seems to promise much is the one devised by Schramm and by Cheyne and Sutherland, on the principle that by permanent drainage the fluid may be conducted into the subdural space, there to be absorbed by the arachnoid villi described by Key and Retzius. The operation is performed by trephining, opening the dura, forcing a catgut drain into the ventricle, then closing the wounds in the dura and the scalp. Here again it will be seen that this is not a causal method, but it is the most promising procedure devised. As a result of this review of the surgical measures now employed we are led to the following conclusions: I. Lumbar puncture may be used in any case. II. As long as the circumference of the head is stationary none of the other methods should be employed. III. When the circumference of the head increases rapidly and the condition of the patient becomes worse, operative procedure may be employed as a *dernier ressort*. The fact must not be forgotten that many cases of chronic hydrocephalus get well spontaneously; when statistics include reports of cases with small amounts of fluid, it will be found that the prognosis is very good in chronic hydrocephalus. The treatment of these patients, when they are cured, may be that of perfectly normal children, or it may vary from this to that of mentally defective children.

PACHYMENINGITIS HÆMORRHAGICA INTERNA

TREATMENT.—In the acute stage the treatment must be the same as that used for any other cerebral hemorrhage. After this has passed it may become advisable to use causal therapy by antisyphilitic measures—the iodides and the hypodermic injection of mercury; if the symptoms are not urgent, the other methods of mercurial treatment may be recommended. All alcoholics must be avoided (v. Chronic Alcoholism).

Symptomatic treatment must be especially directed against the headaches; here the bromides, antipyrine, phenacetin, or even opiates, will have to be given. In acute cases, the question of operative intervention should be taken into consideration when the process is favorable as to localization, although dangerous symptoms may be present. In chronic cases operations should be performed when there is hemiplegia, or the symptoms of intracranial pressure are so great as to render life unendurable, or when there is Jacksonian epilepsy.

II. DISEASES OF THE BRAIN

HYPERÆMIA

Such a morbid entity as hyperæmia or congestion of the brain may be worked out in the future. At present there is no justification for this diagnosis, nor do I mean to imply that such diagnosis will ever be justifiable. At all events my experience coincides with that of Leube; I have never found it necessary to make this diagnosis. (For a discussion of this

subject the reader is referred to Leonard Hill's article in Allbutt's "System," and to Leube's "Special Medical Diagnosis.") As for venous congestion, passive hyperæmia, the symptoms are conclusive of the existence of a hyperæmia only in connection with the causal diagnosis. Here the treatment is self-evident. Otherwise no treatment can be formulated except when there is arteriosclerosis or atheroma. Above all, if there be such a thing as a cerebral hyperæmia, the fact must not be lost sight of that it is produced by vasoconstriction and not by vasodilatation, as has been shown by Geigel, who states that the essential feature in determining the blood supply of the brain is the velocity of the blood in the capillaries, and this is determined by vascular tension.

ANÆMIA

Here we are dealing with a subject that has been proved to exist by scientific investigation and by clinical experience. We have to do with two forms, the acute and the chronic, and in each the character of the form is determined by its cause.

Acute Anæmia.—The acute form manifests itself by faintness, dizziness, syncope. The *treatment* of this form when arising from the heart will be found in the chapter on Chronic Myocardial Insufficiency. When it is due to loss of blood, the method of treatment is that of intestinal hemorrhage in typhoid fever. In sudden dilatation of the blood vessels of the splanchnic area it will be necessary to act as directed in the chapter on Acute Myocardial Insufficiency. Under all other circumstances the patient should be placed upon his back, and with the extremities elevated. The clothing should be loosened about the neck and the abdomen. He should be given plenty of air. Stimulants of various kinds may be administered: the inhalation of ammonia, camphor, vinegar—only in sufficient quantities, however, to produce increase of reflexes. The nitrites have also been used here—amyl nitrite by inhalation and nitroglycerine hypodermically—but they are of doubtful value. Strychnine, given hypodermically, is more likely to do good in a larger number of cases. No remedies should be given by the mouth unless we are sure that there is no difficulty in swallowing; then alcohol, aromatic spirit of ammonia, or the fluid valerian preparations may be given.

The Chronic Form.—This should be treated as to the cause. The patient should be put to bed if the intensity of the symptoms warrants it. He should be warned, if not put to bed, to move slowly; as a rule, the nature of the symptoms is sufficient to cause the patient to take care of himself in this direction. The causes are repeated hemorrhages, diseases of the blood, intoxications (endogenous as well as exogenous), and certain disturbances of the nervous system. In addition to this causal therapy, ergot will be found of value.

ŒDEMA

Treatment.—The treatment of this condition is very unsatisfactory; cerebral œdema is very frequently a terminal condition of a remote cause for which everything has already been done. Except possibly in inflammatory œdema, the object of the treatment should be to increase the blood pressure within the cerebral arteries; in a recent cerebral hemorrhage this is accom-

panied with much risk of renewal of the hemorrhage (v. Chronic Myocardial Insufficiency), which, however, must be reckoned with in individual cases. As the result of the œdema the blood vessels are compressed; if then increased heart activity is induced there is a chance of increasing the cerebral circulation and promoting absorption of the fluid in the parenchyma of the brain. The hypodermic injection of digitalin should be taken into consideration first; then caffeine, camphor, or strychnine. In the œdema connected with Bright's disease much good can be done by sweating and purging.

HEMORRHAGE

Prophylaxis.—This is that of arteriosclerosis (q. v.) and atheroma. When once these have developed direct prophylaxis should be attempted, in order to prevent the rupture of diseased blood vessels. This consists in mental and physical moderation; all the various functions should be taken into consideration; strain of every sort should be prevented. Indiscretions in food and drink should be avoided. In a number of cases the attack is preceded by premonitory symptoms: vertigo, muscular or sensory disturbances in the parts to become affected, or mental symptoms. Under such conditions we can speak of a prophylaxis of the apoplectic attack. How much good can be done by it is always a matter of conjecture, but it has seemed to me that I have been able to prevent a number of attacks; and, on the other hand, where this prophylaxis was not carried out a number of fatal cases has occurred. From a theoretical point of view we may state that under favorable circumstances we can prevent the rupture of a blood vessel, and that under all circumstances the quantity of blood and the rapidity with which it leaves the circulation can be limited. All these factors may become important in an individual case, and, on the other hand, the local conditions in the brain may be of such a nature that no preventive measures can do good. The patient with any of the symptoms mentioned above should be kept quiet; his bowels should be kept open; his diet should be regulated as to quality and quantity; no stimulants should be permitted under ordinary circumstances. The bromide of potassium or of sodium should be given in 1-gm. (gr. xv) doses every four hours; when there is much pain, usually attributed to rheumatism, and the bromides fail to quiet the patient, opium may be added.

Treatment.—*The Attack.*—The patient should be kept quiet; in the beginning of the attack no attempt should be made to move him, or even to undress him. After consciousness has returned and the pulse no longer indicates increased pressure the patient may be moved, but even then only with great care. Too much stress cannot be laid upon this direction; no one would think of doing anything else where there are visible evidences of hemorrhage, but when these are not present very little attention is paid to it. It is far better to let a patient lie upon the floor quietly than to take the risk of removing him, and thereby of increasing the hemorrhage. When consciousness does not return within a reasonable time the patient should then be put to bed, his head being higher than the trunk. The next thing is to try to stop the hemorrhage. This may be attempted in various directions, directly and indirectly. Ergot, since it causes contraction of blood vessels, may be used either by the mouth or hypodermically; how much good it does we do

not know; that its action is always uncertain we do know, but in medicinal doses it does no harm. Indirectly the cerebral circulation is affected by reducing the quantity of the blood in the general circulation by blood letting. When the patient is seen in the beginning of the attack, the diagnosis being positive, venesection may be performed, from five to sixteen ounces of blood being withdrawn, as the pulse warrants. The contraindication is found in cases where the blood pressure is not high, and in weakened or anæmic subjects. In some cases venesection seems to be followed by great improvement, sometimes very temporary; in the massive hemorrhages I have rarely found it of service. Reduction of intracerebral pressure may be produced in these cases by lumbar puncture, but in two attempts that I have made the final result was unchanged by this measure. When possible, depletion of the splanchnic area should be attempted; for this purpose it is well to use the hydragogue cathartics; if the patient is unconscious, croton oil dropped upon the tongue should be tried; if conscious, it may be given in the ordinary way. The bowels should be emptied as soon as possible by means of saline cathartics, castor oil, calomel, or by rectal means, even if upon examination they may appear to be empty. Peripheral irritations may also diminish the circulation in the brain; for this purpose sinapisms and counterirritations have been recommended. I have never used them, and the research work of Geigel shows us how careful we must be in drawing conclusions as to the possible effect of any measures upon the cerebral circulation. The administration of bromides also diminishes the quantity of blood in the cerebral blood vessels; they are indicated, however, only in the milder forms during the attack, and their activity is increased by the addition of ergot.

After these indications have been looked to, the duty of the physician consists in seeing that no further harm comes to his patient. No food whatsoever should be given the patient by the mouth provided there is evidence of any difficulty in deglutition; in these cases rectal feeding should be used (v. Gastric Ulcer); this is of enormous importance for the prevention of deglutition pneumonias. When the patient is thoroughly conscious, food such as milk, eggs, and broths may be given by the mouth. The mouth of the patient should be kept clean (v. Scarlatina); the bladder should be evacuated when necessary, and bedsores should be prevented.

In debilitated persons the debility should also receive attention.

After the Attack.—The effort here should be to mitigate the bad effects of the attack as much as possible, and to enforce prophylactic measures against a second attack. In the mildest form, when voluntary motion returns soon, the patient should not be allowed to move about much for at least one week; then graduated use of muscles may be recommended. At the end of two or three weeks faradization of the muscles and passive or systematic active movements may be begun. In the severer forms the patient should be kept quiet as long as it is necessary. To prevent muscular inactivity and contracture electricity, massage, and resistant movements are recommended. How much good is done by electricity is a debatable question. Under no circumstances should electricity be used too early, especially as it is alleged that the faradic current increases the tendency to an existing contracture. On the other hand, it is asserted that the galvanic current and static electricity may be used not only with safety, but also with benefit. Indeed, the use of the galvanic cur-

rent (the cathode being applied to the antagonists of contracted muscles) is especially recommended for the treatment of contractures. The whole subject is as yet too little settled to permit of positive conclusions. From a practical point of view, the above objections may be taken into consideration. At the present time no patient with paralysis of any sort is considered as being treated properly unless electricity is used, and there can be no doubt of its efficacy, but this is due not entirely to the effect produced upon muscles, peripheral nerves, etc., but in part at least to its psychic effect, and we see this produced just as well by those complex apparatus which generate no electricity as by those that do. For early use, then, apparatus alone should be used; for later use electricity may be employed. Massage should be used in such a way as not to tire the patient; it is most valuable in the flaccid variety, some authors asserting that it facilitates contracture of muscle. Passive movements are the most valuable in all forms, with or without resistance, the latter in the early treatment, the former as the case progresses. Active movements should be especially encouraged in the flaccid form, but later they may be used in either form.

The care of the skin is accomplished in the same way as in all other conditions in which trophic disturbances may be expected. Baths should be given to these patients daily—neither too cold nor too hot, but according to the habits of the patient; they may be tub or sponge baths, as the condition of the patient warrants.

The postapoplectic psychical and nervous conditions require the same treatment as is indicated under other conditions, except in so far as that those remedies must be chosen which do least harm to cerebral circulation.

The psychical treatment of this stage is most difficult; the situation of the patient should be made clear to his friends; they should be informed that those symptoms which do not disappear in from three to six months after the attack cannot be relieved by any treatment. Whether this should or should not be told to the patient depends entirely upon his individuality. As a matter of fact, no one is justified in laying down an absolute time limit for improvement, as everyone has seen exceptions to the above rule. In the majority of cases, moreover, if the patient is told the consequences he turns to some irregular practitioner, who is apt to do more harm than good, although it must not be denied that the psychic effect produced by such of those practitioners as do least harm is sometimes astounding.

EMBOLISM AND TROMBOSIS

Prophylaxis.—In *embolism* there can be no prophylaxis except in so far as the causal condition is concerned, and in so far as it is limited to the prophylaxis and treatment of endocarditis, aneurism, atheroma, and septicopyæmia. In *thrombosis* the prophylaxis consists in the treatment of arterial disease: syphilitic arteritis, arteriosclerosis, atheroma. In order to prevent a thrombosis which is imminent cardiac tonics may be tried—strophanthus, not digitalis. A combination of vasodilators with cardiac tonics is very valuable for this purpose, but here digitalis is more efficacious than strophanthus.

Treatment.—**Embolism.**—*During the Attack.*—Provided the diagnosis can be made, it is essentially that of cerebral hemorrhage. Bleeding should not

be resorted to because, if anything, the coagulability of the blood is increased by it. Sedatives should be given—large doses of bromides. Vasomotor depressants, such as veratrum viride or aconite, which should not be repeated more than a few times unless there are special indications, such as a continuous, full, soft pulse, are recommended by Collins when the patient is in good general condition. Otherwise the treatment is purely symptomatic.

After the Attack.—It is the symptomatic treatment of the sequelæ, due to the localization of the embolism. The general condition must be taken into consideration; the physical and psychical welfare and the treatment of the causal condition are essential. In most of these cases the administration of the iodides is valuable.

Thrombosis.—*During the Attack.*—We speak here only of arterial thrombosis; venous thrombosis is, as a rule, a surgical affection. The treatment differs essentially from that of cerebral hemorrhage or embolism. Here the patient must be put to bed, his feet elevated and his head low, for the principle of treatment is to facilitate the passage of blood through the affected vessel, and thus prevent as much as possible the cerebral changes (softening of the brain) that take place as the result of change in its lumen. Posture is a very important aid, especially where the lumen is only partly obliterated. In addition, increased blood supply to the area beyond the obstruction can be attained by increasing the heart's force and by dilating the blood vessels. For increasing the heart's force stimulants have been recommended—ether, Hoffmann's anodyne, alcohol; cardiac tonics, such as digitalis, strophanthus, caffeine; for dilating the blood vessels only the nitrites are available. The statements made in connection with prophylaxis are equally true as to treatment. The patient should receive the most nutritious diet whenever it is possible.

After the Attack.—The treatment does not differ from that of embolism. Here again the danger of recurrence must be taken into consideration. Nothing that acts as a depressant should be recommended; no violent purgation, no debilitating remedies, no fatiguing methods of exercise or gymnastics.

ENCEPHALITIS

Acute Hemorrhagic Encephalitis.—As the disease is produced by infections and intoxications, the only *prophylaxis* that can be taken into consideration is that of influenza, the acute exanthemata, cerebrospinal meningitis, and chronic alcoholism.

TREATMENT.—The *hygienic* treatment is that of cerebral hemorrhage—viz., a dark, quiet room, elevated head, the same diet, the same care of the bowels, and absolute rest. Ice bags are put on the patient's head. When the patient is robust, leeching may be resorted to. External application of drugs to influence the cerebral process is without value; neither in the acute stage can internal medication affect its course. For *symptomatic* treatment the fever may be considered, and is best treated by hydrotherapy; when there is much restlessness or headache from the fever, antipyrine or phenacetin may be given. For the delirium the same treatment should be given to alcoholics as is recommended for the treatment of delirium tremens (q. v.). In non-alcoholic cases, opium or morphine, chloralamide, sulphonal, or trional may be

given for the same purpose. In asthenic cases it is necessary to use slight stimulation; the stimulants must be selected according to their symptomatic indications—i. e., as applicable to one system or another, or to the general condition. Sometimes they must be given for the purpose of tiding over the dangerous effects of these symptoms; then little regard can be had to the possible dangerous effects of drugs, especially when the latter have been evolved from experiments upon lower animals. The focal symptoms that remain cannot be treated surgically; the administration of the iodides and of mercury is here indicated; how much good is done by them it is impossible to say; at all events, care must be taken that they do no harm. In convalescence the patient should be treated as in cerebral hemorrhage, in addition to which the indications that arise in connection with the disease that has caused the encephalitis must be fulfilled.

Brain Abscess.—PROPHYLAXIS.—Here much can be done, especially in the proper treatment of otitis media and of suppurative processes in the cranial cavities. Next to these conditions, the careful treatment of wounds of the head must be taken into consideration. Finally all septicopyæmic forms of disease, when properly treated, may be looked upon as belonging here. The proper treatment of otitis media purulenta and the asepsis of wounds in the head are the most important factors in preventing brain abscess.

TREATMENT.—The treatment is surgical. When the localization has been made, the operation of evacuating the pus must be performed as early as possible; when it is not possible to localize exactly, there should be an exploratory operation. For the results of this method of treatment a quotation from Macewen will suffice; he says that "in uncomplicated abscess of the brain, operated upon at a fairly early stage, recovery ought to be the rule." The symptomatic treatment is the same as that of purulent meningitis or hemorrhagic encephalitis.

TUMORS

TREATMENT.—A. *Medical.*—(*a*) *Causal.*—The greatest good is accomplished in gummata by the internal administration of the iodides. In order to procure the best results the iodides should be given in ascending doses until the doses are very large (v. Syphilis). Mercurial treatment may be added to this. As a rule, if the case is one of syphilitic tumor, improvement takes place very rapidly; if, however, after a thorough course of antisyphilitic treatment lasting from five to six weeks, no improvement takes place, we may conclude that the tumor is not syphilitic, and that some other method of treatment should be pursued. On the other hand, improvement in the symptom does not always signify that the tumor is syphilitic, so that on account of this experience it is the custom of practitioners to give antisyphilitic treatment, especially by the iodides, in every case of brain tumor. I do not believe this to be bad practice, except in cases where symptoms are present that can be looked upon as an indication for immediate operation. Other remedies, such as arsenic and sera, have been recommended for sarcoma; for tuberculosis the ordinary method of treatment in tuberculosis has been used, but general experience shows that little can be here accomplished.

(*b*) *Symptomatic.—Pain:* This is one of the most distressing, and at the same time one of the most constant symptoms. Relief should be aimed at

by rest, by cold or hot applications, by mild external counterirritation (sinapisms). Medically the bromides, antipyrine, phenacetin, acetanilide, and caffeine have been recommended; these, singly or combined, give relief in individual cases. Morphine must be given in very many cases; the opium or morphine habit need not be feared here, especially in the case of an inoperable tumor, but care must be taken not to increase the dosage too rapidly, or the limit of beneficial action will be reached too soon. The fact must always be borne in mind that only relief for pain should be sought, not the production of physiological effects. In these cases cannabis indica or belladonna may also be tried; sometimes they give relief when opium fails. *Vomiting:* The ordinary methods should first be tried—ice pills, sinapisms at the epigastric region, ice bags over the stomach or at the nape of the neck. The remedies recommended for the pain frequently also give relief for the vomiting, but in the great majority of cases morphine is the only one that can be relied on to give relief. *Insomnia:* Any one of the hypnotics may be used here—veronal, trional, sulphonal, chloral or its compounds, especially chloralamide, even opium. Collins speaks highly of hydrotherapy, the use of such measures as are intended to draw the blood to the surface.

Convulsions should be treated as under other conditions. *Spasmodic contraction* of muscles can be relieved by local pressure or, if necessary, by the internal administration of bromides, with or without chloral, depending upon the extent and intensity of involvement. Epileptic convulsions should be treated as epilepsy itself.

Apoplectic attacks should be treated in the same way as would hold good for them under other conditions.

Paralyses are relieved by the iodides, when due to syphilitic peripheral lesions in nerve trunks; after the specific treatment has been carried out, the ordinary treatment of neuritis should be recommended.

Optic neuritis is best relieved, as far as medical measures are concerned, by the administration of potassium iodide.

B. *Surgical.*—(*a*) *Palliative.*—All the symptoms enumerated above are also relieved by the measures now to be mentioned. *Lumbar Puncture:* All symptoms due to compression may be relieved by this simple measure in suitable cases. In cerebellar tumor it should not be used, as sudden death may be caused thereby. *Tapping the ventricle* is of value in the presence of an internal hydrocephalus by relieving pressure, and thus giving relief for symptoms.

Trephining: The advantage of this measure is that not only may relief be given, but also a diagnosis as to the localization may be possible.

Ablation of the tumor has been recommended, and in a few cases great benefit has followed.

(*b*) *Radical Operation.*—Here the tumor is removed. Unfortunately the number of tumors susceptible of operation is very small—about six per cent, according to Starr's analysis of 600 cases of tumor. According to this same author also, as a result of the investigation of 365 operations for brain tumor, it was found that about forty-five per cent were successful, inasmuch as removal of the tumor had been effected and the patient had recovered. The mortality when the tumor was removed amounted to about twenty-five per cent, so that the outcome of surgery in brain tumors would be expressed in figures as follows: six per cent only suitable for operation, of which forty-five

per cent recover; therefore, about three per cent of all cases of brain tumor can be cured by operation. It is a notorious fact that the mortality from surgical operations that is deduced from such statistics as have been referred to is always greater than is represented by the figures, simply because a large number of fatal or unsuccessful cases are not reported. At present, then, we cannot look upon surgical intervention with any great amount of enthusiasm. And yet this operation is indicated when medical treatment fails, as giving to the patient the only chance of recovery. Moreover, we can confidently expect that as the technique of surgeons improves the results will be somewhat more favorable.

Contraindications to the operation are found in an inaccessible localization where vital functions are involved; tumors of the pons, the medulla, the base of the brain, the basal ganglia, and those deep in the hemispheres are included here. As to the cerebellum, tumors may be operated on, and have been operated on successfully. Upon the whole the motor area is best suited for obtaining the best operative results. The nature of the tumor as regards malignancy should be taken into consideration, but unfortunately in a majority of cases this cannot be determined before the operation. Secondary tumors should not be operated on, except for palliation. Carcinoma, multiple tubercles, and gliomata are the least favorable for operation; sarcomata, cysts, and solitary tubercles the most favorable. The size of the tumor may be a contraindication to radical removal, but as much of the tumor as can be ablated should be removed, first because of the palliative effect which occurs as a rule, and secondly, because a number of cases are on record in which a further reduction in size followed the operation (Erb, Oppenheim).

INFANTILE CEREBRAL PALSIES

Prophylaxis.—The prevention of acute infections and the treatment of syphilis in the pregnant woman should receive some attention here. The treatment of prolonged labor, whatever be the cause, is the principal prophylactic measure that should be insisted upon. On the other hand, a certain number of cases have resulted from trauma, the result of the application of the forceps; but in the cases that have come under my observation, the greater number was produced by protracted labor, not by instrumental delivery.

Treatment.—*Medical.*—At the onset the proper treatment of convulsions (q. v.) is imperative, for the convulsive act adds to the danger from increase of local damage. It should be noted also that after any infantile convulsion the attending physician does well to take into consideration the possibility of the development of infantile cerebral palsy.

Little can be done by medicine in this disease. Tonics of various kinds may be indicated. Nux vomica or strychnine should be used in very small doses only after the symptoms of the onset have subsided. Potassium iodide and mercury are without value unless there is a syphilitic lesion, and then only in so far as this lesion itself permits of improvement by their administration; it will be seen, then, that very few cases of this disease can be beneficially affected by this medication. The medical treatment of epilepsy with the bromides is also very unsatisfactory in cerebral palsy; the administration of opium or of chloral hydrate frequently does more good than that of the

bromides. The other symptoms occurring during the attack should be met according to their indications.

Orthopedic measures are of great importance here; they will be described in the chapter on poliomyelitis anterior acuta (Infantile Paralysis, q. v.).

Pedagogic.—When it has been shown that mentality has suffered, and there are few exceptions to the rule that this is not the case, the question arises what shall be done for the child? He must be educated, so that when he becomes an adult he may, if possible, take up his burden with all possible chances in his favor. This can be done only by preventing deformity as much as possible, which is accomplished by the orthopedic surgeon and by teaching the child, which is the duty of the pedagogue. The best method is treatment in an institution. Even the wealthy cannot obtain what is found in an institution and is most valuable for any child—association with other children. These children must not be allowed to go to the public schools, for they are in no way suited to compete with normal children, and any attempt made to force them into this competition results disastrously to them. Children are savages, and a child both mentally and physically so deficient that it cannot defend itself soon becomes an object of derision or of cruelty. Yet in practice it is difficult to persuade parents that their child should be sent to an institution: the well-to-do believe that private teaching will be sufficient, and the poor have a fear of public institutions—not always without foundation; they can rarely be induced to send their children away until poverty compels them to do so. There is a large number of private institutions in this country where excellent results are obtained, and most of our States provide for "feeble-minded" children in public institutions. The results obtained by institutional treatment are much better than those obtained by home treatment, for it requires special pedagogic knowledge to treat these children, and few pedagogues have this special training. In some instances excellent results are obtained by proper education and training; under all circumstances we must give to these children the best possible chance for improvement, and this is not usually done. When once the diagnosis of feeble-mindedness is made the child is, as a rule, given up as incurable, which indeed it is, but attention should be given to its symptomatic improvement. In Little's disease the treatment is practically the same as that described; the results, however, are more favorable, because in a number of cases the underlying cause, developmental deficiencies, may disappear partially or even entirely.

MULTIPLE SCLEROSIS

If the fact is taken into consideration that multiple sclerosis is a progressive disease which, with very few exceptions, necessarily leads to death, the therapy suggests itself as that of *symptoms*. It consists largely in the care that the patient can give to himself, with plenty of rest, plenty of good food, plenty of good air. As to rest, there should be no mental strain; even in the first stage, the patient should give up his occupation. He should keep up his nutrition to the highest level; alcohol should be avoided. When possible he should change climates, going to warm climates in the winter and to cool ones in the summer. For medication, ergot and silver nitrate have been recommended. Tonics, of necessity, play a very important rôle. Arsenic is

supposed to have some beneficial effect upon the cause of the disease. Müller recommends the following combination: ℞ Acid. arsenios., 0.0005–0.001 gm. (gr. $\frac{1}{130}$–$\frac{1}{60}$); extract. nucis vomic., 0.005–0.01 gm. (gr. $\frac{1}{12}$–$\frac{1}{6}$); quininæ hydrochloridi, ferri lactat., āā 0.05 gm. (gr. $\frac{3}{4}$); extract. gentian., q. s. ut ft. pil. No. I. Dent. tal. dos. no. xxx. Sig.: One pill three times daily. Electricity is also recommended: galvanic, faradic, static. Hydrotherapy may be prescribed in the form of baths, as the indication requires it. Even graduated exercise has been highly spoken of. It is best, for all reasons, to give some internal medication; possibly it may affect the disease, but certainly it benefits the patient. The principal thing is to give symptomatic relief to the bladder, the intestines, and in headaches, vertigo, faintness, etc.

APHASIA

Besides the treatment of the cause (syphilis, abscess or tumor of the brain) and its removal when possible, the treatment consists in educating the patient to use the centers on the unaffected side. For the details of this method the reader is referred to the special works on diseases of the nervous system.

III. DISEASES OF THE SPINAL CORD

ACUTE MYELITIS

Prophylaxis.—There can be none except the general prophylaxis of the infections. Aside from the myelitis due to syphilis, there can be no causal therapy, and the physician is consequently restricted to *symptomatic treatment*, which in this disease is of the utmost importance. Especially in the acute stage much good can be done in preventing further damage to the cord. This is accomplished by perfect rest. The patient should be left absolutely quiet and in bed. As soon as the diagnosis is made the patient should be put upon a water bed; if this cannot be obtained, the greatest care should be taken in the selection of mattresses and pillows; a supply of rubber pillows should also be kept on hand, so that decubitus may be prevented. In addition, the skin should be kept clean, and all other preventive measures should be taken such as have already been described in connection with the prevention of decubitus in typhoid fever. It has been stated that the patient should not be allowed to lie on his back, but always upon his side or in the prone position in order to prevent spinal hyperæmia; practically this prevention is impossible, but the position of the patient should be frequently changed by the attendant; under no circumstances should the patient move himself. Bedpan and urinal should be used. Great care must be observed in the prevention of soiling by urine or fæces. When there is incontinence of the urine it may be collected in a urinal, provided a proper one can be found; for men the ordinary glass urinal usually suffices; for women rubber urinals may be found; in the absence of these, absorbent cotton should be used to collect the urine, but it is necessary to wash off the skin very frequently and to use mild antiseptics in the form of either lotions or salves. When there is retention of urine, catheterization becomes necessary; too much care cannot be taken to have the catheter aseptic, for infection of the bladder, and therefore cystitis with all its

consequences is one of the most serious complications of myelitis. The bowels should be moved daily; autointoxication should be prevented, otherwise an additional factor will be added, which of itself may cause the disease to grow worse. In order to keep the bowels open calomel should be used at the onset, followed by a saline cathartic; after this the treatment of chronic intestinal autointoxication (q. v.) may be used, as it can be adapted to the individual patient. As a rule, it will be found that rectal means will have to be used daily in order to secure regular evacuation of the bowels.

The *diet* should be that usually prescribed in febrile diseases. It should be in accordance with the condition of the bowels, not on account of its nutritive value only; both indications—nutrition and the regulation of the bowels—can usually be met by diet. Unless special reasons for giving alcoholic stimulants exist, these should be forbidden.

Local Treatment.—As little as possible should be done in this direction. When the symptoms lead the physician to suppose that there is also involvement of the meninges, the ice bag may be tried. Local blood letting, by cups (wet or dry) or by leeches, is not necessary. The application of counterirritants should not be countenanced, although nearly all kinds have been recommended, chemical and physical. We have seen how important it is to prevent any lesion of the skin, and what efforts are made to prevent this; the use of any of these counterirritants is obviously in direct antagonism to this indication, and, moreover, adds to the discomfort of the patient, and even causes pain. If we were at all assured that in this stage counterirritation could be beneficial, the detriments and benefits to be derived from it would have to be carefully balanced. As it is quite generally accepted that no good can be accomplished by it, this need not be considered. Electricity applied at this stage cannot do any good, and may do harm.

Medicinal Treatment.—The only remedies recommended in myelitis due to infectious diseases are sodium salicylate (3–5 gm. [gr. xlv–lxxv] during the day), diaphoretics (Oppenheim), and mercurials. Sodium salicylate is valuable at times to relieve pain; the diaphoretics may aid in toxine elimination; as to the use of mercurials there exists considerable doubt. If there is a syphilitic history they might be used, but even then only with great caution so as not to reduce the patient; aside from this there can be but little temptation to prescribe them, as we are now not so certain of their antiphlogistic effects as formerly. Brown-Séquard recommended ergot, but it has not been shown that any benefit follows its administration. Belladonna is also used; from its physiological effects we should conclude that it is more apt to do harm than good. For the pain, antipyrine, phenacetin, or opium may have to be given. The twitching and spasmodic contractions may be relieved by bromides; sulphonal in small doses—0.3 gm. (gr. v) three or four times daily—is sometimes invaluable. After the acute stage has passed the treatment is that of chronic myelitis.

CHRONIC MYELITIS

Prophylaxis.—The prophylaxis is that of the diseases or conditions that produce chronic myelitis; acute myelitis, syphilis, ergot, alcohol, lead, and mercurial intoxication, gout, anæmia, diabetes mellitus.

TREATMENT.—*Causal.*—Here we must take into consideration the treatment of the diseases mentioned above. Of infections the principal one is syphilis, and this should be treated except in cases where the general health of the patient forms a contraindication. No other contraindication exists, for nobody can tell before they have been properly carried out how much or how little may be accomplished by antisyphilitic measures. Wherever, then, there are evidences of syphilis, the treatment recommended in the chapter devoted to syphilis should be instituted and faithfully conducted. It may be necessary here again to call the reader's attention to the fact that in syphilis of the central nervous system the largest possible doses of the iodides should be given; many failures in treatment are due solely to failure to use adequate doses.

For the intoxications the methods described in their respective chapters may be followed. The cases that arise from acute myelitis should be treated with extraordinary care; the patient should be watched for some time before he is allowed to leave his bed, because of the danger of relapse. When it is decided that he may get up, he should do this very gradually; as a rule it is not a getting up, but a being taken up, and even this must be done with the least amount of motion to the patient. With these particular recommendations in view the treatment of chronic myelitis is the same in all forms.

Electricity.—Application of electricity to the spine is of no value whatsoever. Electricity can be used only for symptomatic indications—to prevent muscular atrophy, possibly to give relief from pain. All electrical treatment must be begun with weak currents, otherwise pain and jerkings will be produced. For the muscles both the galvanic and the faradic currents may be used, the current being applied both to the peripheral nerves and to the muscles. For the pain, galvanism is applied in long sittings and in weak ascending currents (the anode over the seat of pain). High-frequency currents are also very valuable against the pain.

Medicines.—The iodides have been recommended in all cases; how much good is done in the nonsyphilitic cases is doubtful. The identical remedies recommended in multiple sclerosis have been recommended here also. Tonics must frequently be given, according to individual indications. Strychnine is very frequently prescribed.

Counterirritation.—When the active process in the cord has subsided counterirritation produces some results. It may be made by the hot douche upon the spine, by sinapisms, vesicants, or the actual cautery; only the first and the last should be used. The actual cautery is best applied in the form of the galvanocautery or the Paquelin. That it does good in this disease can be testified to by those who have had experience with it; whether the good follows the act of counterirritation or is a psychical effect is immaterial.

Massage, Gymnastics.—Both are very valuable. As a passive method massage is the best agent we have at our disposal; it improves the nutrition of the muscles, and therefore their contractility, and when properly applied the condition of the peripheral nerves also. It has very little direct effect upon the central nervous system.

By gymnastics we get the effect upon both the muscles and the peripheral nerves, and effect also upon the nerve centers. Active and passive movements should be combined in all these cases; care should be given to the exercise of synergistic and antagonistic muscles. The gymnastic exercises should begin

with the mildest efforts and should gradually increase. Resistance can be applied either by an operator or by a system of pulleys and weights, which can be arranged to be used by the patient, the weights being gradually increased; in this way great stimulation of nerve processes is obtained.

Baths.—Much good can be obtained by the systematic use of baths. Warm baths (90°–95° F.) of long duration are especially valuable for the spastic conditions; also with the addition of common salt or CO_2. It has been shown repeatedly that the patient can move more easily in the bath than out of it; this is due to the buoyancy of the water and also to the fact that spasmodic contractions are prevented by the temperature of the bath, so that while the patient is in the bath any one of the various gymnastic exercises that have been recommended may be used to good advantage. The patients may be sent to those health resorts especially equipped for the treatment of nervous diseases by hydrotherapy, electricity, exercise, etc. The cold-water cure is sometimes very valuable in these cases, and also the treatment of mineral baths; here the sulphur, the CO_2, the NaCl, or so-called indifferent waters are recommended. In this country the Hot Springs of Virginia and Arkansas, Sharon, Richfield Springs, the various sulphur springs of Virginia and Saratoga; in Europe all the waters used for the Nauheim methods (v. Chronic Myocardial Insufficiency)—Harrogate, Leamington (England), Kissingen, Homburg, Wiesbaden, Baden-Baden, Gastein, Ragatz, Wildbad, Teplitz (Germany), and those places which are especially devoted to the treatment of nervous patients—may be selected. These patients should not be allowed to take sea baths until a long enough time shall have elapsed for no harm to be done (Leyden and Goldscheider say not before one to two years shall have elapsed from the onset of the disease). In this disease, as well as in all chronic diseases, the *psychic treatment* of the patient is invaluable. The details will be described in connection with neurasthenia and hysteria.

COMPRESSION MYELITIS

Pott's Disease.—Treatment.—The general treatment is that of tuberculosis (q. v.). The *local treatment* consists in orthopedic or other surgical methods; the former cannot be entered into here, the latter are applicable in very few cases. They consist in the usual method of treating caries of bone, removing the carious part and applying some dressing. Because in Pott's disease usually the body of the vertebræ is affected, it will be seen how difficult the operation (first performed by Macewen in 1888) becomes. Because of this and the following considerations the operation has not been followed by the good results that were expected: the general condition of the patient is not favorable; there are apt to be multiple deposits in the vertebræ, or more than one vertebra may be affected. If to these be added the possibility of tuberculous infection of the cord itself or of extensive purulent exudate, it will be seen that the chances for success are not the best. Orthopedic treatment gives much better results, not only for the compression myelitis, but especially for its prevention.

General Treatment.—This is causal and symptomatic. Much difference of opinion exists as to the value of the general treatment of tuberculosis in this condition. As a rule it does little good when the local process has advanced

so far as to produce compression; but it can do no harm, and therefore the various remedies recommended in tuberculosis (q. v.) may be tried. As for the dietetic and other directions found in the chapter on tuberculosis, they find their indication, with proper limitations, here as well as elsewhere.

Tumors.—The possibility of a syphilitic tumor should always be taken into consideration and the appropriate treatment be instituted. Indeed it is well to give the patient the chance of improvement from antisyphilitic treatment in all cases; a few weeks of this treatment can do no harm and, as in cerebral tumors, it may be of value for the relief of symptoms, even where the tumor is not syphilitic. There is no other medical treatment, except it be palliative, that can be given in these cases of spinal tumor.

Surgical Treatment.—Removal of the tumor was first introduced by Horsley (1887) in a case in which Gowers had made the diagnosis. The operation consists in laminectomy, to be followed by opening of the dura, when necessary, and removal of the tumor. Series of cases have been reported by Bruns (1897), Putnam and Warren (1899), Schlesinger (1898), Collins (1902), and Leyden and Goldscheider (1904). The last-named authors have collected 43 cases, in which the tumor was completely removed by surgical intervention. In 11 of these cases complete recovery took place, in 11 more improvement followed, in 2 cases no improvement followed because the tumors had done irreparable damage to the cord. In 19 cases death occurred after the operation ("shock, sepsis, meningitis, secondary hemorrhage, debility, tuberculous masses that could not be removed"). In about twenty-five per cent there was recovery; then in the same number of cases improvement; in about fifty per cent death, either directly after the operation or hastened by the operation; the postoperative mortality is about thirty per cent. Notwithstanding this great mortality, the operation should be recommended, for without it death will inevitably follow. Contraindications are found in those tumors that are situated within the cord; when the tumor is secondary to sarcoma or carcinoma in other places, and when the general condition of the patient is poor. The exact diagnosis of location—i. e., the decision between intramedullary and extramedullary tumors—is frequently impossible; in such cases laminectomy should be performed (Brown).

Fractures and Dislocations of the Vertebræ.—When possible immediate reduction should be attempted, with fixation by a plaster of Paris or other apparatus. When this is not possible, operation should be performed for the removal of fractured ends of the laminæ, projecting portions of vertebral bodies, or, "not infrequently, intervertebral disks, which are the most frequent means of compression" (Horsley).

The *after-treatment* in these cases is much the same as that of acute myelitis (q. v.).

HEREDITARY ATAXIAS

Treatment.—Only symptomatic treatment can be used here. The patients should fatigue themselves as little as possible. The paralyses, contractures, and atrophies may require attention, but without hope for anything more than temporary relief. The patients should be made as happy and as comfortable as their means will permit.

SYRINGOMYELIA

There can be no causal therapy in this disease, and on account of intermissions or remissions which occur in the natural course of the disease hasty conclusions as to the effects of any therapy should be discountenanced. Upon the whole, the treatment is based upon the principles applied to that of chronic myelitis and spinal muscular atrophy. The patients should be warned that on account of anæsthesias they may be liable to traumatism or burns. Because of the trophic changes in the skin, resistance to pus-produced infections is diminished; therefore great cleanliness of skin should be advised. The complications arising from trophic disturbance plus infection should receive prompt surgical care. All infectious processes, on account of general reduction in resistance, should be especially guarded against. Even without infection, troubles due to trophic disturbance in the spinal column or in the joints may require attention. The patients should not overexert themselves, as this is apt to cause increase in symptoms.

LOCOMOTOR ATAXIA (Tabes Dorsalis)

Prophylaxis.—Aside from the proper treatment of syphilis no prophylactic measures are possible. If we accept at their full value the various ætiological factors noted by the various authors, the fact still remains that very little can be done to prevent their resulting in the production of tabes. Even if we accept syphilis as an almost constant factor in the production of this disease, so little is understood of the contributing causes that prophylaxis can be rarely applied. How can anyone protect himself against exposure to cold, the ætiologic factor which Leyden considers the most important? And, it might be asked, who knows who should protect himself, and why? How can one protect oneself against trauma? Granted that these causes do produce tabes, they can be looked upon only as contributing causes for which there must be a local predisposition. After all that has been said and written about the ætiology of tabes, one fact stands out clearly, that from seventy to ninety per cent of all tabetic patients have had syphilis (Fournier, Erb). Whatever may be the relation of syphilis to locomotor ataxia, this factor must be dealt with as an indication for prophylactic treatment, and this means the proper treatment of syphilis. As to the value of this as a prophylactic measure, the authors differ, as they always differ in regard to the effect of antisyphilitic treatment upon the frequency of late syphilitic developments. This can be explained by the statement that it is impossible to tell what the proper treatment of the individual case should be unless the maximum as to time and intensity is applied. Even here it is a well-known fact that cases will be found in which it is impossible to control either early or late manifestations. There is no doubt in my mind that the proper treatment of syphilis (v. the chapter on Syphilis) does prevent the development of tabes. Too often have I seen tabes develop in neurotic patients who have neglected their *mild* cases of syphilis, so that I am convinced of the relation between improper treatment of syphilis and the occurrence of locomotor ataxia. That cases occur in which there is no evidence of syphilis is not denied; that, on

the other hand, other infectious diseases may run their course with ephemeral manifestations, leaving no marked evidences, can also not be denied.

TREATMENT.—(*a*) *Hygienic.*—As we are dealing with a disease which usually lasts for a long time, the morale of the patient must be looked to. Here again comes up the question of the attitude of the physician as to the amount of information it is necessary to give the patient as to the nature of his ailment. Here, as in the case of many other ailments, the easiest thing to do is to tell the patient the whole truth, and with some patients this is the best thing that can be done, for the responsibility of carrying out precautionary measures then rests with them. But with the majority of patients this is not necessary, as they will carry out anything that is reasonable if a proper explanation is given for its necessity. Thanks to the popularization of superficial knowledge, every one knows especially the unpleasant features of locomotor ataxia, and therefore, whenever this disease is diagnosticated, the patient will consider himself doomed. The result is hypochondriasis, as I have seen more than once, the giving up of all interests in life, not infrequently suicide. It is well, then, to become acquainted with the patient, to study his character, as a result of which we may learn how and when he should be told what ails him. In addition, the fact must not be lost sight of that the diagnosis of early locomotor ataxia is by no means easy, everyone having seen mistakes in this connection; especially in these cases should the physician be very careful in telling the patient about the possibilities that may arise in years to come. Careful instructions as to the various measures that prevent harm and the statement that complications may arise later are sufficient.

Shall the patient continue to attend to his vocation? Apart from the cases where this question is answered by the necessities of the patient, it depends largely upon the stage of the disease. In very advanced cases the question answers itself, and also when pain or immobility is the dominant symptom. When possible, however, the patient should follow his calling, unless in and of itself it causes the disease to grow worse; then some other occupation should be found. It is a good rule never to take a patient with a nervous affection away from his vocation unless there is a special indication for it. If the stress of the vocation can be diminished it is well, but we all see patients with locomotor ataxia at the head of large institutions and connected with great enterprises without damage to themselves or to their trusts.

There are no rules to be laid down for *diet.* The patient should live upon his ordinary, accustomed diet, avoiding excesses and keeping his bowels open. If the patient has gastric crises, that diet should be so arranged that it is nutritious in small quantities. It is best that these patients should abstain from alcohol and tobacco; under all circumstances moderation should be advised.

Muscular strain should be avoided; overstrain may do much harm in regard to the anatomical changes in the posterior roots. The treatment by exercise and gymnastics will be referred to hereafter.

The *prophylaxis of infections and intoxications* must also be looked to, as they cause increase of symptoms on the part of the cord. Excess in venery should be avoided; while this has been looked upon as a cause of the disease, it

is more commonly a result; it does harm in the same way that any excessive use of nerve tissue does harm.

(*b*) *Causal Therapy.*—The necessity or propriety of carrying out antisyphilitic treatment is a subject that has been much discussed. My own experience has led me to the following conclusions: There is no evidence that antisyphilitic treatment can affect those parts of the spinal cord already involved; the evidence that the disease can be arrested is doubtful; the evidences that improvement may follow are more satisfactory. Antisyphilitic treatment is permissible in all tabetic patients (Möbius); it is absolutely indicated in the preataxic stage, it is necessary in all cases in which it has not hitherto been used or has been insufficiently carried out, and it should always be administered when other evidences of syphilis are present. The use of the iodides, as giving relief for pain, is sanctioned even by Leyden, who absolutely refuses to admit any connection between syphilis and tabes, preferring as his cause the exposure to cold.

Silver Nitrate.—The use of silver nitrate in nervous diseases comes to us from the astrological conceptions of the old Arabian authors, and it has been used ever since by European physicians. Since the days of Wunderlich it has also been prescribed in tabes. Nearly everyone who has seen many cases of tabes will have seen that one or more have been improved by this drug; there is no explanation why it acts thus, experimental evidence going to show its inertness as far as the nervous system is concerned. The danger in its prolonged use is argyria, which can be avoided by watching the gums and limiting the dose. It is given in the form of a pill (℞ Argenti nitratis, 1 gm. [gr. xv]; argillæ, q. s. ut ft. pil. No. lx), each pill containing about one fourth of a grain, one to be taken three times daily for a month or two. If necessary, the dose may be increased to two pills three times daily, but gradually, and always under the observation of the physician. This course may be repeated after an interval of from six to eight weeks.

The use of the *iodides* has already been referred to; aside from any antisyphilitic effect, they are the most valuable remedy we possess in locomotor ataxia; they should be administered in ascending dosage until large doses are taken, and this is easily accomplished without harm to the patient by means of the new iodine preparations (v. Syphilis).

Ergot for a time enjoyed great favor; it seems, however, not to have any effect upon the disease. Phosphorus, arsenic, strychnine, have all been recommended for the arrest of the disease; that they have failed is not surprising; that they may do some good to the patient is not to be doubted.

For a short time *organic extracts* made from the brain or testicles of lower animals were quite in vogue; they are not much prescribed at present. In their stead we give the glycerophosphates, which are very valuable in this disease (v. Neurasthenia), but no one can affirm that they arrest it.

(*c*) *Symptomatic Treatment.—Exercise.*—The most important exercise is that introduced by H. S. Frenkel, a Swiss physician, in 1890, and it is essentially a treatment of the ataxia—i. e., incoördination. The principle upon which it is based in tabes dorsalis is that here the fault lies primarily in the centripetal nerves, through which normal impulses are not conducted properly, and therefore are not properly recognized by the cortical sensorimotor centers.

If, now, perception, memory, and volition are increased in these centers by exercise, compensation takes place there, and the ataxia is improved by increased recognition of the centripetal impulses. Frenkel calls the method one of "compensatory therapy." The exercises consist in voluntary muscular movements, upon which the patient concentrates his full attention. They should be conducted in the most methodical manner, always under the supervision of the physician, when possible in his presence, and never without a trained attendant. Apparatuses of various kinds have been constructed, but, unless in the severest forms of ataxia, they are unnecessary except for their moral effect. If a physician is willing to study this method carefully, proper contrivances will suggest themselves for successfully carrying it out. As the exercises are very fatiguing, on account of the concentration that is demanded of the patient, they should be of short duration, not exceeding five minutes to begin with, and they should be repeated two or three times a day. The length of time is *slowly and gradually* increased. The frequency of movement must be controlled, either by loud counting or by direction of the attendant; a metronome may also be used for this purpose. The exercises themselves differ according as they are applied to the legs or the arms. For the former they are begun with extension, flexion, adduction and abduction, the patient lying upon his back; then more complicated movements are added; after this the patient makes movements while sitting down; then while standing quietly, finally while walking. All these are done with the eyes open; when done with closed eyes they contribute also to exercising the muscle sense, which is a great desideratum. For the upper extremity such exercises are used, beginning with those of the larger muscles, as will finally lead to the finer movements in the arms and fingers. In no way should these exercises be conducted so as to produce overfatigue; as a rule, tabetics tire very easily. After the exercise has been completed the patient must rest. The requisites for carrying out this plan of treatment are, first, the *personnel*. The physician must have the proper training, and must be patient and optimistic. The attendant should be skillful, faithful, cheerful, and obedient. The patient should be constantly encouraged by physician and attendant. This method cannot be used in certain individuals: those that are too easily fatigued, those whose general condition is bad (anæmia, debility, tuberculosis), those who have arthropathies. In heart and arterial disease the condition of the heart or of the arteries determines whether or not the method may be used. In a number of patients pains are increased, even crises produced, and these persons are not fit subjects for this treatment. The results of the method are excellent, and it is well worth while to follow it when the conditions are favorable. After satisfactory results have been obtained the patient is permitted to carry out the plan of treatment by himself.

Massage and Gymnastics.—Massage may be used advantageously at times for pain. It is also of value in atony or paresis of the muscles. When a patient with locomotor ataxia has any other affection in which massage is indicated, it may be recommended. But care must be taken not to have the massage used with too great force; upon the whole, vibratory massage is better than manual because the amount of force used can be better regulated. Both German and Swedish gymnastics have been recommended. For the Swedish the indications are the same as for massage. The Zander apparatus may also

be used instead of Swedish movements or massage, but none of these takes the place of Frenkel's exercises.

Electricity.—For our present purpose it does not matter whether electricity does good by suggestion, by improving the tone, general or local, by changing the circulation in the posterior roots, or in any other way; it suffices to say that in a number of cases it does good. There is no evidence that it acts curatively, but it may give relief to pain, and in other ways directly or indirectly benefit the patient. Electrical treatment should not be used too long with these patients; if no benefit follows in two weeks, it is not likely that anything will be accomplished by it. Again, there is nothing to be gained by prolonged courses of application; a course of daily treatments covering a period of six weeks is generally sufficient. The galvanic current has been applied to the spine, the sympathetic, and the extremities. The electrodes should be large, not more than six to ten milliampères should be used, and the sittings should not be longer than from five to ten minutes. If there is great relief from pain, two sittings a day may be given. The directions for application are as follows: one electrode upon the chest, upon the neck, or under the angle of the jaw, the other upon the spine. Both electrodes may be placed upon the spine, the one being gradually moved toward the other; the anode may be applied to painful places, the cathode to indifferent places.

The faradic current is used against paræsthesia, anæsthesia, pain, and also muscular atony. Except for anæsthesia, strong currents should be used, not, however, to the point of producing pain, but until a distinct sensation is aroused. The faradic brush is also recommended; it should be used in sittings lasting from five to twenty minutes. High-frequency currents and static electricity are also favorably spoken of.

Balneotherapy and Hydrotherapy.—Here again there is no satisfactory explanation why baths do good except by their indirect effects, such as general relaxation, promotion of sleep, improvement of general health as the result of change in surroundings, mode of life, climate, and occupation that occur in connection with a stay in places especially constructed and located for the purpose of carrying out all the many indications of balneotherapy. As a result of this, baths are selected which contain few chemical ingredients, salts, sulphur, or CO_2 gas, and which are warm (85° to 95° F.). No precise indications can be put down for their use except that they should not be much warmer or much cooler than the temperatures just noted. Contraindications are found in individual peculiarities of patients. Some had better stay at home on account of the stage or nature of the disease; others find more comfort and more happiness at home, and the improvement obtained at baths does not counterbalance the loss of comfort and happiness. The taking of this form of treatment should be looked upon as a luxury, not a necessity, so that if the patient's means are limited the money spent in taking balneological treatment can be more advantageously laid out at home in securing comforts or necessities. Many places are recommended: in this country, the Hot Springs of Virginia or of Arkansas, Richfield Springs, N. Y.; in Germany, Nauheim, Rehme-Oeynhausen, Pyrmont, Franzensbad, Teplitz, Gastein, Wildbad, Aix-la-Chapelle; in France, La Malou.

The hydrotherapeutic measures recommended are again many: the warm full bath, the half bath, the Charcot douche, or Fleury spray may be men-

tioned as of value for general and local symptoms. What has been said under balneotherapy also holds good here as to temperature except that, as has been noted in another connection, the temperatures may be taken much lower for the Anglo-Saxon race (10° F. lower on an average). Artificial salt or CO_2 baths may be made or pine-needle extract added; these act by peripheral stimulation. For the proper use of these methods it is best for the patient to go to some institution especially adapted for their use. At home, hydrotherapy may be applied in the form of douches, packs, the half bath, and hot baths. Cold baths may be given to a large number of patients in this country; they act as they do in healthy individuals, who have found them of service. Ocean bathing acts differently with different people; I am not prepared to say that there is any individual who may not take sea baths unless his condition precludes it. Fresh-water bathing is beneficial, provided the temperature is not too low.

Mechanical Treatment.—Formerly patients were suspended by their heads, a plan introduced by Motschukowski in 1883, with the purpose of stretching the spinal cord, which purpose, however, it does not fulfill. Whatever the *modus operandi*, experience showed that suspension gave relief and improved the general condition of the patient; in this country the Sayre apparatus was chiefly used. In order to obviate the danger of the method various modifications were introduced, of which the inclined plane, to support the weight of the body, was the most obvious and successful. At present the whole method has been largely discarded, to be rediscovered, possibly, in the future.

It is not necessary here to detail the many orthopedic measures that may be applied to give relief, as they are found in works devoted to the general subject of orthopedics.

Counterirritation.—This has been applied here in the same way as in other diseases, but in a more active manner, on the theory, doubtless, that the graver the disease the more vigorous must be the remedy. Formerly the red-hot iron and the moxa were used; now the Paquelin and the galvanocautery are applied. None has any effect upon the course of the disease, and, if used, great care should be taken that no infection shall take place; and besides it is not always safe to make lesions in the skin of the tabetics. I have seen symptomatic improvement follow the use of the potential cautery by using the galvanocautery over the spinal column without touching the skin. Mustard and various liniments are also used for the purpose of giving relief to pain, which they sometimes effect.

Medicinal.—All the measures mentioned are of some value, but it becomes necessary now to take into consideration the treatment of special symptoms. First among them is lancinating pain. Any one of the methods mentioned above as valuable may be used. But in addition certain remedies must be prescribed: antipyrine, acetanilide, phenacetin, pyramidon, analgen, and many others; of these, antipyrine and its combinations are the most generally successful; antipyrine may also be given hypodermically, in which way it acts more promptly; pyramidon, dimethyl-amido-antipyrine, is given in doses of from 0.3 to 0.5 gm. (gr. v to vijss.) twice a day. Acetanilide (antifebrin), in doses of 0.2 to 0.3 gm. (gr. iij to v) or even larger, is given; phenacetin is much safer than acetanilide, and exalgen, a derivative of the latter, may be given with comparative safety in doses of from 0.4 to 0.8 gm. twice a day.

Analgen is given in doses of 0.5 gm. (gr. vijss.), so that the amount given during twenty-four hours does not exceed 3 gm. The various liniments of the Pharmacopœia may be used; they are valuable only in the milder developments of pain. It cannot be denied that the administration of morphine becomes a necessity for some of these patients, but before this is done all the many combinations made from antipyrine, acetanilide, and phenacetin should be tried. When it has been decided that morphine must be given, and this decision is not an easy one, all precautions should be observed so as not to induce the morphine habit. But with all the precautions that can be taken, some tabetics will become morphinists. How difficult it is to decide to give morphine and how easily a patient may become a morphinist are shown by the following: One of my patients with mild locomotor ataxia, a very nervous, excited subject, self-indulgent and intolerant of any irritation, had neuralgic pains, for which I had prescribed the coal-tar products, changing from one to another as each lost its effects. One night he could not sleep; another physician was called in, who gave him a hypodermic injection of morphine—entirely justifiable in view of the apparent great suffering of the patient. From this time the patient became a morphinist, and died as such, since nothing—suspension, hydrotherapy, or new coal-tar products—could give the relief afforded by one hypodermic injection of morphine.

For the treatment of the crises morphine is usually indispensable. In the treatment of gastric crises the internal administration of ice pills, cocaine hydrochloride (0.02–0.05 gm.—gr. $\frac{1}{3}$–$\frac{5}{6}$), anæsthesin (Ritsert), cerium oxalate (0.2 gm.—gr. iij), or morphine may be given. Here the question of nutrition must be taken into consideration during and after the attack. During the attack the feeding should consist of digestible, condensed food—usually best borne ice cold; after the attack superalimentation (q. v.) frequently becomes necessary.

For the *laryngeal* crises inhalations of a concentrated aqueous solution of potassium bromide or anæsthetization of the larynx with cocaine may be of use. If suffocation or dyspnœic symptoms develop, a whiff of chloroform or of amyl nitrite may be tried. Here as well as in the visceral crises morphine may have to be given. Tracheotomy or intubation may have to be performed.

Disturbances in the *bladder* require great circumspection in treatment. *Prophylactically* every patient with locomotor ataxia should be taught to exercise his bladder; whether this may be called true "compensatory exercise" does not matter; under all circumstances the effect of the will upon muscular contractions can be increased, both as to stimulation and inhibition, by exercise. The cortical centers then can be educated, just as in Frenkel's exercises. To do this the patient must be told to empty his bladder once every three or four hours during the daytime; when these patients first come under treatment it may be necessary to give them increased quantities of fluid to drink, but these must be diminished gradually as soon as the patient begins to be able to empty his bladder whenever he wishes. The early use of catheters should be avoided, because of the danger of infection of the bladder and the production of cystitis. When the bladder does not empty itself, manual expression may be tried; the application of electricity, as in enuresis (q. v.), is also recommended. For the atony large doses of nux vomica sometimes give

relief. When cystitis develops it should be treated as recommended in the chapter devoted to this subject.

For the *sexual disturbances,* when they manifest themselves by irritability, large doses of the bromides may be given; in well-developed cases they will do very little good unless given for some time. For the impotence nothing can be done.

For the *amaurosis* little if anything can be done. Hypodermic injections of strychnine are recommended; also of cyanide of gold and of potassium, 0.02 gm. in 10 gm. of distilled water, of which five drops are injected into the back daily, the dose being increased one drop every day until fifteen drops are given. After a rest of a few weeks the course begins again. Electricity applied directly to the eyes has also been recommended.

Trophic disturbances must be treated according to the surgical rules laid down for their management. The perforating ulcer has been successfully treated by rest and by the application of cold or hot water, in the form of the douche, and by various other methods; sometimes, however, it resists all methods of treatment, growing steadily worse, and then amputation becomes necessary.

In the last stage of the disease, or whenever prolonged pressure exists upon any given part of the body, the usual preventive measures for bedsores must be applied.

POLIOMYELITIS

Acute Anterior Poliomyelitis (Infantile Spinal Paralysis).—Treatment.—As irreparable damage to the spinal cord results from this process, of which the cause is unknown, treatment resolves into that of three stages: The onset; the stage of repair; and the stage of the sequelæ.

The Onset.—Here the treatment is that of all acute febrile diseases in children—that of fever, convulsions. There can be no specific treatment because we do not know the exact cause of the disease. The diet should be that of ordinary infantile febrile diseases; the bowels should be kept open by means of mild laxatives, such as calomel, castor oil, or cascara sagrada. Oppenheim has suggested diaphoretic measures; both these and the laxatives tend to the elimination of toxines. Above all, it should be the duty of the physician to see that the patient is kept absolutely quiet, so that the inflammatory process may not be made worse.

The Stage of Repair.—In this stage it will frequently be seen that muscles, or groups of muscles, which at first were paralyzed, begin again to contract, and the case gradually settles down to that condition that remains permanent. As this is due to the efforts of nature to do as much as possible for a *restitutio ad integrum,* no violent therapeutic efforts should be encouraged. Here again the patient should be kept as quiet as possible, the diet and the condition of the bowels should be controlled. Baths of various kinds may be given—warm, cool, with or without the addition of salines, CO_2, or extract of pine needles—always in such a way that they do no harm. Electricity may be applied; mild currents should be used, either the galvanic or the faradic. It is immaterial which of the two currents is chosen, and just as immaterial how it is applied; galvanization of the spinal cord, which was once so highly recommended, does no good and may do harm. The medical treatment should be

adapted to the special indications, which as a rule will be found in the administration of tonics; iron, arsenic, cod-liver oil; strychnine should not be given in this stage, as it has a tendency to increase and prolong inflammatory processes in the central nervous system (Cushny). In this stage the use of diphtheria antitoxine has been recommended.

The Sequelæ.—The treatment of the sequelæ consists in attempting (*a*) to secure compensation for those muscles that have been paralyzed; (*b*) to prevent contractures and deformities; (*c*) to treat the contractures and deformities already existing.

(*a*) Here we are limited in our efforts by the amount of damage originally done to the spinal cord; those nervous elements that are completely degenerated and those muscles whose trophic centers are destroyed are beyond therapeutic relief. Fortunately this complete process of destruction and degeneration does not affect all the nervous elements of the paralyzed parts, so that much may still be done in the way of treatment by the use of electricity and massage. In order to improve the nutrition of nerve and muscles galvanism is recommended; to improve contractility of muscle faradism is used. When muscles present the complete reaction of degeneration no results can be expected from this method of treatment. *Massage* is applied once daily in the form of friction, effleurage, and tapôtement; the treatment should not be given to the extent of producing fatigue, and after its application, even more than at all other times, the patient should be allowed to rest. If improperly applied it will increase, rather than diminish, the chance of the development of contractures; therefore only those groups of muscles should be treated which have been paralyzed. Strychnine may also be used now, according to a method of administration by which the patient receives one hypodermic injection of strychnine sulphate daily, the dose to be calculated for the age of the patient and gradually increased.

(*b*) These measures are also indicated in order to *prevent contractures and deformities.* When a contracture is developing, the healthy muscle contracts; the paralyzed muscle, on the other hand, is stretched and lengthened. In applying massage or electricity it is necessary to have the contracted muscle relaxed before treating the paralyzed group; this can be accomplished by pressure or by holding the affected parts in such a way that the healthy muscle relaxes, otherwise the paralyzed groups cannot be made to react. As soon as any voluntary control of the paralyzed groups develops, exercise and gymnastics should be recommended; the methods of applying these will suggest themselves. To prevent deformities it is important to see that the patient does not get into the habit of keeping his limbs in a bad position; the bed clothing should be supported, so that by its pressure it does not hold a paralyzed part in an improper position.

(*c*) *The Treatment of Contractures and of Deformities.*—When contractures already exist, electricity and strychnine should be discarded. By means of movements and massage much good may still be done. If this should fail, orthopedic measures should be applied: tenotomy, proper apparatus. The treatment of deformity has taken upon itself a new aspect since the introduction of tendon transplantation by Nicoladoni in 1881. It consists essentially in attaching the tendon of a paralyzed muscle to the tendon of a healthy muscle, for the details of which operation the reader is referred

to the proper works. The results that I have seen follow this operation are quite remarkable. Other operations, arthrodesis, have also been performed; but tendon transplantation not only relieves deformity, but in the most favorable cases helps to restore function.

The treatment of infantile spinal paralysis always requires tact, patience, and endurance on the part of the physician. On account of its chronicity and its obvious results, it tries the parents and relatives even to a greater degree. As a result it is comparatively rare that the management of such a case is intrusted to one physician alone. The patients are fortunate if nothing worse happens; a great many are taken to irregular practitioners, who promise much, do little, and know less, so that the patient is injured, frequently directly, but oftener indirectly by loss of time. Throughout the history of mankind people have been attracted by pretense and promises, especially in things medical. The physician who undertakes to treat a case of infantile spinal paralysis must take this into consideration, and in order to protect his patient from harm he must do enough in the way of treatment to satisfy the parents and relatives. In doing this care must be taken not to do harm and not to deceive oneself; these errors being avoided, any procedure is legitimate. That treatment does do good all of us who have seen much of this disease can corroborate; that a number of measures without direct value have been recommended can also be accepted. But anything is better than the neglect that comes from ultrascepticism or from the preposterous and harmful methods applied by those not properly trained. There are very few patients who cannot be benefited in this disease by proper treatment, even years after the first onset.

The treatment of poliomyelitis anterior acuta adultorum and of poliomyelitis chronica is essentially that of infantile spinal paralysis.

Bulbar Poliomyelitis (Acute Bulbar Myelitis).—The treatment of this rare affection is essentially that of other bulbar diseases.

THE PROGRESSIVE MUSCULAR ATROPHIES

Progressive Spinal Muscular Atrophy (Duchenne-Aran Form).—General Treatment.—This consists in proper hygiene. The patient should have nutritious, easily digested food; he should be in the fresh air as much as possible; he should exercise in moderation, but never to the point of fatigue. When motility becomes so much diminished that he can no longer help himself, all proper aids should be furnished. It is of great importance to try to have these patients seriously interested in mental occupation; I have seen one patient who, in addition to his general reading, made a special study of caricature, and was making a large collection of caricatures of all ages and countries. While this patient was under favorable conditions—and not all patients could be situated as he was—yet it should be the duty of the physician to help and encourage his patient in the selection of some diversion or occupation which may be continued until the helplessness becomes extreme.

The use of strychnine in the treatment of this disease was first recommended by Sir William Gowers, who asserts that the disease is arrested in more than one half the cases. While this estimate of cases arrested has not

been verified by others, yet it is admitted by most English writers that encouraging results may be obtained by the proper use of this drug. In order to try to get the same results as recommended by any given author it is necessary to follow his directions; the number of changes that are made by many in carrying out an author's method so that failure results has already been pointed out in connection with Brand's method in typhoid fever. I suspect that those authors who say that strychnine is without value in this disease have never used it in the way Gowers recommends it to be used. It certainly is the duty of the physician in so hopeless a disease as progressive muscular atrophy to try any remedy recommended the use of which is sanctioned by trustworthy authors. The strychnine (nitrate) is administered hypodermically once a day; the quantity used should at first be small (gr. $\frac{1}{100}-\frac{1}{60}$), and should be increased gradually until tolerance is produced and continued for from two to four months. When the disease has been arrested the injections are continued with intermissions of one week in every three or four. If one course as just indicated is not followed by any result, the method may be given up as useless in the individual case. The other remedies used are iron, arsenic, and silver nitrate.

In addition to the hygienic treatment and the strychnine, other methods may be recommended to increase muscular nutrition and to prevent increase in atrophy. Here may be mentioned gymnastics, both active and passive; they should be applied daily and with the greatest caution, so as not to produce overfatigue, the cause of much harm. Massage is especially valuable here, in that blood and lymph currents are increased in muscle, and nutrition is consequently improved; but here also caution is required not to attempt too much. Electricity is also used; weak currents only should be applied, with the object of producing contractions of the muscle. The galvanic current is preferred, but the faradic is also used. The sittings should be daily and not longer than five minutes in duration. Whatever is attempted should be continued for a long time; if favorable progress is made it should be persisted in, but when this is not the case changes should be made from one method to another. In the majority of cases little or nothing can be done to relieve, to arrest, or to cure the disease.

Chronic Progressive Bulbar Paralysis (Labio-glosso-laryngeal Paralysis).—Here we meet with a disease with a uniformly fatal outcome; it is doubtful if treatment can do anything to affect the pathological process. On the other hand, much can be done to make the patient more comfortable and to prolong life. The method of Gowers for the use of strychnine in progressive spinal muscular atrophy may also be tried, but all authors agree that it is not followed by the same favorable result here. If this method has been tried unsuccessfully, strychnine, or better nux vomica, may be given by the mouth in ascending doses, on account of its tonic effects. Other remedies recommended are silver nitrate, arsenic, potassium iodide, mercury, zinc phosphide, ergot. Unless the mercury and the iodides are especially indicated, their general administration in this disease is to be deprecated.

The *diet* is of paramount importance; not only should the quantity be sufficient, but the quality, aside from the usual requirements, must be adjusted to the difficulties that exist in swallowing and chewing. Therefore the food should be made up of semisolids and liquids; as soon as deglutition be-

comes difficult or there is danger of producing deglutition pneumonia, feeding by the stomach tube should be instituted. All food that produces irritation (coughing), that is followed by fatigue (difficulty of mastication), or is indigestible should be avoided, and small quantities only should be taken at one time. Feeding by the rectum can only be used temporarily (v. Gastric Ulcer).

Electricity applied in various ways has been recommended: central galvanization, anode at the nape of the neck, cathode over the affected muscles (but this seems altogether futile), the faradic current applied to the paralyzed muscles, or the galvanic current. Upon the whole, the directions given in the previous chapter for the application of electricity apply here. Whether anything can be done by *gymnastics* or exercise is doubtful, although the latter has been recommended for the various muscles, especially in order to improve the speech. Massage has been employed.

The SYMPTOMS that require special attention are: (*a*) *Drooling.*—It is stated quite commonly that atropine in small doses—0.0005 gm. (gr. $\frac{1}{130}$)—will stop the outpouring of saliva. This statement is based upon pure laboratory experience; in practice the drooling of paralytics is not controlled by atropine. The drooling is largely due not to increased flow of saliva, but to the impossibility of swallowing the normal amount of saliva. It is a symptom difficult to control by drugs; sometimes when the patient is kept very quiet morphine acts beneficially, temporary improvement following. I have repeatedly tried to introduce absorbent cotton into the mouth, but it has to be changed so frequently that it is impracticable. (*b*) *Dyspnœa.*—This can be controlled in the beginning of the disease by bromides or by the reassurance that the attacks are not dangerous. In the later stages tracheotomy may become necessary. (*c*) *Coughing.*—Here it is difficult to know what to do in individual cases, as the act of spasmodic closure of the glottis is what prevents the introduction of foreign bodies into the bronchial tree, thereby preventing deglutition pneumonia, abscess, and gangrene of the lung. When the cough is purely spasmodic and not dependent upon the act of deglutition the reflex may be diminished in the manner recommended in the treatment of respiratory diseases. When it is dependent upon deglutition, the utmost care should be used in giving remedies that reduce the reflex arc; it is more judicious in such cases to use gavage. (*d*) *Syncope.*—This symptom should be treated by the remedies used under ordinary circumstances; ammonia preparations, ether, camphor, etc., may be used. (*e*) The troubles in cardiac innervation should be treated as described in the chapters devoted to them; the same may be said for the treatment of hysteria.

Amyotrophic Lateral Sclerosis.—The TREATMENT here does not differ from that of chronic myelitis, progressive spinal muscular atrophy, or bulbar paralyses, and such treatment should be applied as the symptom-complex makes necessary for the individual case.

Muscular Dystrophies.—PROPHYLAXIS.—Individuals in whose family there exists a history of muscular dystrophy should be advised not to become procreators, and warning should be given them not to overexert themselves.

The TREATMENT is the same as that recommended for the spinal form of atrophy of muscles.

IV. AFFECTIONS OF NERVES

MULTIPLE NEURITIS

PROPHYLAXIS.—The causation of multiple neuritis resolves itself into two factors—the predisposing and the direct cause. The former may be permanent or temporary. The permanent cause may be looked upon as some form of congenital structural peculiarity resulting in diminished resistance of the nerves. It is difficult to determine precisely which individual has within him this peculiarity. Upon the whole, the statement that individuals with the neuropathic diathesis belong to this class may be accepted as true; certainly it may be accepted as a working hypothesis. These patients should be protected as much as is possible against the action of the direct cause. The temporary predisposing cause may be developed by the activity of the direct cause, so that in the treatment of patients, especially with infectious diseases, the causal treatment of these, and notably that of convalescence, may be looked upon as very important prophylactic measures. In a large degree all prophylactic measures are difficult of application, especially as to the predisposing cause, because the degree of individual susceptibility cannot be measured.

For the direct cause much more can be done by preventive measures. In the traumatic form nerve suture in disturbances of nerve continuity and reparative surgery are very important. Neuritis due to infections may possibly be prevented by the proper treatment of the infectious disease: by the use of antitoxines, the treatment of symptoms, proper attention to the nutrition, and the watchful care of the period of convalescence. For the forms that follow intoxications, the prevention of intoxication by alcohol, lead, arsenic, mercury, carbon disulphide, etc., is the paramount indication, for which the reader is referred to the chapters devoted to this subject. The treatment of autointoxication is also a very important factor in preventing multiple neuritis, especially that of chronic intestinal autointoxication (q. v.). Finally, the proper treatment of all reducing diseases—the anæmias, gout, diabetes—must be taken into consideration.

TREATMENT.—A. *Causal.*—At first the thought comes to us that this form of treatment would be valuable, but when the patients come to us the cause has already been effective, and its removal now does very little good to the nerves that have already been damaged. One thing is certain, however, that the disease cannot be relieved as long as its cause is still operative, and in this direction causal therapy is most important. An alcoholic must give up his, or more frequently her, alcohol; patients with other intoxications must be removed from the possibility of introduction of further poisonous material; the infections should be treated (tuberculosis, gonorrhea, syphilis, rheumatism); surroundings and diet should be changed so as to get the best general results in nutrition; this holds good especially for all those diseases in which metabolic changes have taken place. Various methods are used for neutralization of the various toxic bodies (v. Intoxications). Elimination of toxines is also recommended, and this can be accomplished in various ways: diaphoretics for elimination by the skin; the introduction of large quantities of fluid into

the general circulation for the kidneys; cathartics for the bowels; lavage for the stomach. Any one or all of these methods may be valuable, especially in the beginning of the attack of multiple neuritis or during its course when the cause does not seem to have been removed. The chronic infections will in time undoubtedly be treated by specific measures; for the present our means are still very limited, but with our increasing knowledge, especially due to Ehrlich's work on immunity, the outlook is hopeful. The treatment of arteriosclerosis may also be very important here.

B. *Hygienic.*—Patients with multiple neuritis must be kept in bed, and all those measures to prevent bedsores and other skin lesions already described in other connections must be instituted. The utmost attention should be given to cleanliness. Of all the means employed in the treatment of multiple neuritis, absolute rest is probably the most important; it matters not how incompletely the neuritis is developed, absolute rest in bed should be insisted upon, for by it not only may it be possible to prevent further development, but the disease runs its course in a shorter time than when the patient is allowed to get up. This must always be insisted upon in the early stages of the disease. The *diet* should be as liberal as can be permitted, and arranged for the individual's taste, appetite, and metabolic requirements. Proper attention should be given to the condition of the bowels; fortunately for these patients, the bladder, as a rule, requires no attention. When it does, the usual methods should be applied.

C. *Symptomatic.*—(*a*) *The Nerves and Muscles.*—During the inflammatory period no treatment except that of rest should be applied. When the stage of reaction sets in, electricity, massage, and gymnastics may be used. All these, especially electricity, must be used with great care; Eulenburg says of it, in this disease, that the sum of harm done by it outweighs the sum of good. While the minute refinements of electrotherapy have never impressed me as being necessary, yet in a disease like multiple neuritis, in which we should be especially careful not to produce irritation, the least that can be expected of the practitioner is to know how to control the dosage of the remedy he uses. If this cannot be done the physician should abstain from giving electrical treatment, especially in view of the fact that the same results can be obtained by other means, except possibly that consequent on the use of an imposing apparatus. We use only weak currents—faradic or galvanic—applied to the muscle. The electrical treatment of nerves must be very carefully carried out, and as a rule is unnecessary. Massage may be given here as elsewhere, to improve the nutrition and contractility of muscle; never to such an extent as to cause pain. Movements of all kinds may be prescribed—active, passive, resistant. They are most important for the prevention of contractures and deformities as well as in the treatment of them. Formerly all the various methods of counterirritation were used to affect the inflammation in the nerves; at present they are no longer used in multiple neuritis. Balneotherapy has also been recommended in this stage—i. e., the chronic stage; here the same methods and places may be recommended as in locomotor ataxia.

(*b*) *Pain.*—When the neuritis is localized in any part that can be made immobile, rest is the best remedy for the pain. Many external applications are used for giving relief.

1. *Thermal.*—Hot or cold applications may be made according to the effect upon the patient; cold applications may be made by means of ice bags, ice-cold compresses, Leiter's tubes; warm applications by the Priessnitz, warm packs, warm-water bottles or bags. Care must be taken with hot applications because of the presence of anæsthesia of the skin, which may be well marked, and then great harm may be done by the production of an ulcerative process.

2. *Counterirritants.*—These are rarely used to-day for multiple neuritis, but are still constantly being applied when a few nerve trunks only are affected. For this purpose the usual means described in connection with other diseases are applied. Here they are used for the purpose of influencing favorably the pathological process as well as for the relief of pain; how much or little they do in either direction cannot be estimated; at times they seem valuable, but those only should be used that can be applied with precision—the galvanocautery or the Paquelin.

3. *Local Anæsthetics.*—Subcutaneous methods are used for their greater or less direct effect upon the nerves themselves. Here the following have been recommended: cocaine or its compounds and substitutes; Schleich's infiltration anæsthesia; Eulenburg recommends highly the carbolic-acid injections first recommended by Hueter in erysipelas—1 gm. of a two- or two-and-one-half-per-cent solution should be injected into the tissues surrounding the nerves. These injections act like cocaine elsewhere in that local anæsthesia is produced. Local, external anæsthetics are also used by applying cold, ether, ethyl-chloride spray. Menthol may also be applied, either in the form of an alcoholic solution or in vaseline (five to ten per cent). The effect of the applications is transitory, and frequently not pleasant; they are not to be recommended in multiple neuritis.

4. *Electricity* is also used here; the galvanic currents should be used with the greatest care, as has already been said, the anode being applied to the nerve; preferably long sittings with two to three milliampères, then short sittings with stronger currents. Massage may also be valuable, especially vibratory massage. All these methods should be used not so much for the pains of the so-called inflammatory stage as for those that are called neuralgic.

5. *Medication* to give relief for pain is directed in various ways. We first have the large number of drugs that give relief to pain either by general or local effects upon the nervous system itself. Here the coal-tar derivatives must be taken into consideration; all have been recommended, all have been used. Antipyrine may be given hypodermically—1 gm. of a solution of one part of antipyrine in two of distilled water. As there are so many drugs belonging to this group, the combination of salicylic acid with antipyrine, acetanilide, or phenacetin, and so many others to come, the use of the basic substances or their combinations opens up a very promising field of therapeutic activity in nervous diseases. As a matter of fact, this field has already been cultivated, and the result has been more or less satisfactory. Certain it is that sometimes most unexpected therapeutic benefits will follow their administration, and again just as unexpected failures. Besides the direct effect, it cannot be denied that the administration of these drugs produces excellent suggestive effects; for instance, if antipyrine and salicylic acid are given to-

gether, no one can tell beforehand whether this or salipyrine, which is the same, will have the better results. In nervous diseases, then, these drugs should be used always with regard to their unpleasant, or even dangerous, effects. For the prevention of depressant effects combinations with caffeine or camphor may be made; acetanilide (antifebrine) should never be given without caffeine; even then the risk is great, because it is impossible to calculate the damage that may be done to the individual's heart, and this may have to be counteracted by the caffeine. Acetanilide should be given only in case nothing else gives relief. The profession takes the greatest interest in deaths from anæsthetics, because a death from this cause is an obvious example of apparent cause and effect; I am sure that if the deaths from acetanilide could be collected, their number would largely exceed that of deaths from chloroform. Yet whatever we may do, in a certain number of cases opium or morphine will have to be administered; but this should be done only after all other methods have been exhausted or when the individual indications make it imperative. When this is the case a large dose should be given, so that the effect may be decided, but the attempt to keep the patient absolutely free from pain will result in the opium or morphine habit. In individual cases, where there are psychic complications, the risk of this should be taken into consideration. When the patient is in a hospital or institution where the drug can be introduced and withdrawn, the patient being under perfect supervision, there is very little risk in its use—indeed, good results are obtained; but in private practice, where the patient cannot be perfectly controlled, the risk is very great. On account of the elective affinity that methylene blue has for the tissue of peripheral nerves, Ehrlich has advised its administration in pill form; Collins speaks of having had encouraging results after its use.

(*c*) *Hyperæsthesia and Anæsthesia* (*Paræsthesia*).—These are treated by electricity. The hyperæsthesia is treated in the same manner as pain—i. e., by galvanism, 4 to 6 ma., long sittings, anode to the affected part. The anæsthesia may be controlled by the faradic pencil or brush. The paræsthesiæ are sometimes favorably influenced by the treatment for pain.

(*d*) *Other symptoms* are treated as they would be in connection with other diseases; here we may have fever, trophic disturbances of various kinds, skin troubles, psychoses, bulbar symptoms, and many others.

Medical.—It can be readily understood why antisyphilitic treatment has been recommended by some authors in every case of neuritis; but this must never be carried to the extent of damage to the patient's general condition. There can be no doubt of the fact that potassium iodide combined with small doses of mercury is very useful in some cases of neuritis; that it should be given in every case, however, is entirely out of the question. If arteriosclerosis is present, or the history of syphilis, the iodides may be very valuable. Sodium salicylate may be given when there is a rheumatic history or tendency. Arsenic in small doses is valuable, on account of its tonic effects. Strychnine, after the acute stage is passed, may be given as in progressive spinal muscular atrophy (q. v.); it acts in the same way here, and is a valuable remedy. Tonics of various kinds will probably have to be given—the iron preparations, the bitters, cod-liver oil.

FACIAL PARALYSIS (Bell's Palsy)

TREATMENT.—The *causal treatment* is unsatisfactory, for in the great majority of cases the cause is general or local exposure to cold, which has done its harm and therefore can no longer be removed. These are the cases that are called rheumatic, and are therefore supposed to require salicylic acid or its compounds for their treatment. I have no desire to discuss the ætiology of this affection here, but it seems unreasonable to suppose that refrigeration can be anything more than a direct ætiological factor. We must therefore hunt for the predisposing factor, which will be found in a general disturbance of nutrition—infections, intoxications, the so-called neuropathic diathesis—and this must be treated. The causal treatment is of great value in a small number of cases of peripheral facial paralysis due to syphilis, middle-ear trouble, and diseased conditions of the parotid gland. In the first and the last of these the results are sometimes brilliant; in the second the result depends upon the possibility of removing the ear trouble.

The *treatment of symptoms* is carried out in various ways. Before attempting anything it must not be forgotten that in a large number of these cases the patients get well without treatment. External remedies and applications of all sorts have been recommended. Heat has been used because it gives relief. Because of the fear of doing more harm by the application of cold (which would be a rational application in case we are dealing with an inflammatory condition) than already exists, it is not so frequently applied. Counterirritation in one form or another is also recommended, to be applied to the region of the stylomastoid foramen. Local blood letting, by means of leeches or cups applied in the same region, is also advised. The choice among these depends upon the therapeutic faith of the individual physician; it cannot be proved that any one or all of them will do anything except give some relief and produce a moral effect upon the patient. This can all be accomplished by simpler means; the face can be kept warm by applying absorbent cotton, some iodine preparation may be rubbed in over the exit of the nerve, preferably iodovasogen or iodopetrogen; the rubbing acts as a counter-irritant, and the iodine may have some effect upon any existing inflammatory process. In addition, the iodine preparations are very valuable agents for moral or suggestive treatment. Under all circumstances the general treatment of the patient is of more importance in the beginning than the local when any general cause is to be found.

For the *treatment of the paralysis itself* electricity is principally to be considered. When the case is seen early the galvanic current should be used by placing the cathode over the place of exit of the nerve, the anode upon the sternum; not more than three milliampères should be used; daily sittings, which should not exceed five minutes in duration, should be given. The effects that are ascribed to this method, which is recommended by most authors, are supposed to be due to electrotonic, catalytic processes set up by it, even to some hypothetical effects upon nerve regeneration. On the other hand, if this method is not used with accuracy and care much harm may be done by irritation of the nerve. The galvanic current is also applied for the purpose of giving relief from pain and preventing the disturbances in nutrition of muscle. For this purpose still weaker currents—one milliampère—are used with the

anode upon the muscle, the cathode upon the sternum. The sittings should be given twice or thrice a week. The value of the method, according to Eulenburg, depends upon the fact that in addition to the effects already enumerated, when the reaction of degeneration already exists, this method of application is most valuable in the production of changes in muscle. Everywhere the statement is found that the faradic current should not be used except with the greatest care, so that contractures may be prevented. Yet in those cases in which very slow improvement takes place, I have found a weak faradic current of great effect. Whatever may be said about the value of electrical treatment, and its exact scientific value cannot be estimated here, I put more faith in massage and exercise. Massage must be given by an experienced operator under the direction of the physician, who, as he is responsible, should know what kind of massage is to be given. Massage should not be given until the so-called inflammatory stage is over, then friction should be begun; after this the other movements; not only the exposed part of the nerve, but also the muscles, should be treated. If necessary, electrical tests should be made, to determine which muscle or muscles should be treated. The exercises should be those of inducing voluntary contractions; they should be attempted in the form of mimic efforts. The efforts to obtain complete cosmetic effects may be aided by using various kinds of appliances, especially to the angle of the mouth, where the effect of the paralysis disappears last if it disappears at all.

NEURALGIA

Neuralgia is a symptom, not a disease; it may be due to pathological change or to purely functional disturbance. The symptom or symptoms are referred to the area supplied by sensory nerves. Theoretically it is paroxysmal and never due to changes in nerve structure; practically this definition is without value, because we cannot, as a rule, determine when there are organic changes. The treatment in all cases must be directed toward the cause of the neuralgia and to relief during the attack. As neuralgias differ somewhat according to the nerves affected they require special consideration.

Trifacial Neuralgia.—TREATMENT: *Causal.*—There can be no prophylaxis except in removing the cause, which in and of itself is included in the treatment. The removal of the cause of the attack is of paramount importance, but is frequently difficult or impossible. I have often seen a possible cause for this neuralgia taken for the cause in the individual case; thus, if a patient has neuralgia and also some error of refraction, it is by no means certain that the eyes have anything to do with the condition of this patient's fifth pair of nerves. I have seen one patient who has had his teeth pulled, spectacles adjusted, the ethmoid cells and the antrum of Highmore opened, and finally the frontal sinus evacuated, but his neuralgia still comes back. While it is not denied that neuralgia of the fifth pair of nerves does follow peripheral causes, yet the majority of these cases are due to some cause which is general, a fact proved by therapeutic results.

As an example of the many cases I have seen, the following may be mentioned: One of my patients has the atrophic form of Riggs's disease, which, however, had caused no suffering in the gums except as the result of direct irritation from heat, cold, etc. This patient became greatly reduced in her

general condition because of worry, care, and loss of sleep, and she suffered excruciatingly from trigeminal neuralgia. Her general condition was changed by superalimentation, and with this improvement the neuralgia disappeared, although the Riggs's disease remained unchanged. The importance of local causes should be appreciated at their proper value. The most common local cause for this neuralgia is found in some diseased condition of the gums or teeth; the proper local treatment should be applied here as in all the local causes. Not only should all the possible local causes be taken into consideration, but also the history of the patient, which may be that of traumatism, or a careful examination may reveal local irritation or compression of the nerve itself. Errors of refraction do not produce neuralgia except in neurotics. On the other hand, lesions of the cornea, the iris, and glaucoma are followed by neuralgia. Inflammatory diseases of the middle ear and of the sinuses of the head produce marked neuralgia.

The treatment of the general cause is difficult, at times impossible. It is very simple when the cause is self-evident, as in the infections; intermittent neuralgia, due to malaria or influenza, is cured by quinine or antipyrine; antisyphilitic treatment cures those cases in which this method is indicated. Intestinal autointoxication, which plays a very important rôle in the ætiology of this affection, should always be looked for, and treated when necessary. In addition, anæmia, general malnutrition, chronic intoxications, morphine, alcohol, lead, mercury, iodine, may have to be taken into consideration. There remains a large number of patients in whom there is nothing but a neuropathic tendency as a general cause, and some slight peripheral irritation as a local cause. In these a draught of air, the slightest change in temperature, the exposure to local heat or cold, may bring on an attack. In these patients the treatment of the general condition is paramount. But in a large number of patients there can be no causal treatment, because a cause cannot be found.

Treatment of the Attack.—As a rule, for internal medication some form of antipyrine, phenacetin, or salicylic acid product is given; we have frequently referred to this group of bodies, and their dose here does not differ from that in other diseases of the nervous system. Salicylic acid, in the form of sodium salicylate or aspirin, is sometimes very valuable. Butyl chloral hydrate is prescribed by Liebreich, according to the following formula: ℞ Butyl chloral hydratis, 10 gm.; aquæ, 100 gm.; glycerini, 20 gm. M. D. S.: One teaspoonful every ten minutes until three or four doses are given. Gelsemium is spoken of very highly by a number of observers; in order to give relief in the severe forms it must, according to Horsley, be administered until its physiological effects are produced. Gelsemium is administered in the form of the tincture, 0.3–0.6 gm. (♏ v–x); gelsemin is a very unreliable preparation, and should never be used; gelseminine, an alkaloid, may be tried in doses of from 0.0005 to 0.002 gm. (gr. $\frac{1}{130}$ to $\frac{1}{33}$) several times daily; not more than 0.01 gm. should be given during the twenty-four hours. I have no experience with any of the gelsemium preparations; on the other hand, the preparations of aconite have given me good results; they may be used locally as an ointment, or the alkaloid may be given by hypodermic injection. Great care must be taken not only in the choice of the preparation, when using the alkaloid, but also in the dosage; I have never used aconitine hypodermically, because of the danger in using the drug, and because, when admin-

istered in this way, it frequently produces pain which may last a great length of time. Furthermore, this method of administration is unnecessary, as excellent results are obtained when the drug is employed internally; the dose is 0.0004 gm. (gr. $\frac{1}{165}$), which may be increased to 0.0007 gm. (gr. $\frac{1}{100}$) three times a day. Morphine may have to be employed, always with the same precautions as are recommended elsewhere.

Local Treatment.—This may be applied by means of salves, liniments, or ordinary solutions; for this purpose opium, aconitine, veratrine, cocaine, menthol, camphor, and a large number of other substances have been used. Chloroform and ether have been applied; combined with camphor there are official with us the Linimentum aconiti, the Linimentum belladonnæ, the Linimentum chloroformi. Other counterirritants may be prescribed; they do very little good, as a rule. In the majority of cases heat is more beneficial than cold (when applied externally). Pressure upon the nerve by means of the finger or thumb is sometimes followed by great relief; the pressure should be applied to the nerve where it leaves its external foramen; it should first be applied with slight force, which must be gradually increased, the patient usually guiding the operator as to the amount of pressure which can be applied. In some cases effleurage of the whole affected area makes it easier for the patient to bear the beginning of the pressure treatment. When the maximum pressure has been applied and the pain mitigated it may be gradually diminished. As a result of this treatment the attack may be relieved, but this is rare; more commonly the relief is followed by sleep, and the patient wakes up refreshed, although the pain may still be present, perhaps in diminished intensity. Manual vibratory massage may also be used in connection with the pressure.

All agree that electricity is of very great value in the treatment of neuralgia. The galvanic current is applied by the labile method—the anode over the affected nerve, the cathode on some indifferent part of the body. The electrodes should be large, not more than two milliampères should be given, and the sittings should be long. In all neuralgias, when this method gives relief it does so at the first two or three sittings; when this is not the case some other form of electricity may be tried. The high-frequency current has seemed to give more relief than the static electricity in my experience. The sinusoidal current may also be tried here, but it must be very weak. Cure by electricity is effected in one of two ways: either one application suffices or the length of time in which relief is afforded becomes larger and longer after each sitting.

After all the causes have been removed and the various symptomatic measures used, as well as some others to be described in connection with tic douloureux, if there is no relief the question of surgical intervention arises. The indications for this are the same as in tic douloureux.

Tic Douloureux.—Treatment.—Head calls this form of neuralgia neuralgia quinti major, and differentiates it from the ordinary form of trigeminal neuralgia. While this may apply to individual cases, yet in the majority the tic element is the only distinguishing element that can be recognized. The treatment under all circumstances should be that of the ordinary form. To this the following may be added: the injection of a few drops of a one-per-cent solution of osmic acid into the sheath of the nerve, as recommended by Hughes Bennett. Every one of these patients should be subjected to a course

of treatment in a hospital or properly equipped sanatorium. This for many reasons; it has been said that these patients are neurotic; they need not be so primarily, but after any human being has suffered from tic douloureux it is natural that a neurotic state should develop. For the treatment of this methods that have already been referred to—e. g., rest, superalimentation, etc.—can be best carried out in an institution. In addition, these patients can there be given treatment with morphine which alone suffices in a number of cases to cure the affliction; it should be given with discrimination as to dosage. Unless the patients are taken to an institution where the dosage and diurnal quantity of morphine may be controlled, most of them become addicted to the morphine habit, in which the dose has to be enormous to give relief for pain. Inhalations of amyl nitrite during the attack have been recommended; I have had no experience with them. After a causal, symptomatic, and general treatment have been carried out without good result, the question comes up regarding surgical relief. This must always be looked upon as a *dernier ressort*, for the reasons that a large number of these patients finally get well, if only relief can be given; that it is by no means settled that it is the operation, though it may be an operation which gives relief; that there is a psychical condition which should, in one way or another, be reached; that surgical intervention is not followed by complete relief in all cases; and that there is considerable mortality connected with that operative procedure which is calculated to give relief in the greatest number of cases. As far as my experience permits me to speak of the necessity of surgical intervention, I should seldom recommend it, but in a suitable case undoubtedly it is of value. But I would begin with the least dangerous of the operations—neurotomy; when the relief that has been afforded by this operation has disappeared, then neurectomy, and finally extirpation of the Gasserian ganglion. This would be an ideal procedure, because by the time the patient has recovered from the beneficial effects of all these operations, except the last, the disease might have disappeared. Unfortunately, or fortunately, the patient must be asked to consent to this accumulation of surgical procedures; so great is his suffering that, even after he is told the result of excision of the Gasserian ganglion as far as relief and mortality are concerned, he may insist upon having the latter operation performed first. The mortality from this operation is great—about twenty-two per cent in the hands of those most expert (Krause). This should always be taken into consideration, and this statement should always be made, not only to the patient, but especially to those who are interested in him. Here again it is only that surgeon who has given special attention to this operation who should attempt it. Outside of the mortality, there is the possibility that keratitis, panophthalmitis, and consequent destruction of the eye, may follow; but this, it seems, ought to be prevented by the use of proper measures.

Neuralgia of the Brachial Plexus.—TREATMENT.—The *causal treatment* consists in the surgical treatment of cicatrices, tumors, or anything that may produce pressure; the internal treatment of the infections, the intoxications, and autointoxications. The *symptomatic treatment* is the same as that described in intercostal neuralgia (q. v.). Hypodermic injections applied to the course of the nerves have been recommended; of carbolic acid (v. Multiple Neuritis), of antipyrine, morphine or its combinations. Various orthopedic

and surgical measures have also been recommended. Nerve stretching, or better, resection, may be performed if all the other means fail to give relief.

Occupation neuroses are frequently combined with neuralgia; certainly in most cases there is distinct pain when the occupation is carried on. This form of trouble arises in connection with many occupations, giving rise to spasmodic incoördination and proving very refractory to treatment. This must in every instance be carried out in two ways—the general and the special. My experience has been especially with the neurosis in writers, telegraphers, and musicians (violinists and pianists). The affection begins with abuse of nerve and muscle, and always leads to or is accompanied by some form of malnutrition or general nervous disturbance. These must be treated, otherwise no permanent result can be obtained. In every case we have this combination of causes, and every case presents a problem which can be solved by careful study. It is, as a rule, easy to discover the general cause, but the detection of the local cause requires much study. Here is required some investigation into the muscular mechanism which has been strained by overwork, and which possibly may be corrected with benefit to the patient when the physician understands it. Thus, in pianists, the practicing of arpeggios or passages in tenths sometimes constitutes the beginning of the trouble; outside of these exercises the patient feels very little inconvenience; but the necessity of acquiring these technical features, and no necessity seems so great as a musical necessity, causes the patient to continue them. Finally she—for females are most commonly affected—is forced to give up her practice altogether. She may have a general breakdown—at all events, her artistic aspirations receive a decided shock, or may be terminated.

In a prophylactic way much may be done: the music masters should understand the ætiology of this affection; the pupils should be taught to live a normal life as to exercise, fresh air, good food, and a sufficient amount of rest. When the affection develops, the first local indication is rest; according to the condition of the patient, this may be partial or complete. In the case of pianists, I generally begin by permitting them to practice simple exercises for a limited time every day. If the condition does not improve, the patient is made to give up all practicing.

In the writer's cramp the same method is followed—all exertion or uncommon work is to be avoided; if this does not cause improvement, the patient must give up all writing; the same thing holds good for telegraphers—indeed, for all occupations. As soon as the patient comes for treatment, hydriatic methods are used; Priessnitz applications, made during the night or during the whole twenty-four hours, are especially valuable in those cases in which there is pain, for which hot douches are also valuable; in addition, the patient is ordered hydrotherapy for the general condition. The arm may be put into a sling, or into splints, but must not be kept there too long. Usually after a week mild massage may be begun, and this will have to be continued for some time. Electricity may also be used, always mild currents, either galvanic or faradic, according to the indication. When this combined local and general treatment has been continued for three or four weeks the patient is ready to go to work again; then comes a relapse, because instructions are not followed, with the resulting depression; this in its turn may lead to an awakening of reason or sense or, in the case of musical students, to a rational view of

the patient's limitations. Occasionally we find some peripheral lesion which must be treated—a cicatrix, a painful thickening of the skin. For the cramps, the bromides may be given; otherwise the same methods may be used as have been recommended before.

Intercostal Neuralgia.—TREATMENT.—The *causal treatment* is the same as that of other neuralgias. For the pain much can be done. As motion causes the pain to get worse, the first thing is to see that rest is secured. This is accomplished in one of two ways: either by putting the patient to bed, or by strapping his chest with adhesive plaster, as in fracture of the ribs. For this purpose the zinc oxide adhesive plaster is used, care being taken to obtain a good article, otherwise great irritation of the skin follows its use; in other words, just that result is produced for the prevention of which the oxide of zinc plaster was introduced. In all those cases in which herpes zoster is present this treatment is especially valuable; not only do we get relief from pain, but the herpes vesicles are completely covered by a nonirritating substance that excludes the air completely and makes it impossible for infection to take place. In intercostal neuralgia, counterirritation seems of great value; it should be applied to the painful points near the vertebral column, and the usual counterirritants may be used. The local application of cold by means of ether or ethyl chloride sprays to the painful areas may also be used; the relief given is of shorter duration than that afforded by counterirritation. Heat may be applied in the form of hot-water bags, poultices, the hot bath, or the hot spinal douche. Galvanic electricity is applied here, as in the other neuralgias; the faradic brush is also recommended, but I have never used it. Many external remedies have been recommended, in the form of salves, liniments, medicated plasters; in using the latter, care must be taken not to produce poisoning from the medicinal substance they contain.

Medicinally, all those remedies that have been recommended may be tried (v. Trifacial Neuralgia, Multiple Neuritis).

Sciatica.—TREATMENT: A. *Causal.*—The principal factor for the successful treatment of sciatica must be looked for in the removal of its cause; as this can be accomplished in a large percentage of the cases, this treatment is more efficacious than in any other form of neuralgia. The physician must divest himself of the idea that such or such a remedy is good for sciatica; it is his duty to try to find the cause in every case by careful examination of the patient; then the treatment that will be successful will suggest itself. The general causes referred to in connection with the other neuralgias need not be taken into consideration, except those connected with infection and intoxications, as in multiple neuritis. Sciatica is not uncommon in diabetes mellitus; when it is a purely functional disturbance the ordinary antidiabetic treatment suffices to give relief; when it is a well-developed neuritis the treatment must be of a special kind. Remote causes are found, especially in such conditions as produce stasis in the inferior vena cava or the pelvic veins; here the treatment of chronic myocardial insufficiency, that of diseases of the liver, or of anything that may produce pressure upon these veins is followed by good results. The mechanism of the production of sciatica under these conditions is very simple. The sacral plexus and the trunk of the sciatic nerve are surrounded by veins—the common pudic, the gluteal veins, the hemorrhoidal plexus; these, when overfilled, may cause sciatica directly

by pressure or by the resultant congestion. This mechanism is the one that must be most carefully looked for; Leube says "the rule should be strictly adhered to, not to make a diagnosis of sciatica at all until an exploration of the rectum has been made." I would add not to begin treatment at all in the majority of cases until all the pelvic organs have been explored. The cause of the sciatica will be detected, and its removal means the cure of the disease. Anything, then, that causes pressure upon the sacral plexus, directly or indirectly, must be removed; this is accomplished by the proper treatment of affections of the nerves themselves, of bone, of blood vessels, of the uterus and its adnexa, of the prostate gland, of the bowel. In a large number of cases the proper treatment of the rectum is of the greatest importance—viz., that of hemorrhoids, fissures, and coprostasis. For those causes which act temporarily, such as traumatism, atmospheric influences, exertion, nothing can be done in the way of causal treatment. The treatment of syphilis, gonorrhea, and the intoxications must also be considered.

B. *General.—Rest* is the great remedy for this form, as well as for the other forms, of nerve pain. In acute cases the patient should be kept in bed; in subacute or chronic cases motion should be restricted as much as possible. In a number of these cases excellent results are obtained by the use of a long splint. Next in importance is the general treatment of the gastrointestinal canal. Here the treatment should be conducted upon the principles described in connection with constipation (q. v.). Castor oil has been lauded as though it were a specific; in those cases of subacute or chronic sciatica due to collection of fecal matter at the sigmoid flexure or in the rectum its efficacy, when given two or three days in succession, is very marked; but equally good would be the action of any other cathartic by which the bowels can be properly evacuated.

C. *Medical.*—Various remedies must be given, either for causal or for symptomatic indications. For the pain morphine should be used in acute, never in chronic cases. When the great pain has been relieved the other remedies recommended for neuralgia may be given. Insomnia is not uncommon in the chronic form, the usual remedies for which may be tried. Tonics of various kinds may be required, according to their indication. In chronic cases, especially, it frequently becomes necessary to place the patient upon a restorative plan of treatment. When the patient has become neurotic or the pain is the result of a pure neurosis, in either case accompanied by malnutrition, the best method of giving relief is a rest cure.

D. *Hydrotherapy* is carried out either locally or generally. For local application, hot, warm, or cold water is used; upon the whole, heat is better borne than cold, but there are notable exceptions to this rule. Water may be applied in the form of fomentations, the Priessnitz application, or by bandages which can be kept moist with warm or cold water, as the case may require. In chronic cases the Scotch douche is of great value. The Scotch douche is applied by alternate douching of the affected part with cold and warm water under pressure. The temperature of the water should be from 60° F. to 110° or 125° F.; the pressure may be begun with twenty to twenty-five pounds to the square inch, applied from thirty to fifty seconds (Collins). As a rule, this method can be satisfactorily employed only at a hydropathic institute, but extemporaneous apparatus can be constructed with-

out much difficulty, especially where there is sufficient water pressure. After this method of douching a fan douche of cold water, gentle massage, and exercise in the form of a brisk walk are ordered, so as to keep up the reaction. Generally hydriatic treatment is carried out by warm or hot baths; to these may be added undercurrents in the form of douches through a hose applied under pressure to the affected part. The object of the douche, under all circumstances, is to produce a decided reaction in the skin; in other words, it is a method of counterirritation, and therefore of the same therapeutic value as when counterirritation is applied in other ways. The latter method is much more comfortable than the Scotch douche, being more easily applied in private practice, and it should be followed by the same beneficial results. But given a convincing, enthusiastic hydrotherapeutist, with an imposing apparatus from which all effects can be worked out by formulæ shown to the patient, and how much better his results than those of a common practitioner with an ordinary bathtub and a rubber hose, the nozzle of which is not even nickel plated!

E. *Balneotherapy.*—Warm, mud, sand, and Fango baths have been used successfully in subacute and chronic forms; they are very highly spoken of by those who have used them, but they cannot be given at home. The mineral baths are to be chosen in accordance with the causal indication. Thermal baths, containing CO_2 or NaCl, and sulphur baths are the most useful. In this country, the hot springs of Virginia, Arkansas, North Carolina; the Idaho Springs, Col.; those of Mount Clemens, St Clair, St Louis, Mich.; Richfield or Sharon, N. Y., may be prescribed.

F. *Electrotherapy.*—The faradic current may be used in the form of the brush, in order to produce counterirritation, and it gives relief to pain, especially in the subacute or chronic cases. For this purpose high-frequency currents may also be used. Galvanism is applied by using large electrodes, which must be placed as follows: the anode is applied to the lumbosacral region and the cathode is moved in such a way that the labile current is given along the whole course of the nerve. The sittings should be long—from ten to twenty minutes—and five to ten milliampères may be used. No muscular contractions should be striven for, although the directions for giving electricity differ here as elsewhere. I have always used the method just described; it does well in some cases and fails in others. It is not this method—or any method, for that matter—that is at fault, but it is the nature of the nerve condition and of the patient, which in most instances defies recognition. Franklinism is also recommended; this form of electricity, it seems to me, is the most untrustworthy of all as to therapeutic results.

G. *Massage* is also valuable in sciatica; it may be used in the acute stage, provided the pain is not increased by it; only the mildest manipulations should be used here. In the subacute or chronic stage efforts should be directed to influence favorably the nerve condition by direct treatment.

H. *Other Local Measures.*—Counterirritation is valuable; it matters not whether it is applied in one way or another; as has been intimated, the *amount of good done may frequently depend upon the manner in which it is applied.* Any one of the many counterirritants may be used; they may be of great value irrespective of the form of sciatica treated. *Hot or cold applications* may be made by means of the hot-water bag, poultices, or the

ice bag or sprays (ether, ethyl chloride); the large, thick poultice sometimes does good when the hot-water bag fails. Cold or hot packs may also be used.

Hypodermic injections may be given as in the other forms of neuralgia, even those that are directed to the nerve itself, such as osmic acid, are recommended. I have never seen much accomplished by direct medication of the sciatic nerve, but it is not asking too much that no harm be done, as has so frequently happened in the use of this method, for even the injection of water is not without danger. *Blood letting* undoubtedly gives relief for pain; a few dry cups or leeches applied to the lumbosacral region sometimes change the nature of the pain from an excruciating to an endurable character. *Acupuncture* is used and recommended by English physicians (Gibson and Fleming, Brown). From four to six steel needles, about three inches in length, are introduced along the course of the nerve, so as to transfix it. These are left in position for a few minutes only. It goes without saying that strict asepsis must be carried out when this method is used.

I. *Nerve Stretching.*—The surgical method is no longer used, as the nerve may be adequately stretched by the following method, according to J. J. Graham Brown. Dorsiflex the foot of the patient at the ankle, extend the leg at the knee, flex the whole limb at the thigh, the patient lying on his back. For diagnostic purposes it may be valuable to cut down upon the nerve, in order to see if it is compressed; when compression exists relief can be afforded as in no other manner

V. THE GENERAL NEUROSES

NEURASTHENIA

Introduction.—We can accept Beard's definition for neurasthenia, nervous exhaustion; or that more commonly given, a functional affection due to irritable weakness of the nervous system. Under all circumstances, in neurasthenia stimulation of nerve produces exaggerated reaction; manifestly this can be due only to increased irritability of the centers or nerves. Increased irritability of nerve centers, in its turn, is due either to some inherent fault or to diminished nerve energy. This is of the greatest importance for the consideration of prophylaxis and treatment, for a human being may be neurasthenic from congenital fault in his nerve centers or from this combined with any cause affecting the nerve centers not sufficient to produce neurasthenia in healthy nerve centers; or, finally, neurasthenia may be produced without predisposition as a result of excessive operation of a direct cause. The direct cause may be one of many, but all are dependent upon improper functional activity. This may arise from improper nutrition of nerve tissue, due to infections, circulatory conditions, intoxications, misuse, and to many other causes. Improper or excessive functional nervous activity is followed by fatigue, which does not disappear so rapidly in nerve as in muscle. In all probability this fatigue is followed by both morphological and chemical changes in nerve structure, concerning which we know very little. But the removal of the direct cause is, under all circumstances, of the greatest importance for treatment as well as for the prevention of subse-

quent attacks. For the majority of cases the coexistence of internal and external causation holds good—i. e., there must be a predisposing cause and a direct cause; next to these in number come those in whom the predisposing cause is at the same time the direct cause; and lastly, those in whom there is no predisposition. The object of prophylaxis is to prevent the development and activity of both these causes; the object of treatment to remove them, to counteract their harmful effects. It has been stated that neurasthenia is not a new affection, and that it is not on the increase. It matters very little whether it is a new or an old affection, but the physician who closes his eyes to the fact that neurasthenia is enormously on the increase is in danger of doing great harm by inaction. Aside from any theoretical reasoning, one who has been in practice long enough can testify to the great increase in neurasthenia. In addition, it should be stated that any physician who looks upon neurasthenia as a "lack of will power," as identical with hysteria, or as a trifling disorder because it is supposed to be functional only, should not treat these cases at all. The reasons for this are obvious; they may be compressed into the general statement that no physician should treat a disease which he does not understand, because he is apt to do more harm than good. In neurasthenia, as well as in hysteria, the personal factor is invaluable in therapeutic results; it is of greater importance in hysteria than in neurasthenia, but as both are found so frequently associated, the first statement is substantially correct. The requisites for the physician are wisdom, tact, knowledge, force, patience, endurance, sympathy, and above all optimism. There are men who are so born that they control others; such men treat nervous patients best, provided they have the other requisites. Again, we may find that a physician who has the greatest percentage of successes fails absolutely in an individual case in which cure is afterwards effected by another possessing very few of the requisites mentioned above. Who has not seen neurotic patients going from one physician to another, from one rest cure to another cure, spending time and money, and then finally relieved by some absolutely ridiculous method of treatment? Yet these results should be a lesson to us all not to neglect any suggestive measures which can be applied, for after all it is our duty to do all we can for these patients, and our only object in treating them is to cure them.

Prophylaxis.—This should properly be begun before birth, although recent investigations on heredity make it more likely that other ancestors are of more importance in transmitting hereditary traits than the parents. The possibility of regulating marriage by artificial selection has been referred to before; it is not practicable, and the fact that it has been attempted is in and of itself a conclusive proof of the widespread existence of the neurasthenic mental attitude.

The prevention of the development of neurasthenia in the individual, however, is a different question. Prophylaxis should begin in childhood, but at the outset it may be confessed that it is carried out with great difficulty, first because of the parents, secondly because of the child. The parents may be unable or unwilling to carry out instructions; this is notably the case with the mother, who is apt to be a neurotic herself, and therefore the worst person to bring up a child of this kind. As far as the child is concerned, the difficulty frequently lies in the fact that the diagnosis of a neurotic child

cannot be made early enough, notwithstanding statements to the contrary. A diagnosis of a neurotic inheritance in children cannot be made from physical evidences alone. If we wait until evidences of neurasthenia develop, which most commonly occurs during the period of sexual development, we may not be able to do much good; for the present, the rule should be followed that all children of neurotic parents should be brought up as if they were neurasthenics. As this method is one that is excellent for all children, it is no hardship for the normal child. It is well to begin with the prophylaxis as early as possible; in the infant it consists of regularity of feeding, giving it proper quantity and quality of food, the care of the skin, and proper clothing, and the absence of all coddling as to rocking and other indulgence. The fact that an infant is trained to obey has an effect upon inhibition which cannot be overestimated as to its far-reaching results. Naturally this can all be lost in a short time, but when regularity is maintained the child begins to recognize that things are as they are, not to be changed, but above all not as he thinks they should be or might have been. The question who should take care of these children answers itself in the greatest number of instances; the mother is always the best person to take care of her children, provided there are no reasons why she should not do so. In neurotic children, however, the condition is different; when the mother is neurotic, or too busy, the child should be turned over to a governess or nurse. The difficulty here lies in convincing the mother that this should be done; being a neurotic, she has either an exaggerated affection for her child or an exaggerated sense of duty. But whoever does take care of the child must see to it that the same regularity recommended for infants is continued through childhood. In this person should be found a judicious temper combined with kindliness and firmness. In many respects the attitude toward life is of great importance; a matter-of-fact person is of much greater value than a romantic or sentimental idealist, the happy mean being at times the happy solution. Everyone knows of nurses who have increased the innate nervous tendencies of children by their own romantic or religious proclivities. It should be understood that the parents, and they alone, are responsible for the religious development of their children. With them lies the responsibility of harm done by injudicious or improper religious teaching at improper periods of development; but this is a question for the spiritual, not the medical, adviser, broached here only because (in modern times) the physician is often confessor and adviser.

The child should be so trained or diverted that no self-examination or introspection may take place. His play should combine diversion with exercise; under no circumstances should *strenuous* competitive games be permitted, but the play should be sufficiently interesting to prevent the child's thinking of himself. Diverting play in the form of toys, mechanical devices, horticulture, etc., may be recommended. The child must be taught to make little complaint of pain or suffering; least of all should he be permitted to brood over real or imaginary harm done him by others. The food should be adapted to the individual, but as a rule it will be ordered in the direction of fat-making, because of the universal experience that fat is, as it were, an antidote to nervousness. Alcohol should never be given to these children; they are also better off without tea or coffee. The baneful effect of tobacco

in children cannot be overestimated; in neurotic children every possible effort should be made to prevent its use. The care of the bowels is also of great importance, because toxines derived from the intestinal tract irritate nerve tissue, and because constipation produces symptoms which may themselves lead to the development of neurasthenia. The child should be induced to sleep as long as possible; children, like adults, are good or bad sleepers; in the former, as much sleep as can be obtained (and the amount cannot be measured by hours) should be encouraged; in the latter, the cause of the sleeplessness should be sought, and if it is simply a neurosis the physician must insist that the child be kept in bed at least ten hours out of the twenty-four. Nothing should be allowed to interfere with the regularity of the child's going to bed. For this reason, among others, these children should not be taken to evening entertainments. For that matter, they should be kept away from all children's entertainments where a number of children collect, especially in closed spaces. This holds good for nonneurotic children as well. Neurotic children should be taught the value of cold water in the form of sponge baths, either in the open air or in the tub. A daily cold bath of some kind should become routine usage; it hardens the skin; in other words, it reduces irritability, thus protecting the nerve centers; it also acts as a general stimulant and tonic; these effects pass off, but lead to no unpleasant reaction. Exercise may be obtained in many ways—walking, romping, riding, rowing, swimming, and the playing of various so-called athletic games. The object of all exercise should be to improve the muscular condition, and at the same time to divert the patient's attention from himself. Walking is excellent exercise provided it is taken in company; when a neurotic walks alone he is apt to think of himself. Riding is much better, because it is necessary to look after the horse. Rowing and swimming are excellent, because it is impossible to row or swim and to be inattentive; bicycling is also valuable for the same reason. All games are valuable provided they are played properly; when played as the only and highest aim of life, before large audiences and under great strain, they are very injurious to neurotics; there are very few events of this nature which are not followed by more or less harm to some of the participants. Here neurasthenia is the result both of muscular and of nerve strain. There should always be competition in games; this, when not artificial and exaggerated, is of inestimable benefit to the neurotic child.

We are frequently consulted in regard to the education of these children, and this is a very serious question, possibly taken too seriously by many modern parents. The choice of school is usually submitted for the physician's approval. No child should be permitted to go to school until he has completed his seventh year; this also includes kindergartens. Shall the child be sent to a public or to a private school? In a way public schools are best, in that the child gets the competitive effect. On the other hand, when a large number of pupils are under the care of one teacher, individualization is out of the question. Large private day schools are the same as public schools, except that the class of pupils found there differs from that in public schools. The choice for the individual case depends upon whether it is best for him to have the leveling process of public schools combined with a comparatively low average educational standard; the leveling process of a large

private school, necessarily of a different nature, with a possible higher intellectual average, or the individualization and high educational standard that is found in our best smaller private schools. But there are many conditions in the family life which make it necessary that the child be sent to school away from home. When it is found that neurotic parents and neurotic children have a bad effect upon each other, the best thing is to separate them. I have more than once seen a neurotic boy, who was always rubbing his father the wrong way, come home after an education obtained abroad and act as a regulator of the nervous household pressure. The fear of overwork always exists, and with children it does occur in a small number of cases, being more common as they get older; but it is, as a rule, not the overwork that does harm, but some other direct cause of neurasthenia. Except that inhibitory processes are less developed in the young than in the adult, the same rules hold good as in the adult.

For the prophylaxis of neurasthenia in adults we have a subject which can be dilated upon *ad libitum*, but which will bring little practical outcome. The reasons for this are plain: we are living in an age which makes more demands upon our nervous system than any in the history of mankind. The struggle for physical existence is becoming less and less severe, so that the "unfit" survive. Neither the one nor the other can be controlled; neither, therefore, can the prevention of neurasthenia be controlled, except for the individual. We are here concerned, then, with individual prophylaxis only; in general terms, the same prophylaxis holds good as for children, but as a rule no attention is paid to directions given, for here, as elsewhere, we profit by no experience except our own. These directions can be carried out in adults usually only after they have had an attack of neurasthenia. Under all circumstances neurotic individuals should be warned against unnecessary strain, mental or physical, but at the same time all directions must be given in such a way that hypochondriasis does not develop. Neurotics can be easily influenced by suggestion; one celebrated neurologist, for example, complains that in a disease described by a second celebrated neurologist all the symptoms were produced by suggestion.

Next to overexertion, and possibly just as important, is the question of rest; enough time for sleep, food, and recreation should always be reserved. A man or a woman who must always be doing something is, *eo ipso*, a neurotic, and frequently in the beginning of a neurasthenic attack. All neurotics ought to be taught to *cultivate leisure*; as long as the neurasthenically predisposed can relax absolutely there is little danger of trouble. At present it is difficult to be at leisure, but every adult should have some diversion which may occupy his mind to the exclusion of his occupation; this is especially valuable in the neurasthenic, and it should preferably be something which can be followed in the open air, and be accompanied by exercise.

Neurasthenics should not be alcoholics; a great many cases of neurasthenia are the result of alcoholism. A man or woman is tired, or a little depressed, from some form of overexertion, and a small quantity of alcohol is taken, with an excellent immediate result; after a short time the original unpleasant feeling returns, then another quantity of alcohol is required; this cycle continues day in and day out, and the result, in favorable cases, is neurasthenia; in unfavorable ones, chronic alcoholism. As to the rôle played by tobacco

in the neurasthenia of adults there can be no doubt when tobacco is used in excess; in moderation, I have seen no harm come from it, and the same may be said of coffee and tea. Great care must be exercised in prescribing narcotics and hypnotics to these patients.

The proper treatment of the infectious diseases may be looked upon as a prophylactic measure, this being the case especially in connection with the treatment of the period of convalescence. The frequency of neurasthenia after influenza has impressed upon us the special importance of watching convalescence in that disease. Any disturbance of general health must be looked to—e. g., in gout, the anæmias, diabetes mellitus. All local disturbances should be treated; great attention should be given to traumatism, especially in preventing the patient from taking up his usual occupation too early or when he is still in a debilitated condition. Sexual excesses should be avoided, as should all other excesses; they produce neurasthenia in the same way. The treatment of local disturbances is of great importance in preventing attacks; neurasthenic nerve centers get improper impressions from exaggerated or abnormal afferent impulses, and many special instances occur in which, by the proper treatment of local disturbances, attacks may be prevented or the patient be made much more comfortable and less apprehensive.

TREATMENT.—A. *Causal.*—Most of the causal treatment will be found under the prophylaxis, as prophylaxis and treatment are combined. Where we are fortunate enough to be able to find a cause and to remove it, the attack of neurasthenia is soon relieved. Consequently every neurasthenic should be examined, not only for the purpose of making a diagnosis, but also in order to determine if anything can be found which in any way may be looked upon as a direct cause. Everything that produces mental or physical pain must be eagerly seized upon as possessing causative value, and when possible it should be removed. This does not mean mutilation or extravagant surgical interference, especially when they are based upon imperfect or crude physiological and pathological knowledge. It is the duty of the physician to see to it that when an operation becomes necessary the neurotic patient is in good physical condition, otherwise the condition known as postoperative neurasthenia is added to his other troubles. This caution is especially important in operative measures upon the genitourinary tract, and one peculiar occurrence frequently observed will suffice as an illustration: A patient has persistent leucorrhea; at the same time she is neurotic; the leucorrhea does not improve, and a slight operation (curettage of the uterus) is decided upon. The operation is successfully performed, possibly the endometritis is cured; but an injury is done to the patient's nervous condition—an injury that may last for some time. All this could have been avoided if the nutrition of the patient had been improved or the proper treatment instituted in other directions.

Both for the purpose of causal treatment as well as for the proper symptomatic treatment it is necessary that the patient should tell his whole story. In eliciting a history the physician should ask no direct questions, otherwise he takes the risk of producing symptoms by suggestion. It is better that the patient should give his history in sections, requiring two or more separate examinations, than that one unpleasant mental symptom should be produced. The patient should not be blamed if, especially with a strange physician, he

is inclined at first not to tell everything, as the cause, or suspected cause, may involve many other people, not to their or the patient's credit, and the symptoms may be such that the patient is frequently ashamed to tell of them. In many instances it is possible to do good by advice; in many others indirect assistance may be given, so as to remove worry, anxiety, strain, and some of the results of poverty.

B. *General Treatment.—The attitude of the physician* is of great importance; he must understand that the suffering of the neurasthenic is real and intense, and it matters not whether the attack be mild or severe, the affection is equally important to the individual. On the other hand, the physician must not lay undue stress upon the patient's malady, otherwise the patient gives himself up to invalidism and becomes hypochondriacal. All cases should be treated as to their form, their intensity, and with reference to the individual and his peculiarities. There is no set form of treatment that applies to all neurasthenics. All directions should be clearly and precisely given, but the patient should be made to understand which directions are absolutely inelastic and which may be varied. In mild cases we do not wish to make an invalid of the patient; in severe cases we do not wish to add to his suffering by laying down rules that he cannot break without causing scruples. In most of these cases an explanation of the condition does more good than drugs; it is true this will have to be repeated and repeated again and again, so that it requires unlimited time and forbearance to treat these patients. But the reward comes to the physician who is willing and able to give up so much of his time, his force, and his energy.

The first question that arises is, Shall the patient give up his occupation? In mild cases this may not be necessary; in severe ones it is usually indispensable. In the milder forms the patient should be induced to take a rest—i. e., to give up his work entirely for a short time, then return to it in a curtailed form. The reduction in work is to be controlled by the physician; enough must always be left to give him real occupation. In the severe forms there usually comes a time when occupation has a decidedly beneficial effect; this is found in all brain workers, who after a time become very unhappy and are diverted by their occupation. Under no circumstances should a neurasthenic be permitted to work with full force during the attack. The patient should seek diversion; this may be found in one of many forms, and differs with the individual. The general rule is that the diversion must not add to the nervousness; thus one patient sleeps better after going to the theater, another lies awake all night. All games should be accompanied with as little excitement as possible; for this reason almost all neurasthenics play patience, which may always be recommended. The books to be read should be selected under the guidance of the physician; whether it is necessary to select the music that should be listened to, as is done in one of the best sanatoria in Germany, is doubtful, except in the case of musicians. The reading of newspapers should be limited to those that are not sensational, for one sensational article may spoil the whole day for a cerebral neurasthenic by bringing up reminiscences of symptoms, by awakening new ones, or by exaggerating those already present.

Exercise.—Those forms of exercise and gymnastics which the patient is in the habit of taking should be continued. Their value has been given

under the heading of prophylaxis. The facts should always be borne in mind that overexertion is bad for neurasthenics, and that they always have a tendency to hasty and inordinate activity. In all cases it should be the duty of the physician to prescribe the nature and amount of exercise or gymnastics. Upon the whole it is best to prescribe graded forms of exercise, as by this method not only do we obviate harm, but we gradually improve tonicity of nerve and muscle.

Rest and Sleep.—It is not necessary to point out the importance of these. The physician should see that the patient gets enough sleep (v. Insomnia), but the getting enough bodily and mental rest is of equal importance. When it is at all possible the patient should be in bed at least ten hours out of the twenty-four. Moreover, he should be ordered to lie down before or after a meal; resting before meals usually improves the appetite, resting after meals the digestion. Mental rest is obtained by sleep, occupation, diversion, exercise, and other things. Give to the neurasthenic rest, because the centers that are fatigued are inactive, while other centers are at work. After all, this is the key to the whole situation: the best way to control the mental symptoms of neurasthenics is not by locking these patients up and keeping them from mental occupation, but by giving them the proper kind of mental occupation. Since the fear of some mental trouble exists in about ninety per cent of neurasthenics, any mental exercise which can be given to demonstrate to the patient that his peculiar mental phobia is not based on anything tangible becomes invaluable. Frequently it requires ingenuity to find something which acts in this way; the physician should always be on the alert to procure evidence from the patient's own acts or thoughts against his abnormal assumptions and conclusions.

Diet.—Upon the whole it may be said that diet should be arranged for weight and the condition of the gastrointestinal tract. In neurasthenics no change should be made from the usual diet unless there are distinct indications for it. In dieting a neurasthenic, invalidism and self-watchfulness are encouraged; even at the risk of producing minor gastric symptoms, it does the patient a great deal of good to tell him that he can eat anything in moderation. When a neurasthenic has lost weight, this must be regained; indeed, the more weight, within reasonable limits, the better for the patient; at all events the first evidence of improvement in lean neurasthenics is gain in weight. In the greatest number of cases it is easy to put on weight for the patient (v. Superalimentation), and this method is accompanied by excellent suggestive effects. But neurasthenia also occurs in the obese; here reduction of weight should be carried out in the slowest possible manner (v. Obesity). The gastrointestinal conditions should be treated as recommended in the chapters devoted to them, to which the reader is referred.

Electricity.—Aside from the symptomatic use of electricity, it is not so valuable an agent in the treatment of neurasthenia as it was formerly considered. It is pretty well agreed that, apart from its suggestive action, no other action can be expected in this affection. The result of this is that it does not matter what form of electricity is used, so that it is administered in such a way as to produce the proper mental effect. Static electricity, high-frequency currents, or galvanic or faradic currents derived from an imposing

apparatus, may be used. It is then not necessary to give electrical treatment in neurasthenia.

Hydrotherapy.—The methods that suggest themselves here are many, and some of them very valuable, both for general and for symptomatic use; but, as has been stated before, the ultrarefinements are without a scientific basis, and when the element of suggestion is withdrawn they are deprived of their benefit. For general use their indication is found in stimulating and tonic activity. We therefore use cold water principally; the temperature required depends upon the cutaneous reaction produced, and this, combined with the other general effects, is our guide in selecting the temperature. When a patient is in the habit of taking his cold bath every morning with the good results that he obtained when in good health, no change need be made in the temperature. Cold baths should be given in the morning; they may be given as a sponge, a douche, a tub bath, a half bath, or by means of the wet sheet. The latter is very valuable, and requires a special description.

A sheet is soaked in water ranging from 50° to 70° F. It is wrung out, and the patient is wrapped in it while he stands up, the head remaining uncovered; the attendant now rubs the patient through the sheet, removes it, and then dries the patient thoroughly with a rough towel. After this bath the patient again goes to bed, and usually falls to sleep.

All the procedures should be begun at the higher temperatures, and when the patient becomes accustomed to them lower temperatures should be used. The Scotch douche may be used with great success when the patient is in an institution. The cold pack is also valuable in some patients, but to some it cannot be given, on account of their nervousness; there, again, institutional treatment is required. Mineral baths are valuable—the CO_2 baths and the saline baths (thermal). In the greatest number of patients fresh-water, open-air bathing is more efficient than salt-water bathing.

Travel.—A common form of giving directions to a patient is: "You need a rest; go away from home and travel." There may be no doubt that the patient needs a rest, but that he will get it by going away from home or by traveling is a different question. This applies especially to the cerebral form of neurasthenia, but under unfavorable conditions the spinal form may be converted into the mixed form. The resulting benefit or harm depends entirely upon the patient; if travel does not divert, it does harm. Even if it does divert, but is so conducted as to cover the greatest distance and the greatest number of places in the shortest possible time, it will do harm. So that, before recommending travel, the physician should find out whether the patient enjoys it, and if he wishes to travel in the condition in which he finds himself. When these questions are answered affirmatively and the physician otherwise finds no objections, the itinerary should be discussed. As a rule, it is wise to leave the choice of places to the patient, the time to be given to the trip may be discussed by the physician. It is always better for the patient to travel and then settle down in one or two places than to keep moving all the time.

Isolation.—The benefits accruing to the patient from this form of treatment depend upon the fact that he can be kept under the closest observation; he is removed from his friends and relatives, who always listen to his oft-repeated tales and who increase his selfishness or self-preoccupation by sense-

less sympathy; he is under restraint to the degree that he must follow instructions, and is therefore under discipline; he is nourished in the proper way, and his food can be controlled in all directions; he has been removed from an *entourage* which may suggest unpleasant symptoms and he now is in the hands of his physician and his nurse. The physician can get at the patient by suggestion; indeed, the whole method lends itself to increasing suggestive effects, and in many cases the results are excellent. These results depend upon various factors—the place where the patient undergoes the cure, the physician, the nurse, and the patient himself. A suitable place should be chosen; it is best not to have it in a general hospital, or in a sanatorium or hospital where many patients are received; the most favorable location is in smaller establishments, where few patients are received at a time. The requisites of the physician are those already described in the introduction to this chapter. In some ways the nurse is of more importance than the physician, as she is always with the patient. In order that nurses may have the best results they should be taught how to treat these cases; but, in addition to this, the proper nurse requires qualities which cannot be acquired, but, as in the physician, are inborn. The patient, after all, is the most important. It has become quite common to send every neurasthenic to a rest cure; this obviously is altogether wrong. Indeed, at times it is difficult to say what kind of a patient should be sent to be treated by isolation. When a patient has physical evidences only, isolation is excellent; but when a patient has principally mental symptoms, as a rule the method is not indicated unless the physical condition, loss of weight, etc., is of paramount importance. Everyone who has had experience with this method knows how many patients will declare, before they begin it, that they cannot stand it, as it will drive them "crazy." No physician need ever be deterred by this statement, which can easily be met by the assurance that this method does not cause insanity. But there remain a number of patients with mental symptoms who grow worse under isolation; those in whom no disciplinary effect is required, in whom the mental symptoms are not entirely endogenous, or when the physical condition is good, or for other reasons that cannot be given with precision. Many of these patients are perfectly willing to do anything to get well; they need very little, if any, discipline, but they grow steadily worse when this treatment is applied.

For the working out of a method of isolation combined with other procedures we are indebted to Dr. S. Weir Mitchell; this method is called the world over the *Weir Mitchell method*, and it has been adopted everywhere. Its proper application has revolutionized the treatment of neurasthenia and hysteria. In addition to the isolation, rest in bed, overfeeding, and massage or electricity are used, all for the purpose of securing improved nerve-muscle tone and for suggestive effects. Dr. J. K. Mitchell has published the following as the plan followed by his father and himself in a full rest cure:

7 A.M.—Cocoa, followed by a cool sponge bath, with a rough rub and the toilet for the day.

8 A.M.—Breakfast, with milk. Rest an hour after.

10 A.M.—Eight ounces of peptonized milk, or its equivalent.

12 M.—Eight ounces of milk or soup, after which the patient can be read to by the nurse.

1.30 P.M.—Dinner, followed by rest for an hour.

3.30 P.M.—Eight ounces of milk, and half an hour later the application of electricity.

6.30 P.M.—Supper, with milk, followed by rest for an hour, after which the patient may be read to for half an hour or longer, if it does not fatigue her.

8.30 P.M.—Administration of malt extract, with an aperient if necessary, or the utilization of some measures to induce sleep, such as the drip sheet or the administration of hypnotics (Collins).

This may be looked upon as an average method of carrying out the treatment. A large number of observers, including myself, prefer to add to the diet a disciplinary effect by giving only milk in the beginning. As the object of diet here is to cause increase in weight, the scales should be used at regular intervals. The least quantity of milk that should be given at first is two quarts a day. About six to eight ounces should be taken every two hours. Many patients gain weight on this alone, but in a large number of cases it is necessary to add some carbohydrate, oatmeal gruel, farina, or fat (v. Superalimentation). For disciplinary purposes, I keep the diet confined to simple articles of food that are rather monotonous but can be easily taken—e. g., milk, gruels, eggs, cream; the condition of the patient is looked upon as an index to the addition of more palatable articles of food. In average cases, where the weight increases, the length of time required before the addition of other articles of food is as a rule four weeks, sometimes six weeks.

The patients are always very anxious to be allowed to go home; the time when this may be permitted can be determined by the weight, the temperature, and the symptoms. The weight increases rapidly in the beginning, but must be made to increase as the patient continues the treatment. The temperature in the beginning is subnormal. I have become accustomed to looking upon normal morning and evening temperatures as one of the best evidences of a successful cure. I make it a rule to state to the patients, the first time they ask when they may go home, that one week after all symptoms have disappeared they may consider the treatment as ended.

The massage should be given in the form of general massage; sometimes it is best given at bedtime, as the patient frequently falls to sleep after it. The electricity may be applied to all the muscles in the form of faradism; it is of comparatively small value except that it fills up time and there is something doing for the patient. In the beginning it is best to have a day and a night nurse; as the patient improves, one nurse will be sufficient. In the event of failure, the cause must be sought in the physician, the nurse, the patient, or the surroundings. In the physician it may be found in his inability to secure the various mental effects or in his error of diagnosis; in the nurse, that either she has not carried out instructions properly or she has not the personal qualifications required for the individual case; in the patient, that he is refractory, absolutely without sense or reason; in the surroundings, that they are, for one or another reason, improper for the individual.

Massage.—There is no special indication for massage in the general treatment of neurasthenia. It should be used for symptomatic purposes as in other conditions; some neurasthenics bear massage very badly, and it is always safer to begin with the mildest movements first.

Psychotherapy.—Much has been made of this, especially by observers on the continent of Europe. I have already referred to the necessity of using suggestive measures, which are of importance everywhere, but to make a method of suggestion, to give precise directions how to carry it out, seems almost incredible. Suggestion is carried on in the waking and the hypnotic state. Hypnotism is not used much by English-speaking physicians, certainly it should not be used in neurasthenia. If it were shown that hypnotism was absolutely invaluable, all the objections to it might be waived; as it is, suggestion in the normal state is thoroughly sufficient when applied in the proper way by the proper person. In hysteria the question is less readily solved, but even here hypnotism has lost much ground.

Medical.—The principal class of drugs used are those that are supposed to have a direct tonic influence upon the nerves. The bromides are most commonly prescribed, but they can have no effect upon the condition itself, although they are invaluable for certain symptoms. They take off the tension, relax the patient, frequently insure sleep, and improve his whole condition. Strychnine easily suggests itself because it has a distinct tonic effect upon the nervous system; if prescribed at all, it should be given in small doses; it is better to give nux vomica, as its action as a bitter is more valuable. Arsenic in ascending doses may do good indirectly, but the idea that it has a direct affinity for nerve structure has certainly not been verified. Phosphorus preparations are also recommended; the phosphites and hypophosphites are more or less inert. One of my favorite combinations, which is valuable in very relaxed neurasthenics, is zinc phosphide and nux vomica: ℞ Zinci phosphidi, 0.065 gm. (gr. j); Extracti nucis vomicæ, 0.3 gm. (gr. v); Extracti gentianæ, q. s. M. Ft. pil. No. xxx. S.: One pill to be taken three times daily. I have used the glycerophosphates for a long time; at first in the form of the wine, so that I was not sure whether its effects were due to alcohol or to suggestion; then I had my own elixir made practically without alcohol, and besides this I have been giving the glycerophosphate of sodium by hypodermic injection—0.1 gm. injected daily or every other day. My conclusions regarding the use of the glycerophosphates are that they are valuable, most so when used hypodermically, least so when used in tablet form. As the injections are absolutely without danger when asepsis is observed, they may be given in every case; it seems to me that they have been of most value in the so-called sexual form of neurasthenia. Whether they act in any other way besides that of suggestion I do not know. It may be freely admitted that a method of treatment that consists of the daily introduction of a drug into the system by hypodermic injection appeals very much to the patient as something that must be useful and rational. Because any method is purely suggestive in its action is no reason why it should not be used; on the contrary, if it does good it is an additional reason for its use, especially if we can do no harm by its continued administration. In every patient over forty years of age the possibility of arteriosclerosis must be taken into consideration. Whenever evidences of this are found it should be thoroughly treated.

C. *Symptomatic Treatment.*—The general treatment should be applied in every case, but it is of great importance to place a proper valuation upon the symptoms that are an additional source of irritation, their removal tending to improvement in the general condition. Every symptom should receive

its proper treatment, which as a rule is the same as that accorded it under other circumstances. The bromides are the most valuable of the symptomatic remedies, and given in proper doses they give relief for a great many of the symptoms. The physician should be careful in their use, for bromism is to be avoided, by giving only such doses as produce the proper effect. For an adult, 1 gm. (gr. xv) of potassium bromide, given four times daily, is usually sufficient to give relief for symptoms; when this does not occur, some other remedy should be prescribed, as even this dosage, when given for one week, commonly produces symptoms of bromism. After the full effect has been produced upon the symptom the dose should be gradually and slowly reduced to that which will control the symptom; frequently, when this method is used, it becomes one that acts purely by suggestion, as I have a number of patients whose symptoms are kept under control by one grain of bromide given, as I commonly give it, with quassia: ℞ Potassii bromidi, 8 gm. (℥ij); Infusi quassiæ, 120 gm. (℥jv). S.: One tablespoonful every four hours.

For the *gastrointestinal symptoms* the bromide is sometimes invaluable; I have frequently seen patients cured of these by its use. The fact is lost sight of very frequently that all these symptoms are due to improper innervation; outside of this the symptoms should be treated as described in their proper chapters.

Cardiac symptoms are also usually controlled by bromides; sometimes valerian or asafetida may be necessary. Exercise is invaluable in these conditions. Cardiac massage has been recommended; it is rational, in that the cardiac reflex is stimulated by it, but I have seen no good results after its application. Digitalis should never be used. Electricity may be applied for suggestive effects. Sometimes those methods recommended in tachycardia (q. v.) are valuable.

Much stress has been laid upon the *eyes* as a cause of neurasthenia; for our purpose it does not become necessary to discuss whether we are removing the cause or a symptom; it goes without saying that all ocular abnormalities, functional or otherwise, should be corrected when they are accompanied by symptoms. I have seen patients improved by tenotomy, but I should be the last one to recommend it for causal or symptomatic treatment in muscular insufficiency.

The treatment of the nose should depend upon the severity of the symptoms and to what degree they affect the patient. Operations should not be performed unless they are absolutely necessary.

The treatment of the *sexual apparatus* is one that requires great care. In the female, normal sexual organs are rarely found; when a patient is neurasthenic, it is better not to perform operations unless they are absolutely indicated. Certainly the first object in treatment will be to improve the patient's general condition. A local condition may produce neurasthenia, but when this occurs a general condition is set up which necessitates more than local treatment in the great majority of patients. In the male, enlarged prostate, vesiculitis, or stricture of the urethra may have to be treated. The treatment of *impotence* will be found in its appropriate chapter (q. v.).

Of the nervous symptoms, the insomnia is the most common, to be treated as directed in the proper chapter. For the depression, codeine phosphate or nitroglycerine may be used. In some of the worst forms of depression I

have seen the use of atropine in ascending doses followed by excellent results. For the *fears*, exercise is the best remedy that can be used; when the patient is able to do so, he should do the things that he fears most. This should be recommended after the patient has been physically improved. For *sensory disturbances*, the same means recommended in other conditions may be applied. *Anæmia* should always be treated.

HYSTERIA

For our purpose it is difficult to draw a line between hysteria and neurasthenia, therefore much that has been said in the preceding chapter applies here; notably is this the case as to PROPHYLAXIS, and especially in regard to children. The children of hysterical parents should be taken in hand early in life, and trained to obedience, self-control, and respect for others. That which holds good for neurasthenia holds good also for hysteria; before the physician begins to treat an hysterical patient he must have made his diagnosis with as much certainty as the art of diagnosis permits; he must have excluded all organic disease. If this is not done the physician lacks the assurance indispensable to the successful treatment of this affection, to say nothing of other reasons. As hysteria consists of a certain mental state, plus suggestibility and accompanied by physical evidences, all of a functional nature, it will be seen how important the personality of the physician becomes in its treatment. The task of the physician here is much more difficult than in neurasthenia; all the rules laid down there hold good for hysteria. But in addition, after thorough study of the case, the principal thing for the mental treatment is to discover how suggestion can be used to overcome the mental condition. Here all the resources of the adept may be required; as these patients are not uncommonly of more than average intellectuality, with keen insight and judgment, almost instinct, as to actions and intentions; always self-centered, they are easily wounded; they have a peculiar view of life, in that it is absolutely egotistic, and this results in their interpreting harmless remarks as reflections upon themselves.

In treating these patients the physician should be both physician and friend, but at the same time he must have absolute control; his will and his directions must be final. But this control is not obtained at once; the confidence of the patient must first be gained in the fullest possible measure; after this has been attained the patient should be made to understand that in order to get well she will have to obey all instructions to the letter. In order to obtain such a result it is necessary to explain to her the character of the treatment as applied to her ailment. To do this properly requires consummate skill; the pure scientist should keep his hands off these cases, as he spoils them for future treatment by others who understand the art. This explanation will mean either that the patient is willing to be treated in the manner described or that she is not; if she is willing, there remains but one thing more to complete the understanding between her and her physician. The physician should demand absolute obedience and conscientiousness in carrying out his instructions, and it should be understood that he will not undertake the treatment under other conditions, or continue it if those conditions are not complied with.

TREATMENT.—A. *General Treatment.*—When possible, all psychical irritants, such as relatives or friends who constitute a disturbing factor, should be removed, or, when necessary, a removal from the seat of psychical unrest to one of peace should be recommended. Here again is shown the necessity of possessing the complete confidence of the patient, as without this nothing of this sort can be accomplished. When there is incomplete nutrition a modified rest cure may be begun at home; but it must be understood that this is not *the* rest cure, which must be represented as that method which never fails to cure. This modified rest cure is of various degrees of intensity; the mildest form may be carried out at home without a nurse, the severer form only in an institution, with a nurse. The principles to be applied are rest, overfeeding, and any form of suggestion. The degree must be commensurate with the degree of intensity of the patient's ailment. For example, the mildest form of treatment may be as follows: A glass of milk before arising, a cold sponge bath, then breakfast in bed, rest until 10 A.M. From 10 A.M. to noon the ordinary occupation to be pursued, dinner at noon, after which one hour's complete rest; at 3 P.M. an hour's walk or drive; at 4.30 to 5 P.M. a glass of milk with some fine form of carbohydrate, crackers; supper at 6.30–7 P.M., rest for one hour; at 9 P.M. massage, then to bed until 7 o'clock the next morning. If no improvement follows, the next step is a complete Weir Mitchell cure; in hysterical cases it should never be carried out at home. The Weir Mitchell cure gives better results than any other method that can be applied, but it is very expensive. I have tried it in the wards of a general hospital, with some measure of success; according to my experience, ward patients should be given the benefit of the method. When some extraneous cause exists which cannot be removed, such as an unhappy love affair, treatment is not satisfactory.

The various *suggestive methods* are the same as have been referred to in connection with neurasthenia: by drugs, electricity, massage, hydrotherapy, psychotherapy. Hysterical patients are easily hypnotized; their hypnotization is not without danger, however, so that this method of treatment is even here gradually being given up. Besides, the same results can be obtained without hypnotization by suggestion in the waking state, if the proper operator can be found. Counterirritation, especially with a proper apparatus, may be very valuable when applied to the spine or the nape of the neck, in order "to change the circulation."

B. *Symptomatic Treatment.*—The treatment of all conditions of the genitourinary tract must be carried out according to the rules laid down in works on gynecology. But hysteria, according to my view and experience of it, is never of uterine, but always of central origin. If there is an important reason for removal of the uterus, ovaries, or all the pelvic organs, let it be a gynecological reason; let no one presume to mutilate a woman because she has hysteria.

Gastrointestinal Symptoms.—(1) *Anorexia.*—The rest cure should first be tried; then, if this is not successful, the stomach tube should be used as a suggestive threat; if after twenty-four hours the patient does not eat, gavage must be resorted to. The physician should act quickly in these cases; the longer proper feeding is put off the slower the recovery and the greater the chance of complications. When, as is often the case, the anorexia is asso-

ciated with retching or vomiting, the same method should be used. Hysterical dysperistalsis of the stomach and intestine should be treated with electricity, abdominal massage, and hydrotherapy. Hysterical eructations may be treated in the same way; the diet should not be changed.

(2) In hematemesis it is necessary always to find the place of bleeding; when there is no doubt that nothing but hysteria can be its cause, the mere fact that the patient understands that the physician knows where it comes from is usually sufficient to stop the symptom. The following case may serve as an illustration: One of my colleagues asked me to see a young woman with him who had been suffering from hematemesis, which he believed to be hysterical. Upon careful examination we found she had been irritating the gum over the second molar tooth, swallowing the blood. In her presence I suggested counterirritation to the region of the stomach; my colleague suggested we could use a red-hot poker for this purpose, and I agreed. My colleague then went into the kitchen, and coming back told me, in French, that there was no fire. I replied, also in French, telling him to heat the poker over a gas jet. We both of us went into the kitchen to heat the poker over a small gas jet; after a proper amount of time had elapsed we entered the sick room, applied the poker carefully to the epigastric region, approaching the skin with care, but the patient did not react. Not a little perplexed by our failure, we prescribed some indifferent compound and then retired. The next morning my colleague received a letter from the patient, stating that our services were no longer required, as she understood French. But we afterwards learned that the patient was perfectly cured, and remained so for some time. When the patient does not get well as the result of the discovery of her wrongdoing she must be put through a rigid rest cure.

(3) *Hysterical Ballooning.*—It is essential to make a differential diagnosis before proceeding to treatment. When there is sufficient development of the condition to resemble a tumor, the patient should be anæsthetized; otherwise the usual treatment of hysteria should be applied.

(4) *Diarrhea or vomiting,* or both combined, will have to be treated on the basis of general hysterical treatment. There is found a peculiar form of constipation in which the patient gets relief only after introducing his finger into the anus, or by a long session accompanied by long-continued, inefficient, but finally efficacious straining. These are difficult cases to treat; they are frequently accompanied by hypochondriasis in the adult, though not so in children. The rest cure is the best treatment for these cases.

Hysterical manifestations in connection with the *genitourinary tract,* the *circulatory apparatus,* the *organs of special sense,* or the *skin* should be treated in reference to the cause as well as to the special indications. The same may be said of the treatment of contractures and paralyses. *Hysterical aphonia* is a difficult condition to treat at times, but with patience and the calling in of the whole force of antihysterical methods the results are usually excellent except that relapses cannot be prevented.

C. *The Treatment of the Attack.*—Here we must take into consideration medicinal means which have some effect upon hysteria. First among these comes valerian, which may be administered in many different ways, so that in a measure its efficacy may be increased by suggestion, especially to the sense of smell. Experimental evidence seems to point to the fact that valeri-

anic acid has decided effects upon the cerebral cortex. Valerian itself may be administered in the form of the fluid extract or the tincture. The fluid extract may be given with equal parts of Syr. rhei aromatic., of which one teaspoonful may be given every two hours, if the case so requires; this combination is of special value where stomach or bowel symptoms are also present. Combined with ammonia we have the ammoniated tincture of valerian, of which 5 to 10 c.c. (3j to 3iij) may be given; a much more elegant preparation is found in ammonium valerianate—0.1–0.6 gm. (gr. jss.–x)—which may be given in aqueous solution with the addition of some flavoring tincture. The ammonia combinations are valuable because of their additional stimulating and suggestive effects To obtain the mildest valerian effects, zinc valerianate —0.065–0.15 gm. (gr. j–ij)—may be given. Validol, menthol valerianate, may be given in doses of fifteen to twenty drops; its suggestive effects are good, as well as those of the other valerianic-acid compounds: valerydin (0.5–1 gm.), valyl (0.125 gm.), two or three times daily. Asafetida is also a valuable remedy which has stood the test of experience; it is given in the form of pills, the Pilulæ asafœtidæ of the U. S. P., each containing gr. iij, of which from one to three may be given at a dose. Asafetida is very valuable in the intestinal troubles of hysterics. The bromides must also be used in hysteria, especially for nervous excitability or overtension; they may sometimes also be good against sleeplessness, but upon the whole they are not so valuable in hysteria as in neurasthenia. Occasionally it seems possible, by the use of one or the other of these drugs, for the patient to prevent an attack; but given sufficient provocation, the attack always follows. Medicine is usually of little value during the attack itself; either valerian or asafetida may be tried, as well as ammonia, vinegar, or camphor, held to the nostrils. Neither morphine nor cocaine should ever be given. Some writers recommend ether or chloroform inhalations in hysterical convulsions; I have never found it necessary to do so. The principal thing in the treatment of the attack is that its nature be thoroughly understood; the more sympathy, the more attention, the more care and anxiety bestowed upon the patient the worse and the longer the attack. When the physician is called during one of these attacks he should speak at, not to, the patient; this is done by talking to one of the bystanders, telling him in a loud voice, for the sensorium of the patient may be dulled, that the attack does not mean anything, that it will pass over, and that there is no possible danger connected with it. As for the patient herself, the more she is shown that her condition does not cause anxiety, and that the phenomena of her attack are not interesting, the sooner does the attack disappear. Isolation is of great importance, in a dark, quiet room, to make her feel that she is not being watched, or, as J. J. Graham Brown puts it, "that the comedy is being played without an audience." In the severe forms the same method may first be tried. But more active measures may then have to be used. First in efficacy comes the use of cold water, which should be dashed over the face and head of the patient suddenly and in large quantities. Though a crude and almost cruel method, it is of value because it takes the patient unawares; her entire attention is suddenly directed from her antics to that of a necessary function (respiration), and the result is a long inspiration, followed by more of the same nature, cessation of the convulsions, a flow of tears, as also of urine, and then tranquility.

The condition in which the patient finds herself when she comes out of an attack may act inhibitorily; a hysterical woman does not enjoy having the bed, her pillows and her linen, her clothing, in the condition she finds it after this treatment has been applied, for her sense of theatrical *mise en scène* is very acute.

In these cases *electricity* in the form of the faradic brush may also be used. Counterirritants, especially when combined with suggestion, such as the necessity of shaving the head or the possibility of a scar being produced as the result of the counterirritating procedure, sometimes do much good. Pressure upon hysterogenetic points—the ovaries, the stomach, the heart, the vertebræ—does good in a limited number of cases, but in a large experience with hysteria, I have seen only two cases that were benefited in this way.

We find, not infrequently, that one or other of these various methods is of benefit for a limited time, the patient going the round of doctors and enjoying the pleasure of semi-invalidism to its fullest extent. There are no other methods to be used; she has been put through the rest cure without any result, she has traveled here and there to consult eminent physicians, she has exhausted the patience of her friends and caused financial loss, possibly disaster. She comes home and again consults a physician, who tells her that she must undergo a rest cure, which under all circumstances is the best treatment for hysteria. "But," the patient will answer, "I have done so with this and that physician, and so and so often, and it has never done me any good." Then the physician will explain to her that there are rest cures and rest cures; that the method which he proposes differs somewhat from those that have been applied, in that her case has become chronic. After the patient has consented, the physician secures the assistance of the most trustworthy and capable nurse he can find; he places the patient in an institution in which all his instructions will be carried out, and he uses all the suggestive mechanisms and effects at his disposal. Sooner or later, if this fails, the patient will fall into the hands of some one whose suggestive methods are completely successful; we see this constantly in daily practice. The profession is in error in making light of their successes; it will be wise for us to give more time and attention to suggestive measures, the use of which is just as necessary and just as legitimate as that of drugs.

EPILEPSY

Prophylaxis.—Prophylaxis is, in the nature of things, applicable only to a limited degree. In the first place, the question must be taken into consideration whether an epileptic may marry and procreate his kind. This has been settled by legislative acts, which as a rule have their incentive in some advice given by professional men. There is no doubt of the fact that epilepsy is transmitted by heredity; how it is transmitted and to which one of the offspring no one knows, nor are we likely to know until the laws of heredity have been worked out for the human being. For the same reason the question of the frequency of hereditary epilepsy cannot be answered by statistics. The only way in which we can answer the question whether an epileptic should marry or not is by taking into consideration the individual case. It is well accepted that epileptics who marry need not of necessity procreate epileptics;

in my experience I know of three instances in which epileptics have had healthy children. One of these cases is especially interesting, as I have been able to observe three generations. Here the first case, in a male, was one of acquired general epilepsy; of his twenty-four descendants not one was affected, and only one female was neurotic, a family history, so far as nervousness is concerned, of which nearly any family might be proud. Those epileptics should not be advised to marry who have congenital or early epilepsy—i. e., that form which comes on during the developing period of nerve structure. This form is determined by the occurrence of epilepsy in the family history. But even here exceptions occur, so that there has been added, in order to make the indication more positive, the existence of degenerative evidences in the family. Acquired epilepsy is, *per se,* not a contraindication to marriage. By acquired epilepsy is meant that form of epilepsy in which the lesion is formed after the nerve structure has completely developed. We need not say here that in this form the chance of hereditary transmission is very small, yet there is a chance of it. Under all circumstances the passage of a law interdicting the marriage of all epileptics should be looked upon as an injustice. Even where these laws are in force they are not obeyed, so that more harm than good is done by them in that these patients do not even take advice from their physicians.

The other mode in which prophylaxis may be of service is in the case of neurotic hereditarily predisposed children. Here, in addition to the precautions to be observed in neurasthenic children (v. Neurasthenia), special prophylactic measures are to be advised. In these children all those things should be avoided that increase reflex irritability; therefore attention should be given to the diet, the care of the skin, the prevention of masturbation and of various other irritations. A child of this kind should not be sent to school; the confinement, the competition, the mental exertion lead to functional nerve troubles. In addition, the chance of trauma is much greater at school than at home, and trauma, fright, and great excitement frequently produce the first attack. If such a child can be prevented from having an attack until the period of puberty has been passed, much will have been gained. While the child is kept from school, it should nevertheless be taught; if the child is precocious or intellectually gifted, care must be taken not to stimulate mental activity; if, on the other hand, the child is dull and below the average of his age, he should not be worried and nagged. The management of these children should be given over to especially prepared attendants who combine pedagogic training with knowledge of handling epileptic children. These children should never be subjected to corporal punishment; it is not good for them, and occasionally cases are brought to public notice in which the first attack of epilepsy followed, and therefore was supposed to be due to, corporal punishment applied by a teacher. Febrile diseases should be treated very carefully as to the temperature, for degrees of temperature, or their cause, which are of no importance to normal children may produce convulsions in neurotic children. The early recognition and proper treatment of rickets, because it predisposes to convulsions, is also of great importance.

In the young adult the prophylaxis is the same as the hygienic treatment.

TREATMENT.—Before this subject is taken up special attention must be called to the fact that there is no specific method of treating epilepsy, and this for the reason that, as far as we know, there is no specific cause to be removed. The causal treatment may or may not be successful; indeed, it is so in only a small percentage of cases. For the treatment of the disease itself we are practically confined, as an indication, to the reduction in number and intensity of attacks or to their causation. As we know very little of the causation of the disease and there is some doubt about the causation of the attacks, it follows that the medical treatment of epilepsy cannot be grounded on a purely scientific basis. But it is not only on account of our lack of knowledge of causation that this is the case; pharmacology is also not in a position to give us much definite knowledge as to the action of drugs in epilepsy. For these two reasons our therapy is the result of experience only, and as the causes are not known it must differ with different forms of epilepsy and with individuals. That epilepsy is cured there can be no doubt; but statistics give us no idea how rare this is, as most of these cases have not been observed long enough. There is no question that in a small number of cases epilepsy disappears spontaneously, so that we cannot tell with precision which cases are cured and which cases are self-limited. If to all this errors of diagnosis are added—for at times hysterical conditions are called epileptic—it will be seen how difficult the decision of a cure in epilepsy becomes. To determine the success of a method of treatment the number of attacks may, upon the whole, be looked upon as an adequate measure of the therapeutic result. The patients who are under treatment should have a record, not only of the number, but also of the kind of attacks; by the general condition of the patient and by this record we can be guided as to our therapeutic result.

A. *Hygienic Treatment.*—(*a*) *Education.*—It becomes a very serious question, in some cases, to know how to give epileptic children the proper education so that they may become useful members of society. When the financial status of the parents is satisfactory the question can be solved, as has been done in the division on prophylaxis. With the poorer classes these children receive very unsatisfactory treatment, with the most unfavorable results to the individual. As there are so many epileptics it might seem possible that in each large city one or more schools might be established for the sole purpose of permitting epileptics to have a chance of gaining an adequate education. During the years required for this purpose the one essential thing to be looked to is that the number of attacks is not increased, so that the degree of mental activity which is demanded of the individual should be carefully decided upon by the proper authority. Under no circumstances should excessive mental activity be encouraged.

(*b*) *Occupation.*—We are frequently consulted as to the occupation to be chosen by individuals. In each case we should take into consideration the individual himself, the form of epilepsy, and the possibility of injury during an attack. The individual must be taken into consideration as to his physical and mental characteristics; the form of epilepsy, as to whether the attacks are frequent, nocturnal, petit or grand mal, coming singly or in numbers, followed or not followed by psychical disturbance. For the safety of the patient he should choose such an occupation as is not connected with

large machinery, the working on high places, with chemicals, and so many other occupations which may be connected with risk in case he has a fit while at work. Yet we see epileptics in nearly all walks of life, who do excellent work and who do little or no injury to themselves and to others.

(*c*) *Rest.*—It is more important to the epileptic to have rest than to most patients with nervous affections; his nervous state is that of instability; when temporary stability is established, fatigue, which always implies more wear and tear, easily causes its disestablishment. These patients should take care that they always have sufficient physical and psychical rest. In regard to the latter, care, worry, anxiety must also be taken into consideration whenever possible. As a therapeutic measure, rest in bed is invaluable. In the severe forms of epilepsy—severe for one reason or another, but principally on account of the frequency and intensity of the attacks—rest in bed is one of the most important adjuvants to therapeutic success. Sometimes it becomes necessary to put these patients through a modified rest cure. The *status epilepticus* always requires that the patient should be put to bed.

(*d*) *Exercise.*—This should be directed to the prevention of overexertion and of injury. The various forms of exercise that may do harm suggest themselves without further detail.

(*e*) *Diet.*—The diet should be prescribed on the principle that peripheral, as well as central, irritations should be prevented. For the first we must take into consideration the digestive processes in the whole gastrointestinal tract in so far as they may produce improper afferent impulses; therefore attention must be paid to those ætiological factors that produce direct irritation, such as foreign bodies, distention, indigestible material, increased quantity of food, etc. In the larger number of cases it is not a peripheral, but a central irritation that arises from the gastrointestinal tract, in that bodies are absorbed which irritate the central nervous system. Even in those cases (which to my mind require further study) in which epilepsy and intestinal worms are found, the toxic body formed by the worm increases the number of attacks, in all probability. As I have studied my epileptic patients, I find that the question of chronic intestinal autointoxication (q. v.) is of the greatest importance in reducing the number of attacks. In one of my cured patients, who has had no attack for thirteen years, this seemed to be the direct cause of the trouble. It was known to Heberden that meat diet was not good for epileptics. Hughlings Jackson also insisted upon the necessity of restricting nitrogenous food; at present all modern authors agree upon the importance of restricting the quantity of meat taken by epileptics. Meat can act badly only in one way, not by producing digestive disturbances, but by the production of autointoxication. The diet should be that recommended for gout and chronic intestinal autointoxication. It goes without saying that the diet must be such as is adapted to the individual needs and peculiarities; some will be found who cannot get on without meat; some can become vegetarians, others not; and many other individual peculiarities exist. If in such patients the physician insists upon disregarding those peculiarities, he does it at the risk of doing harm. All stimulants should be avoided; this is especially the case with alcohol; but coffee, cocoa, and tea should also be refrained from, on the principle of their stimulant as well as their toxic activity. This toxic activity lies in the active principle, which is allied to the xanthine bodies found in

the urine; their stimulant effect is most marked in the use of caffeine; cocoa, containing theobromine, is least harmful; it may therefore be given to these patients in small quantity, provided it does no harm to the digestion. Tobacco may be used in moderation, for as a rule it does not excite, but quiets the patient.

(*f*) *Suggestion.*—The patient should be kept as cheerful as possible, and no one can contribute to this more than the physician. Patients as a rule know that their ailment is incurable, therefore it is not necessary for the scientist who is disguised as a physician to say much about this phase. The real physician will encourage these patients by showing them how the attacks have diminished in frequency and intensity, and in this way will keep up their courage. The depression is worst after an attack; the patient shows by his expression of abject hopelessness and depression what has happened. At this time, especially, the chart which has been made as to the time, the number, and intensity of attacks will be very helpful; for after all most cases of epilepsy can be helped in this direction. I have no experience with other forms of suggestion; the assertion has been made that patients have been cured by hypnotism, but I am not aware that it has been verified.

In all other directions the hygienic treatment of these patients is the same as that of healthy subjects.

B. *Causal Treatment.*—In syphilis that form of epilepsy due to gumma (not primary epilepsy) is relieved by antisyphilitic treatment; when the epilepsy is due to the syphilitic virus or is a parasyphilitic trouble the outlook is not so good, but under all circumstances syphilis should be treated. In alcoholic epilepsy the mere withdrawal of alcohol is sufficient to give relief, unless the alcohol has produced organic changes. In arteriosclerosis, which accompanies or follows alcoholism and syphilis, the proper treatment must be instituted. In a number of cases I have seen benefit follow; even in senile epilepsy this has been the case. I have never been able to convince myself of the existence of a reflex epilepsy, though I have been hunting for cases of this sort since the beginning of my medical career, and therefore I do not believe that removal of a peripheral irritation will cure epilepsy. That the number of attacks may be materially reduced by the reduction of improper afferent impulses has already been stated; that a case of epilepsy has been permanently cured in this way is doubtful, because the predisposing cause has not been removed. I believe, however, that all sources of peripheral irritation should be removed in epileptics: those in the eye, ear, and nose, the genitourinary tract, the gastrointestinal canal, and those due to traumatic causes. The surgical treatment of the cause will be found below.

C. *Medicinal Treatment.*—The bromides are the most valuable of all the remedies recommended. Whatever be the method of treating epilepsy, it must be borne in mind that the earlier the treatment is begun after the first attack has occurred the better will be the result. The combination of bromine with any base may be used; potassium, sodium, ammonium, strontium bromide are all used. Hydrobromic acid and bromipin are also recommended. Of the salts, potassium bromide is the one principally in use, and is the most effective. Some prefer combinations of ammonium, sodium, and potassium, which here seem to offer no advantages over the potassium bromide alone. The objection that the potassium ion depresses the heart can be waived here, as in the

human being the depression does not seem sufficient to do harm, and furthermore this depression also affects the nervous system beneficially, as far as our present purpose is concerned. Strontium bromide affects the digestion less, but is absorbed more slowly; I have had no experience with it in the treatment of epilepsy. The bromides are used alone or in combination with other drugs. When we begin the treatment of epilepsy with the bromides we should be prepared to continue it for a long time, possibly for several years or longer. In order to do this it is necessary to try to counteract or to prevent the development of certain symptoms which would render it impossible to use this drug, for it benefits from ninety to ninety-five per cent of all epileptics. For this purpose cleanliness of skin should be prescribed: daily bathing and the use of a nonirritating soap. We commonly receive the advice that arsenic should be given with the bromide, in order to prevent the skin manifestations of bromism; I have never found an instance in which I could satisfy myself that arsenic acts either prophylactically or curatively here. The bowels must be thoroughly evacuated daily, for in this way some of the symptoms on the part of the gastrointestinal tract may be prevented; the bromine is partly eliminated through the alimentary canal, and as it produces irritation here the sooner it is removed the better. Cleanliness of the gums and mouth must be insisted upon (v. Stomatitis). The dose should not be larger than is necessary to reduce the number of attacks to the minimum possible for the individual case, and the bromide should always be given well diluted. The dose with which one should begin treatment in an adult is 4 gm. (℥j) in a day, given in divided doses, 1 gm. (gr. xv) every four hours. An exception to this rule is found in those rare cases in which the attack comes at the same time every day; here a large dose—2–3 gm. (gr. xxx–xlv)—should be given from two to three hours before the attack. When the bromide has been given for four or five days without any effect upon the attacks, the dose should be gradually increased, so that 5 gm. (gr. lxxv) are given in a day, then 6 gm. (℥jss.), and so on, until the limit of dosage which is supposed to do good has been reached, or the development of bromide symptoms makes it imperative to stop this method of treatment. This limit of dosage has been expressed differently by different authors, but it does not exceed 20–30 gm. (℥vj–℥j) a day for adults, and from 2 to 4 gm. (℥ss. to ℥j) for children; when this does no good, bromide therapy is useless. Féré states that when the organism is saturated with bromide (and this is shown by the presence of its physiological effects), and the attacks do not cease, the bromides will do no good. The best results are obtained, according to Gowers, when it is not necessary to give more than 4 gm. (℥j) daily. After the maximum effect has been produced, the dose should be reduced to find out the minimum dosage which will control the attacks. The bromide must be given for at least one year after the last attack has taken place. The bromides should be given to every patient with epilepsy; they fail most frequently in epilepsy developing late in life, but there is quite a large number of patients in whom this therapy is useless, on account of the fact that it cannot be carried out. One method of giving the bromides, especially recommended by Richet and Toulouse, must be referred to. It consists of dechlorhydration while the bromides are taken. The dechlorhydration need not be so complete as in nephritis (q. v.), from 3 to 5 gm. of NaCl a day being permitted. As a

result of experience it has been shown that smaller quantities of bromides are required when dechlorhydration is carried out; the theoretical explanation has been offered that NaCl inhibits the activity of the bromide in the central nervous system or that the one displaces the other by substitution. I have found partial dechlorhydration valuable in the treatment of all epileptics, irrespective of the drugs that are taken; from experience, also, we know that those articles of diet which contain the least quantity of NaCl are the best for epileptics. The reasons for this are to be found in the effect of NaCl upon osmosis, not the least important effect being that upon the kidneys.

A number of combinations of other drugs with bromides are recommended, especially antiepileptics or hypnotics; digitalis, adonis vernalis, camphor, belladonna, stramonium, opium, codeine, chloral have been recommended. Digitalis, adonis vernalis, camphor, stramonium may be combined with bromide for combined indications; otherwise their administration together is of very little value. The combination of chloral hydrate with the bromides is invaluable in nocturnal epilepsy, and, so far as my experience goes, there is no danger of the production of a chloral habit, as the dose of chloral need not be increased. The use of atropine and bromide, as recommended by Moeli, has not been followed by satisfactory results. On the other hand, Flechsig's opium-bromide treatment does give positive effects. As it has been accepted by a large number of authors, as it succeeds when the giving of bromides alone fails, and as the benefits derived from it are more lasting, it deserves detailed description.

In using this method, opium, not morphine, is given, so as "to prepare a more favorable basis for the treatment with bromides" (Binswanger). Opium is given for six weeks, at first 5 cgm. three times daily, to be increased every two or three days by 2 or 3 cgm. until 1 gm. is given during a day. When 0.5 gm. a day is reached, the patient must be put to bed and watched as to the effects of opium; these are all the usual physiological and toxic effects, the latter making it necessary to interrupt the treatment at times. When the full dose has been given and the full effects produced, the opium must be suddenly withdrawn, and in its stead large doses of bromide should be given—6–8 gm. (℥jss.–ij) daily. After this the bromides should be given as recommended when they are given alone. This method should not be used unless the patient can be kept under constant observation, for the giving of such large doses of opium, and their sudden withdrawal, may produce dangerous, even fatal, symptoms. In addition, the question of feeding, general hygiene, the prevention of bromism are all of such great importance that especially trained nurses are necessary. The great objection to this method is the mortality that follows its application (nearly four per cent). Binswanger recommends the method as giving the best results in young persons (children and youths) with the following doses: To children under six years, 0.01 gm. (gr. $\frac{1}{6}$) of opium a day, to be increased to 0.12–0.15 gm. (gr. ij–ijss.); to children between six and twelve years of age, the same initial dose to a maximum of 0.3–0.4 gm. of opium daily; to those from thirteen to sixteen years, a daily maximum of 0.6–0.75 gm. I should be afraid to give such large doses of opium to a young child. As the danger in this treatment lies in the production of toxic symptoms, in the sudden withdrawal of opium, and in the flooding of the system with bromides, it will be seen that one prerequi-

site for its use should be that the patient is robust; for, in addition to any possible individual peculiarities, it takes a very robust individual to go through opium intoxication, sudden withdrawal, and finally a possible acute bromide intoxication. For these various reasons this method cannot become, and has not become, a method to be used in every case of epilepsy. It is of value in those extreme cases not to be helped by other means, and in such as are inveterate.

Numerous other remedies are recommended for the treatment of epilepsy, and they are put into a class called antiepileptics, for the administration of many of which no reason exists except that they have been found of value by experience. As about one hundred remedies have been given in epilepsy, it is impossible, and unnecessary, to enumerate all or many of them, especially as the number of those that are of value is reduced from year to year more rapidly than new ones are added to the list. Silver nitrate, given in ascending doses (v. Locomotor Ataxia), is undoubtedly of value, though it is rarely prescribed nowadays, on account of the argyrosis. The zinc salts are beneficial also, when given in the proper way—i. e., in ascending doses. My favorite remedy after bromide treatment has failed is zinc valerianate, of which I give as much as twenty grains three times daily, beginning with two grains three times daily. I have never obtained any results from valerian alone; its effects, however, have already been referred to in connection with hysteria. Belladonna and atropine are also prescribed in ascending doses until physiological effects are produced. Gowers recommends borax—0.3–0.6 gm. (gr. v–x). Picrotoxin, in doses of from 0.5 to 1 mgm. (gr. $\frac{1}{130}$ to $\frac{1}{65}$) in the day, has given good results in some cases. Tincture of simulo occasionally does good, especially in petit mal. Curare should not be used except in desperate conditions, because of the difficulty in dosage, aside from the fact that from its physiological effects it does not seem a reasonable remedy in epilepsy. Chloral hydrate and amylene hydrate (3–5 c.c.—℥ xl–lxxx) are valuable when a number of attacks follow one another rapidly, as also in nocturnal epilepsy. Besides these may be mentioned antipyrine, formin, the nitrites.

D. *Surgical Treatment.*—In primary epilepsy very little can be expected from operative intervention, though many operations have been recommended, such as excision of the superior sympathetic ganglia, ligation of the carotid and vertebral arteries, trephining. Any operation will be of temporary benefit to these patients provided it produces a sufficient central effect, which as yet cannot precisely be defined. Even circumcision may at times be temporarily beneficial; certain it is that in every epileptic male child this operation is recommended by some one or another. In the so-called reflex epilepsy, due to cicatrices or tumors, especially neuromata, operations should be performed, because as a rule they are without danger, and in some instances give relief. We may be guided as to the relation of cause and effect by the following considerations: when the aura starts from the lesion supposedly producing reflex epilepsy, when the spasms begin there and become general, or when pressure upon the lesion brings on an attack. But even with these guides, we are never in a position to say anything about the condition of the central nervous system; if the epileptic condition has been established, then all peripheral interference is followed by only temporary results. In symptomatic

epilepsy due to central lesions surgery alone can be of service, as the medical treatment is only of very temporary value. But operations should be performed only in cortical or Jacksonian epilepsy, especially when due to tumor, and in traumatic epilepsy. Here, again, the formation of the morbid epileptic habit prevents permanent success, except in a small percentage of cases. In traumatism, especially, much could be done prophylactically by the proper treatment of wounds and injuries of the head.

E. *Treatment of the Attack.*—Many things are recommended to prevent an attack; as a rule, the patient has worked out some method by which this is attempted. It usually consists of some means of preventing the afferent impulse which is called the aura from reaching the central nervous structure; some mechanical interference applied between the origin of this impulse and the center. If it is a mental aura, concentration of mind upon some other current of thought; substitution of pain by pressure upon sensitive spots (exit of the branches of the trifacial nerve, for instance) for the aura; the application of cold to the head, or peculiar combinations of muscular contractions—all, in individual instances, may prevent attacks. Inhalations of ether, chloroform, amyl nitrite, and other substances have been recommended to prevent the attack; aside from the possibility of their increasing the number of the attacks, their action is most frequently too slow to do good. During the attack nothing can be done except to prevent the patient from hurting himself. As soon as the attack begins he should be placed in a comfortable attitude—best upon his back; his clothes should be loosened, a cork or a wedge should be placed between his teeth, and restraint should be put upon his movements to the degree that he does not hurt himself by producing contusions. During the convulsive stage care must be taken that the patient is not suffocated, either by foreign bodies getting into the trachea or by the tongue dropping back upon the glottis. In nocturnal epilepsy this danger is always present unless the patients are under observation every night; but fortunately it is a very rare occurrence that patients are strangled by their clothes or suffocated by the pillow or bed clothing. After the convulsion is over the patient should be allowed to sleep quietly or to rest; the time it is necessary to rest differs with the individual; no rule can be laid down here, or as to the length of time the patient should refrain from mental activity. For the attacks of psychical excitement the vasodilators, bromides, and peripheral irritants have been recommended. The treatment of serial attacks or of the *status epilepticus* consists primarily in causing the convulsive seizures to stop; all peripheral or external irritations should be avoided; therefore the room should be dark and quiet, there should be quiet attendants, and as little disturbance as possible. Chloral hydrate, either by the mouth or by the rectum, is the best remedy; in the serial attacks vasodilators have also been recommended. For the feeding of these patients it is frequently necessary to resort to gavage.

INFANTILE CONVULSIONS

The question of infantile epilepsy is not to be considered here; in practice, infantile epilepsy is frequently mistaken for simple infantile convulsions. Infants and young children easily have convulsions, because, as Soltmann has

shown, inhibition is but imperfectly developed. This alone is a sufficient predisposing cause; if, however, there is added a neurotic inheritance, we have a child which from small irritations or direct causes will react by a convulsive seizure more or less like an epileptic attack.

TREATMENT.—For the treatment we must take into consideration the removal of the cause and the treatment of the attack. The direct cause can be found either in general or in local conditions. For the general conditions we must take into consideration the proper treatment of rickets, anæmia, malnutrition, and certain toxæmias which result in high fever; indeed, we must consider high fever itself, from whatever cause. For the local causes, disease of the brain and reflex conditions must be taken into consideration. At the time of an attack it will be seen that only the fever, the toxæmia, and the reflex causes can be treated. For the fever the best thing is hydrotherapy—a lukewarm bath, into which the child is put as soon as possible without waiting to remove the clothing; sometimes it is necessary to give a small dose of antipyrine; if it cannot be given by the mouth, it may be given hypodermically. The toxæmias, arising as they do from the gastrointestinal tract, should be treated by the administration either of an emetic or of a cathartic. In the place of the emetic, lavage of the stomach, or of the cathartic, lavage of the intestine, may be substituted; at all events, one of the most important indications, whether we look at the gastrointestinal cause as acting by production of toxæmia or of abnormal reflex activity, is to clear out the gastrointestinal tract. Gastric remedies are used only when there is evidence that there is something left in the stomach, or to facilitate elimination by the stomach. Uræmia should be treated as recommended in the chapter on Diseases of the Kidneys. The peripheral reflex origin of infantile convulsions is very commonly accepted as being the most common cause; if there is an irritating peripheral cause it should be removed, but the effect of its removal is the same as that referred to in connection with reflex epilepsy (q. v.). Great care must be exercised here; in the case of an infant having had convulsions a few times, it is not necessary to recommend operative interference—circumcision, the removal of adenoids, etc.—certainly not except as a *dernier ressort*. The most common causes for infantile convulsions are not the peripheral, but the general, especially rickets and fever.

Treatment of the Attack.—The only indication is to stop the convulsion. Sodium bromide should be prescribed—0.3 gm. (gr. v) every two hours—while the preparations are making for the warm bath or the causal therapy is being carried out. If the convulsion does not cease, or returns, chloral hydrate should be administered, either by the mouth or by the rectum; as children bear this drug in large doses without ill effects, it may be administered with a liberal hand. In young infants, 0.1 gm. (gr. jss.) is given by mouth or rectum, and repeated in a short time. John Thomson gives 0.3 gm. (gr. v) of chloral hydrate by the rectum to a child of six months, and 0.6 gm. (gr. x) to a child aged ten months. If the convulsions do not cease, inhalation of chloroform should be tried. Compression of the carotids has succeeded in controlling convulsions where there is present hyperæmia of the face or a tense fontanel; lumbar puncture has also been recommended here. I have never used hypodermic injections of morphine in infants for fear of danger.

TETANY

TREATMENT.—A. *Causal Therapy.*—In the adult, as well as in children, it should be seen that sanitary conditions as to ventilation, cleanliness, and food are of the best possible nature. In the adult the treatment of the cause lies in that of gastrointestinal troubles; gastrectasis has been found in a number of cases, and frequently intestinal autointoxication. In these cases the elimination of toxines should be tried, the treatment of the organic disease which underlies the toxic condition being reserved for a subsequent time unless both can be carried out together with advantage to the patient. As the direct cause of the attack is most commonly some toxine, its elimination by the skin, kidneys, or bowels, or the rendering of it less active by dilution of the blood, as in all toxæmias (v. Septicopyæmia), is of the utmost importance. When tetany develops as the result of thyroidectomy, thyroid feeding must be instituted, though usually with little chance of success. In pregnant women, the necessity of bringing on premature labor must be taken into consideration. It is doubtful if the treatment of the infections will have any influence on the development of tetany. In children, rickets and gastrointestinal diseases are of most importance. Phosphorus treatment, as recommended for rickets (q. v.), is of the greatest value, for tetany is frequently found combined with laryngospasm and convulsions, and its value in tetany is the same as in laryngospasm. The treatment of the gastrointestinal condition is that of the adult with those modifications required for children.

B. *Symptomatic Treatment.*—Here any antispasmodic may be tried; strictly speaking, any remedy which has a soothing effect upon any part of the reflex arc. For this purpose the bromides, morphine, chloral hydrate, hyoscine, and curare have been recommended. Pilocarpine and sweating have also been used. In the epidemic form large doses of quinine have sometimes given good results. Electricity has been recommended by Strümpell—the ascending galvanic current to the affected nerves and galvanization of the spinal cord.

CHOREA MINOR (Sydenham's Chorea)

The views expressed about the cause of this disease, aside from a neuropathic predisposition, may be expressed under the following headings: (1) That it is a specific infection or intoxication. (2) That it is an autointoxication. (3) That it is a sequel to infections and intoxications produced by the special infection. That there is a connection between rheumatism and chorea has been established; that chorea follows other infections has also been demonstrated; that there is a specific chorea bacillus or toxine has not been demonstrated, although there are clinical evidences to that effect. There is no evidence that chorea is due to autointoxication. These infections, including rheumatism as an infection, or intoxications affect certain parts of the central nervous system, producing functional changes, possibly permanent anatomical lesions. This brief statement, with the many things left unsettled by scientific investigation, will show that little help can be expected from it for the purpose of treatment beyond the fact that chorea is due to an

infection or intoxication. In a large percentage of cases chorea is self-limited, therefore the results of medication cannot be accurately measured; this fact explains the great number of remedies that have been recommended in the treatment of the disease—in all about sixty. Yet whoever has had a large experience in the treatment of chorea must admit that he has had good therapeutic results.

However skeptical one may be as to the curability of chorea, there is no doubt that the duration of the disease may be lessened, the intensity of symptoms diminished, and the mortality reduced. If in the future any specific cause of chorea is found, we may confidently look for the discovery of a specific treatment.

Prophylaxis.—The prevention of this disease is not possible as to the first attack. Formerly, when we accepted an imitative form of chorea, the rule was laid down that in girls' schools no pupil should come in contact with choreic patients. While this rule still holds good, we are preventing, not chorea, but hysteria. The prevention of recurrent attacks, on the other hand, is of great importance. The lines to be followed here are: obedience to all those precepts which make for good general health; the treatment of anæmia, usually of the chlorotic type; the prevention of psychical overexertion or the action of strong mental emotions, and the prophylaxis of infectious diseases. In a number of cases pregnancy may be looked upon as the cause; the pregnancy usually terminates in abortion, but as these attacks are apt to be grave, it may be necessary to advise against procreation.

Treatment.—For the purpose of treatment I divide chorea into mild and grave, the dividing line being that in the mild form there is only diurnal chorea, in the grave form both diurnal and nocturnal muscular contractions. While this division, like all general divisions, cannot be true for all cases, yet every case of chorea in which the muscular movements do not cease throughout the twenty-four hours must be looked upon as grave; on the other hand, there are severe forms, on account of the frequency, character, and intensity of the movements during the day, in which the patient sleeps without muscular activity, but these cases are comparatively rare.

In all cases of chorea the patient should be taken from school. This is absolutely necessary, not only for the good of the patient, but for the welfare of the school. That it may become a hardship to the patient cannot be denied, but it is only a temporary one, and time is saved by keeping the patient from any exertion, mental or physical. When improvement has advanced sufficiently, the muscular contractions usually ceasing last in the muscles of the tongue, private instruction may be allowed. As to food, hygiene, rest, the general treatment is the same as that of other neuroses.

The Mild Form.—When the patient is afflicted to the degree that locomotion, prehension, and other voluntary efforts become almost impossible, he must be kept in bed, with padding of the bed and the other necessary precautions so that he cannot injure himself. When this is not the case, rest in bed is not necessary unless there is chorea in a hysterical child, which, especially in private practice, I find a common occurrence. In a number of these cases, in order to get a perfect result in the shortest time, the isolation treatment of hysteria should be insisted upon. In all cases any external irritations should be removed, and if possible prevented. The *food* should

be of such a nature as to be easily digested, nutritious, and nonconstipating, with plenty of milk, meat once a day, cream, butter, wheat or other breads, cereals, all the easily digested vegetables, fruit, few sweets, no animal soups or broths, no coffee, tea, cocoa, or alcohol. The child should be in the open air as much as possible with a nurse, and kept away from his playmates, as muscular and mental activity are both harmful. *Hydrotherapy* may be used; it is especially valuable in cases that are protracted and which do not yield readily to medicinal treatment. I prefer a half-bath of short duration (three minutes), given morning and evening. *Electricity*, given in any or all forms, has never been followed by any good results in my experience.

The sovereign remedy for chorea is arsènic, but it must be given in the proper way; when this is not done, the therapeutic results are by no means good. I have repeatedly seen patients improve upon this method who have taken arsenic for months in other ways without benefit. Arsenic must be given in ascending doses until physiologic effects are produced, then in descending doses where possible. The dosage which I prescribe is as follows, beginning, according to the age of the patient, with half a drop to two drops of Fowler's solution, well diluted, three times a day after meals. After the dose, let us say two drops, has been given for three days, I add one drop for the dose after the heaviest meal for the fourth day; on the fifth day, in addition one drop is added after a second meal; on the sixth day one drop is added after every meal. The patient is now taking three drops three times daily, and must then be seen by the physician, who, if he finds no untoward symptoms, orders an increase from three to four drops in the same manner as was done from two to three drops. This is continued until the maximum is reached without the production of serious toxic symptoms. As soon as the lids become puffy or gastrointestinal symptoms develop, the dose should be reduced. The maximum dose, according to this method, depends entirely upon individual peculiarities of the patient; as a rule it is possible to give ten drops three times daily; sometimes fifteen drops can be given. In order to prevent gastrointestinal symptoms it has been advised to add opium; this should be done only in those rare cases in which the first few drops produce pain in the stomach or diarrhea. Attention has been called to the occurrence of peripheral neuritis, as a consequence of arsenical treatment; while there can be no doubt that this does occur, it is so rare in connection with arsenic therapy that it need not be considered—at least not at present, when we have no other remedy which will take its place. Hebra, in his whole experience (extended over thousands of cases), never saw any bad effects from arsenic. If the physician will watch his patient while administering arsenic the toxic effects may be reduced to a minimum. Other forms of arsenic have also been used—sodium arsenite, iron arsenate; the former, Fowler's solution, and sodium cacodylate have been used hypodermically. None of these offers any advantages over the method described; in children, especially, it is inadvisable to use arsenic hypodermically; in the chorea of adults this method of administration may be tried.

Arsenic is not, however, an infallible remedy for chorea, and even in the mild form it becomes necessary to use other remedies. Antipyrine is foremost among these; it is well borne in children without fever, it lessens the muscular activity, gives relief to pains in the joints and limbs; it is

doubtful, however, whether it shortens the attack or prevents relapses. It should be given in large doses, about 0.5 gm. (gr. vijss.) a day for each year of age. If no effects are produced after from two to three weeks it is not necessary to increase the dose or to continue the medication. With these doses the least evidence of intoxication must be sufficient to cause the physician to withdraw the remedy; exanthemata, vertigo, faintness, vomiting may be looked upon as the milder evidences.

Salicylic acid and its compounds are also used, like antipyrine, as a causal remedy against rheumatism. When there are rheumatic symptoms the salicylic acid does good, both to the joint symptoms and to the chorea. The routine use of salicylic acid in chorea, as sodium salicylate, however, is not followed by good results. Salol, salipyrine, salophen, salacetol, salicin, salicylamide, aspirine, and many others, are recommended instead of salicylic acid or sodium salicylate. In this form the use of narcotics is not called for, as these patients sleep thoroughly well; in the grave forms they are indispensable.

The Grave Form.—Here we have a different problem altogether from that presenting itself in the previous form. We are confronted with a group of symptoms the presence of which causes the patient to be in a very serious condition. Because of the incoördinate, violent, and constant muscular contractions, the patient is in danger of traumatism, of exhaustion. Traumatism should be prevented by padding the bed of the patient. One not uncommon accident is to see a patient bite a piece out of a glass tumbler when drinking and cut his lips or his mouth. No breakable dishes should be used, and the patient should be fed in such ways that no harm can come to him. The exhaustion, which may end fatally, is the result of constant muscular activity, which produces increased metabolic waste from fever and destruction of albumins as well as of glycogen and fats. As the patient, moreover (again on account of these peculiar muscular contractions), cannot be fed properly, there is no chance of a metabolic equilibrium being maintained. Autointoxication, as the result of this improper metabolic mechanism, may also occur. Another danger to life is found in the frequency of pneumonia, the result of aspiration or of swallowing foreign bodies.

The vital indication, then, in this form of chorea is to stop these choreic movements. This can be done by a narcotic whose activity can be maintained for some length of time without injury to the patient. In pregnancy it may be accomplished by the production of an abortion or the induction of premature labor. We owe to Bouchut the formulation of a method by which these patients may be cured; it is based upon the principle that the movements frequently cease when the patient has been kept profoundly asleep for from two to three days. The drug, which was first recommended by Gairdner in chorea, is chloral hydrate. Bouchut was the first to insist upon the fact that children can take large doses of chloral with impunity. In order to carry out this method, the child (I have never tried this method in the adult) should either be taken to a hospital or, if kept at home, be placed under such conditions that he can be watched day and night. The feeding now should consist only of fluid food—milk, broth, eggs—which must be given at regular intervals in sufficient quantity, the child being given water when necessary. All precautions should be taken as recommended for the mild form. Chloral is given—0.3 gm. (gr. v) every four hours the first day; the

second day, 0.15 gm. (gr. ijss.) are added to each dose; the next day the same quantity until the proper effect is produced. This proper effect consists in keeping the patient asleep until the choreic movements have ceased for about twelve hours. When any digestive disturbances or heart symptoms are produced, the treatment must be interrupted. It is impossible to state how long a time it will require to carry out this treatment, and how much chloral must be given, as both requirements differ in individuals; one of my patients, aged nine years, took 8 gm. in the course of a day. In my experience, this treatment has always resulted in one of two ways: either the child wakes up cured—i. e., without any form of chorea—or the grave form has been converted into the mild form.

The objection has been raised that the administration of chloral is very dangerous in this disease, because chorea is so frequently associated with heart disease. When the use of chloral is confined to the grave form the mortality from it cannot be so great as from the chorea, as this form frequently ends fatally. This drug should not be used in the mild form, certainly not as recommended here, it being unnecessary; but in the grave form, in which the mortality is great, the possible chance of serious chloral intoxication cannot be taken into consideration. By gradual increase in dosage, as recommended, and by watchfulness, unpleasant or serious results from the drug can be avoided—at least this has been my experience. If the chorea is stopped, the patient should be kept in bed until his general health is approximately normal and all evidences of nervousness have disappeared. When the form has been changed, the same indications remain; here, as elsewhere, arsenic, iron, or nux vomica may be added to the treatment. When chorea persists, as a continuation of either the grave or the mild form, attempts have been made to exercise will control of muscle by gymnastics. The exercises should be performed at command from some person in authority as respects the patient, and should consist of such voluntary movements as are calculated to improve direction, speed, and force. Resistant passive movements are also valuable.

PARALYSIS AGITANS

Treatment.—There can be no prophylaxis here, because we do not know the cause of the disease. We also have no remedy for this disease. All that can be done is in the way of *symptomatic treatment.* Everything that will keep the patient in the best possible physical and psychical condition should be recommended. As the tremor is increased by fatigue, anxiety, worry, and excitement, the routine life of these patients should be regulated so that these may be avoided. In the majority of cases, unless interdicted by the condition of the patient, moderate exercise in the form of walking is not only agreeable, but also beneficial. These patients should have diversion, which must vary with the mentality and physical condition of the individual. It is a great mistake to insist upon the patient's giving up his vocation; let the patient do this when he can no longer follow it; if he is fortunate enough to find another for which his disability does not unfit him, so much the better. Fatigue must, however, be avoided here, as always. *Electricity* has been applied in all its different forms; it has no effect upon the course of the

disease, but sometimes gives symptomatic relief, and should then be given as indicated.

Massage has also been used; Charcot found that some patients were benefited by the vibratory effects of omnibus rides; vibratory massage may be tried; it sometimes diminishes the tremor. Passive movements may be given. Hydrotherapy may be used, to give relief for the sensation of burning which these patients usually have; cool sponges or baths may be tried. We must not forget the fact that these patients are very responsive to suggestion, so that temporary relief may be given by any one of the procedures just mentioned.

Because the disease is incurable and improvement follows frequently as a result of suggestion alone, the number of remedies recommended is legion. The drugs that are most valuable for the control of tremor are hyoscine, first recommended by Erb, and duboisine, recommended by Mendel. They may be given either hypodermically or by the mouth; for my part, I prefer the latter method, as giving the same results with less disturbance to the patient. Most authors prefer duboisine; the sulphate is given in doses of 0.33 to 0.5 mgm. (gr. $\frac{1}{200}$ to $\frac{1}{130}$) two or three times daily; the same holds good for the hyoscine hydrobromide. The smaller dose should always be tried first, as I have more than once seen disagreeable symptoms arise from the administration of a large dose when given for the first time. The result is magical in some cases, good in most, but negative in quite a large number. Next to these drugs in efficacy comes arsenic, given as recommended in the preceding chapter; occasionally I have seen the tremor cease entirely for a time when the maximum doses were reached. In several instances iodine preparations have seemed of value when they were given for other indications, especially for arteriosclerosis. Veratrum viride, gelsemium, and cannabis indica have also been recommended. I have had no beneficial results from their administration.

Other symptoms that may require attention are sleeplessness and pain. For the former all the usual soporific agents and drugs should be used; opium should be used only when everything else has failed. For the pains, salicylic acid preparations have been recommended, but they are not followed by good results; relief may sometimes be given by antipyrine, phenacetin, or their various compounds and derivatives.

MIGRAINE (Hemicrania, Sick Headache)

As I believe sick headache, in all instances, to be due to a predisposing and a direct cause, the first being in the vast majority of cases a hereditary tendency, the second one of many possible ones, the treatment that I have followed must naturally resolve itself into a symptomatic, not a causal method. Prophylaxis is not feasible; it would be difficult to convince a patient with sick headache that he or she must not procreate, even if it were proper to try to do this.

TREATMENT.—The treatment resolves itself into that between the attacks and that during the attack.

A. *Between the attacks* everything should be done that tends to keep the patient in the best possible condition of health. When possible, the proper

occupation should be chosen for these patients; this should be out of doors and removed from stress, but should be accompanied by healthful and diverting labor. Indoor occupation, especially in badly ventilated spaces or where the air is contaminated, should not be chosen when circumstances permit. As a rule, these patients know from experience what brings on an attack. Some of these causes are rather odd, so that it is impossible to divest one's mind of the idea that much of this trouble is of the nature of autosuggestion. Thus, the taking of certain kinds of food or the abstinence from others; the going or not going to certain places, and many causes of this nature, will bring on sick headaches in certain individuals. Whatever the reason for this connection may be, it has to be taken into consideration; but if the patient avoids too many things, he becomes an invalid; if he avoids a few things too strenuously, he is sure to get a headache whenever he has to subject himself to their influence. It is better for these patients to harden themselves by short exposures to the causes producing migraine in them, and then to immunize themselves, as it were, by longer and longer exposures. Migraine is a hard master: careers have been modified, even spoiled, by it; v. Scheffel, who himself had migraine, in his great novel has a king lose his throne on account of it. It is therefore necessary in every instance to study the peculiarities of the individual, to make due allowance for them, and, unconsciously to the patients, to try to affect them so that they may not act harmfully. One thing that most commonly produces attacks is bad air. Clean, fresh air should be sought by these individuals; they should be out in the open air as much as possible and sleep with open windows. Daily *exercise* of some kind should be encouraged; there is no special indication to be fulfilled here; any form agreeable or possible may be advised, but not too much stress should be laid upon it, otherwise, when the patient is prevented from taking his exercise he will have an attack. The *diet* should be arranged with regard to the individual case. Everyone will admit that simple diet is the best for these patients. If it is believed (Rachford) that migraine is an auto- or intestinal intoxication, the diet is easily prescribed. As a rule, it will be found that these patients do best upon a diet approaching vegetarianism, but no general rules can be laid down. Overeating or irregularity in eating is just as commonly the cause of attacks as the taking of special kinds of food. Coffee is forbidden by some authors, recommended by others; certain it is that a number of patients have an attack of sick headache if they do not get their cup of coffee in the morning, and that coffee is one of the best remedies for the attack. It is a question, always, how much harm one or two grains of caffeine (the amount contained in a cup of coffee) may do to the patient. For myself, I prefer the risk of the harm done by coffee to that of an attack of migraine, but excess should always be avoided. Tobacco in moderation does harm to some and not to others. Smoking in the open air is less injurious than in a closed space.

It is better that these patients should be abstainers from the use of alcohol; notably is this the case for malt beverages, in which fermentation has not been completely finished. But even the best liquor, when taken upon an empty stomach, or just a small quantity in excess of a minimum dose, may be followed by an attack. *Loss of sleep* is keenly felt by these patients; in some it is the total amount that is required, in others loss of sleep between

certain hours, usually in the morning, which produces an attack. On the other hand, a patient will be found who has migraine after a night when he has slept too hard.

Peripheral irritations should be removed; eye strain is the most common of these, the cause of which should be removed, not with the hope of curing the migraine, but with that of reducing the number of attacks. True migraine is not cured by spectacles, at least I have never seen it, any more than by the removal of any other peripheral source of irritation. In all these cases the nose, the pharynx, the mouth, the genitourinary apparatus must also be taken into consideration. Masturbation, sexual excess or repression may produce attacks.

The most common direct cause for migraine is intestinal autointoxication; for the treatment of this the reader is referred to the proper chapter. I fully agree with Rachford, that no treatment promises so much in migraine as that of intestinal autointoxication, but the routine treatment of migraine is not synonymous with that of intestinal autointoxication. That there are other autointoxications besides those from the intestines, and acting as direct causes, must be accepted; the autointoxication may come perhaps from the ovaries, and possibly from other sources of faulty internal secretion; here elimination by the intestines is frequently valuable. Thus, in women who have migraine during their menstrual period, a thorough evacuation of the bowels for two days before the menstruation is expected frequently prevents an attack. All physical conditions that make for reduction in general health should be treated: anæmia will be found foremost among these; the acute febrile diseases and the chronic infections rarely act as direct causes. Psychical causes are as common in producing attacks as physical: worry, grief, excitement, overwork. Yet most of these patients must work, and as a matter of fact many of them have done excellent work while subject to migraine, and as a rule they are faithful to their day's work notwithstanding the risk of attack. This is the proper attitude, and it should always be encouraged in these patients.

Hydrotherapy may be used to improve general nerve tone as well as for the purpose of reducing nervousness and increasing elimination by the skin. The ordinary cold morning bath may be advised when there are no contraindications; a sponge bath is, as a rule, better than the tub. Cleanliness of skin is important.

Medicinal.—Aside from the treatment of the direct causes mentioned, little can be done except by the continuous use of bromides (Liveing, Charcot) as recommended in epilepsy (q. v.). Möbius gives 2–3 gm. (gr. xxx–xlv) in one dose in the evening. This medication is to be recommended especially in those forms that may be called violent; the drug must be taken for a long time, and it reduces not only the number, but also the intensity, of the attacks. The improvement sometimes begins immediately, at other times it may take from four to six, or even more, weeks before any effect is produced upon the patient. In some patients the large doses required in epilepsy are necessary, in others small doses are sufficient—2–4 gm. in the day, or even less—to keep the patient comfortable. The usual precautions recommended in the bromide treatment of epilepsy must also be employed here.

B. *Treatment of the Attack.*—The importance of treating the attacks, aside from giving relief, lies in the fact that other conditions may develop

from migraine, that the patient's usefulness is interfered with, that his duties are neglected, that the time lost is great. Experience has shown that the course of the affection may be modified by reducing the frequency or the intensity of the attack. As a rule, these patients suffer more from lack of attention on the part of the physician than from its excess, because, after all, the condition is only that of a neurosis. As Möbius puts it, "whoever pays attention only to affections that have a pathological anatomical basis should have become a pathologist."

The nature of the attack is such that the patient is compelled to select those surroundings most favorable to him. As a rule, it is either in or upon the bed in a dark, quiet room; here he lies, hoping to get sleep which mitigates or stops the attack, or at all events permits him to forget his pain and his misery.

External Applications.—In some patients the application of an ice bag, in others the hot-water bag or compresses of hot water, give relief. Again, mild counterirritation, a mustard plaster at the back of the neck, or a dry cup or two may give relief. Graded pressure, vibratory massage, applied to the places of exit of the branch of the fifth pair of nerves which is affected, have been of service with some of my patients. Galvanism sometimes mitigates the pain. Menthol is used, as well as a number of liniments.

Medical Treatment.—Many patients have a remedy which always cures; more have constantly to be changing their remedies; a great many have no remedy which does good. In many of these patients the desire to obtain relief is so great that they will take any drug offered them, and in any dose. This explains the popularity of the headache powder, which usually contains some coal-tar product in doses that no physician would dare to prescribe. For the immediate prevention of an attack, when a patient has to overexert himself, the bromides may be tried, or, according to Möbius, when the bromides fail, 2 gm. of sodium salicylate, in coffee, on the evening before an expected attack. A number of my patients succeed in warding off attacks by taking sodium salicylate in this dose as soon as they notice any premonitory symptoms. A brisk cathartic, if there is anything in the intestines, or lavage of the stomach when indicated, frequently prevents the attack, or when it has developed, mitigates and shortens it. Of the drugs that give most relief to the greatest number of cases, acetanilide is the most effective and the most dangerous. The large doses recommended by some authors—1–2 gm. (gr. xv–xxx)—should never be prescribed; the maximum dose should not exceed 0.5 gm. (gr. vijss.). It is usually given combined with some caffeine preparation, in order to prevent the bad effects upon the heart; as it is most likely that the collapse and cyanosis do not come from the heart in aniline poisoning it will be seen that the addition of caffeine is useless in this respect. On account of the fact that the toxic effects of acetanilide are so uncertain, I never use it, and discourage its use in my patients.

Next to acetanilide in efficacy comes phenacetin, whose toxic effects in nonfebrile diseases are very slight when prescribed in proper doses—0.3–0.6 gm. (gr. v–x). Last in efficacy comes antipyrine, which may be given in the ordinary dose, either by mouth or hypodermically. The number of combinations that can be made with acetanilide, phenacetin, antipyrine, their compounds or derivatives, and salicylic acid, caffeine, and sodium bicarbonate,

is almost infinite (v. Influenza). The caffeine preparations are very valuable; here we have the caffeine itself and its salts (v. Chronic Myocardial Insufficiency), and the guarana preparations. Guarana contains caffeine and theobromine as well; it may be given in the form of the fluid extract (2 c.c.—3ss. or more, every four hours), or as the Elixir guaranæ (4–8 c.c.—3 j–ij); a powder of the Paullinia sorbilis (1–2 gm.) may also be administered. Vasodilator remedies have been recommended, especially by Gowers; when there is pallor of the face the nitrites may be tried; or vasoconstrictor remedies, ergot when the face is flushed; they have never been of much service in my experience. The most efficacious of all remedies is a hypodermic injection of morphine; this should be given in all severe attacks, and in those that are not controlled by other remedies, provided they are of sufficient severity. In many cases the morphine is best combined with atropine. In some cases the atropine alone is serviceable, in others codeine may be given hypodermically or by the mouth, with good effect. While I have never seen a patient with migraine become a morphinist, yet the usual precautions should be taken. A number of patients cannot take morphine; in them the substitutes may be tried, or codeine.

The after-treatment of an attack suggests itself; it is not necessary to do anything in the mild attacks; in the severe ones, rest without mental or physical exertion, and liberal diet made up of easily digested food, are indicated.

TIC NEUROSIS

Simple Tic; Habit Spasm.—Treatment.—Each case should be treated as to its cause; when this can be removed much is gained, but not all, for the nerve cells themselves acquire a habit. All general and local causes (reflex) should be first removed. After this has been done, medical, disciplinary, and hygienic treatment should be begun. Of the medicines, arsenic as given in chorea is most valuable. Atropine has also been recommended. For disciplinary treatment I have found rest cures valuable; when it is a child, and not too much afflicted, it may be sent away from home among strangers, with a nurse, but when the disease is well developed the best place for the patient is in a hospital. It is essential that the patient's symptoms should be disregarded as much as possible—some authors advise punishment; we cannot, however, indorse this recommendation, especially as regards corporal punishment. Suggestive treatment of all kinds is most valuable. Electricity, massage, hydrotherapy, in one form or another, are invaluable. The bringing up of the child in a routine way of life has seemed to me the best mode of stimulating inhibitory processes; this can be arranged, according to the severity of the case, to answer as a disciplinary or a symptomatic indication. This routine mode of life can be made more or less distasteful as the patient improves or gets worse, self-control being thus rewarded. The hygienic treat ment consists in all that which has been recommended for neurotic subjects.

Coordinated Tic.—The treatment is essentially that of the first form, of which not infrequently it is a further development. In many cases it is simply the establishment of a bad habit, which in children should be corrected.

Convulsive Tic.—Very little can be done by treatment except to relieve symptoms and to prevent harm. Sedatives may become necessary. The pa-

tient's general health must be looked to. Change of scene and surroundings is valuable. Diversion is most important; mental or physical labor does much good. Sometimes these patients benefit by isolation or disciplinary methods. Great care must be taken not to confound the psychical tics in this form of trouble with the compulsory ideas or phobias of neurasthenia. In the convulsive tics, when the fixed ideas are dangerous either to the patient or to others, proper precautions must be taken.

NIGHT TERRORS (Pavor Nocturnus)

The treatment of this common and alarming condition of children is so simple and so satisfactory that every physician should be able to carry it out, especially as these cases first come to the general practitioner for treatment. The cause is increased cerebral irritability, the process itself is that of a bad dream, and with the termination of the stage of unconsciousness the attack is ended. Much stress is laid on peripheral irritations—worms, stomach and intestinal conditions—as causative factors; while these should be taken into consideration, it will be found that their removal helps very little in the cure of this affection if the cerebral irritability is not controlled. This can be done by removing its cause; fear, mental overwork, improper mode of living are the most common causes for this factor. (An ignorant nurse will tell the child some story which frightens him; the fear of not having studied sufficiently for the next day; an ambitious mother stimulates her child too much to mental effort, or a child is put through the social paces of an adult.)

In these cases the cause is usually sought for in some peripheral irritation—teething, worms, elongated foreskins, eye strain, etc. When the physician sees to it that the child is treated as a child should be as to its mental functions, the result will be excellent. These children should not be allowed to work in the evening; Sachs says not after five o'clock in the afternoon. Their evening meal should be light, and should be taken about six o'clock; after this the patient should be amused in some unexciting way—by reading or telling pleasant stories; then he should be put to bed. But before going to bed, and this is the most important and essential part of the treatment, the patient should receive a dose of potassium or sodium bromide—from 0.3 to 0.6 gm. (gr. v to x) is usually sufficient; this should be given every night for about a week, when it will be seen that the affection is cured; it will return, however, with the recurrence of the peculiar conditions that acted as direct cause.

HEADACHE

Treatment.—The difficulties in treatment depend primarily upon diagnosis. Headache is the most difficult symptom to treat, for the reason that the diagnosis as to cause is most difficult, and the causes are very numerous. Within our limits we are not able to take up the causal treatment of headache, nor is it our province to discuss or enumerate its various causes. We therefore confine ourselves to the treatment of certain forms of headache which cannot be spoken of in connection with other diseases, and of the symptom itself.

Nervous Headache.—Underlying causes of neurasthenia or hysteria (q. v.) may require attention here. At all events, efforts for the prevention of these

headaches must be directed along the lines laid down under neurasthenia. In some of these cases the preventive measures of migraine (q. v.) should be carried out; all those contributory causes which are followed by excessive expenditure of nerve force should be avoided. It may not be amiss again to call attention to the removal of all reflex causes—those of the eye, the ear, the nose and pharynx, the mouth, the sinuses in the cranial bones; attention to sources of irritation there gives enormous relief. Electricity is sometimes valuable, in the form either of galvanization with weak currents or of the static electricity. Massage of the head, when carefully done, also sometimes gives relief, vibratory massage especially. Glycerophosphates, given as in neurasthenia, are frequently of great service. To give relief, the usual coal-tar products, as recommended for migraine, may be tried. In all headaches the possible existence of arteriosclerosis must be taken into consideration, and also of autointoxication.

Gastrointestinal Headaches.—In the adult a large number of headaches belong to this class; they are usually attributed to biliousness. While it may be confidently stated that retention of bile produces headache, yet in these cases this is not the cause. If the liver has anything to do with the production of these headaches, it is from failure of its filtering function or because it is unable to oxidize the amount of intestinal toxines that come from the portal vein, so that they pass into the general circulation. Here the treatment of intestinal autointoxication (q. v.) should be instituted, or the salicylic-acid compounds and mercurials should be tried for their supposed action upon the liver. Headaches come also from the stomach; the mechanism of their production is a complex one. A reflex mechanism must be taken into consideration as the result of irritation of the nerve endings in the stomach itself; we must also take into account foreign or irritating bodies, dilatation from gas or too large a quantity of food, and the elimination of toxic substances which takes place in the stomach itself. In some patients particular articles of diet will be followed by a headache.

The treatment is that of the stomach; for these headaches, lavage of the stomach is the best remedy as a general indication. A number of my patients who rise in the morning with a headache consequent on some dietary indiscretion of the night before, wash out their own stomachs and thus get speedy relief. In many of these there is a nervous element; such patients should be taught not to eat too much when they are tired, excited, or worried. Apart from these directions, the treatment must be causal.

In the intestine we have even a more complex mechanism. The most common form is that due to constipation; usually it is chronic constipation, which may be treated as described in the proper chapter (q. v.). In acute constipation, a mercurial or a saline laxative is sufficient. The intestinal autointoxication must receive proper attention (v. Chronic Intestinal Autointoxication). We must also take into consideration the effect of intestinal contents upon the circulation within the cranium, as either cerebral hyperæmia or anæmia will be followed by headache. The circulation in general, and therefore that within the cranial cavity, is most affected by the quantity of blood contained within the blood vessels supplied by the splanchnic nerve; therefore the irritation of that nerve will be followed by changes in the circulation within the head. Overfilling of the splanchnic circulation would produce

cerebral anæmia, ischæmia would be followed by hyperæmia. It is a common observation that patients suffering from internal hemorrhoids have headaches, which are relieved after they bleed copiously. The mechanism here is the production of splanchnic ischæmia, with consequent cerebral hyperæmia, which is temporarily relieved by bleeding the patient, but permanently so after the veins producing the irritation have been emptied. Headaches belonging to this class are relieved either by withdrawing fluid from the splanchnic circulation by saline or hydrogogue cathartics, by the action of caffeine or adrenalin upon the vasomotors, or by causing the opposite condition of relaxation of the blood-vessel wall by the nitrites, belladonna, or hyoscyamus. Abdominal massage is of great value, and hydrotherapy may be used, either to increase or to diminish the peripheral and central circulation.

Headaches Due to Circulatory Disturbances.—As cerebral anæmia or hyperæmia, either active or passive, produces headache, anything that interferes with the general circulation is followed by headaches. In this connection diseases of the heart and diseases of the lungs, in which the circulation is especially affected, must be taken into consideration. A headache may therefore be relieved or temporarily cured by digitalis, or by the proper treatment of an acute or chronic myocardial insufficiency, or of some chronic lung disease such as emphysema or fibrosis. Vasomotor changes occurring with lightninglike rapidity are followed by headaches; as a rule, these are accompanied by arteriosclerosis, for which the proper treatment must be instituted, and this is usually very successful. For the headache itself, medication is given on the indication of a flushed or a pale face—either vasoconstrictors or vasodilators.

The structure of the blood is one of the most common causes of headaches; we have already referred to some autointoxications: a number of other intoxications must also be taken into account, such as are found in diseases of the kidneys, which produce a more or less profound disturbance in their functions; furthermore, the peculiar results of metabolism which are found in the diabetic. In the latter form the proper treatment of diabetes mellitus is usually curative, but exceptionally cases are found in which this is not the case, the headache probably being due to some organic change. In renal insufficiency the attempt may be made to have the toxic bodies eliminated through the bowels or the skin by either purging or sweating, or through the lungs as the result of exercise. There are a number of cases, however, in which vicarious elimination is impossible, because certain substances leave the circulation only by the kidneys. In these cases it is necessary to stimulate the functional activity of the kidneys by giving large quantities of fluid or by the use of the milder diuretics. Chronic intoxications, such as lead, CO, or nicotine, must also be taken into consideration. Slight degrees of CO poisoning are much more common than is usually accepted, and they are very fruitful of headaches; here it should be seen to that rooms are thoroughly ventilated, that wherever there are fires, flues and chimneys should be in the best possible condition. Tobacco headaches are also very common, usually due to excessive smoking; for these the remedy is apparent. Headaches are usually associated with anæmia, and the treatment of the anæmia frequently is all that is required in these cases.

Headaches in School Children.—These are the result of a complexity of causes. The headaches usually come on after the child has been at school for from four to six weeks. They are due to a combination of causes: confinement in badly ventilated and overheated rooms; unaccustomed or excessive mental occupation; irregular, improper, or hurried meals; a number of mental causes which may be the result of the whole system of education, and which cannot be enumerated here. The treatment of these cases can, in most of them, be directed toward the existing anæmia. It becomes a difficult matter to decide whether the child should be taken from school or not. This can be answered only after all the various causes of headaches have been taken into consideration. If the individual cause of the headache cannot be removed—and in nervous children this cause may be found to be some trivial matter—the child should be removed from one school to another. If this does no good, the child should be taken from school if the headaches cause great local and general disturbance of health. A thorough study is required to detect malingerers.

Headaches of Adolescents.—These are a form of headache which is found in old cases of neurasthenia, which is made worse by mental efforts, which leads to hypochondriasis, and which begins during or shortly after sexual development. It is very difficult to treat these cases. The first thing is to consider the necessity of taking the patient from school. When this is done the whole future of the patient is at stake in regard to the higher education. If the patient is so situated as to be able to receive private lessons, the nature of the case will determine the advisability of this being done. I have seen a number of young people who, by taking private instruction, have been able to keep up with their contemporaries and enter college with them. But in the large number of cases, private lessons, or study of any kind, is out of the question, principally on account of the financial status of the patient, but also on account of the nature of the cases. Most of these patients, then, must be taken from school, and the question arises what shall be done with them? Occupation they must have or other neuroses will develop. Choice should be made of an occupation that requires attention, is not too fatiguing, and entails the being out in the open air; gardening, forestry, fruit raising, ranching are occupations that have been followed with advantage by some of my patients. Travel by sea in the form of long ocean voyages, before or behind the mast, does well for these cases. The visiting of foreign countries, provided the patient interests himself in the people, the study of the language, the customs, antiquities, etc., is a very valuable, though a very expensive, remedy. I am absolutely opposed to the sanatorium treatment of these patients, as it does the very thing we wish to prevent—encourages invalidism. In one or two instances the following of some sport, such as riding, has been of the greatest benefit. But whatever is done must be done intelligently, so that the patient's will power is controlled, his intellect stimulated, his brain and his body exercised. These patients frequently look upon their trouble as a result of masturbation, and upon this as the unpardonable sin. Just as frequently do they consider the normal seminal discharges as the cause, especially as they have headaches the next morning. In both these instances a quiet, objective talk on the physiology of the sexual organs is invaluable; even the headaches after an emission disappear. Mastur-

bation should be treated as recommended in the appropriate chapter. In all these patients every other cause of headache should be sought for and treated when found.

Rheumatic Headaches.—In this connection are included those forms due to some so-called rheumatic lesion in the soft parts of the cranium. Frequently this trouble has its seat in the galea aponeurotica; at other times it is a form of myositis. Again, that form has been called rheumatic in which exposure to a draught is looked upon as the cause when no other lesion of the catching-cold disease is produced. In the latter cases, occurring in females or pampered males, a genuine neurosis is established, and the patient lives principally for the prevention of his headaches. If, happily, he can forget himself for a short time, all the causes that usually produce his headache may be present and yet no headache follow. If to draughts of air are added the other common causes of headache, it will be seen how useless and selfish this patient becomes, and how unfortunate are those who have to live with him. A great many of these patients can be cured by suggestive measures provided the physician possesses great intelligence and great faith in his methods. In the other rheumatic forms the salicylic acid group is usually without value. For troubles in the fibrous structures the iodine bodies may be tried. In myositis the usual treatment should be followed. The headaches themselves are best relieved by external application of heat. Massage and electricity may also be recommended.

Headaches for which No Cause is Discovered.—Headaches of this class present themselves to every physician, but it is only after all causes have been looked for in vain that SYMPTOMATIC TREATMENT, pure and simple, should be instituted. The means to be applied are:

Hygienic.—Patients with headaches should lead such lives as are normal for them in regard to occupation, exertion, diet, exercise, and other fulfilment of physical and psychical functions.

Thermal.—Either heat or cold may be applied; it is impossible to tell beforehand which may give relief.

Counterirritation may be applied in severe acute attacks or in headaches that persist without being severe. In the former the mustard plaster or other mild counterirritant is sufficient; in the latter the Paquelin or the galvanocautery may be used, applied to the spinous processes of the cervical vertebræ as low as the vertebra prominens. The seton is also recommended, but I have never been able to convince myself of its necessity or propriety.

Electricity may be tried in any form; no special indication exists for its use, or as to the kind of current to be used. Attention must be called to the good effects following the use of high-frequency currents for the relief of pain. I have had success and failure with each and every kind of electricity, whether applied *lege artis* or in the most haphazard way. In more than one instance headaches were cured by a patented electric apparatus which generated no current whatsoever.

Massage.—When massage is applied by a skillful, gentle operator, it may be very beneficial; otherwise it does more harm than good. The vibratory massage apparatus is better than manual massage here, because its force can be better regulated.

Hydrotherapy.—Cold compresses are used. The cold footbath may occasionally be used to great advantage; when possible in flowing water, the feet to be rubbed with a coarse brush. The temperature should be between 45° and 55° F., the duration short—only half a minute at first, but extended later to three or four minutes, according to the reaction. The cold compress is added, around either the head or the neck. The hot footbath—from 90° to 110° F.—of long duration, up to ten minutes, is also of value. These are both indicated in the milder forms of more or less continuous headaches; they are supposed to act by causing a determination of blood to the extremities, which results in a withdrawal of blood from the head. This explanation remains to be proved, but that this method of treatment is valuable is without doubt. Douches—hot, warm, or cold—along the upper part of the spinal column are most valuable. They need not be applied longer than from ten to thirty seconds; they should be followed by cold ablution.

Medicinal.—Here a choice may be made from all the remedies recommended in migraine; indeed, it is only by the trial of a drug chosen according to the character of the individual and the concomitant symptoms that any results can be obtained.

One remedy that has not been mentioned in connection with migraine is worthy of trial: it is ammonium chloride, given in large doses—one large dose of 1 gm. (gr. xv) or smaller divided doses of 0.3–0.6 gm. (gr. v–x) every hour, until three doses have been taken. Morphine should not be given in these cases. In one of these patients I have seen a phenacetin habit produced.

VERTIGO

Treatment.—For our purpose we may accept the view of Thomas, that the cerebellum is the center for maintaining equilibrium. To this center there pass a number of afferent impulses which are taken cognizance of by the cerebral cortex. A disturbance in this mechanism—i. e., in the periphery, the afferent nerves, the cerebellum, or the cerebral cortex—will be followed by vertigo. These causes may act singly or combined, but the peripheral afferent impulses come through known paths, and the intracerebral causes are also known, though it is by no means certain that all the paths and localities, or the whole mechanism, is completely understood. That form of vertigo coming from the *eyes* can be treated only by those who have special knowledge and skill. Vertigo may be due to visual disturbance, to muscular insufficiencies, or to changes in intraocular tension.

Aural Vertigo.—For the treatment of aural vertigo anything that produces a change in the intralabyrinthine pressure, the vestibular branch of the auditory nerve, or its end filaments, must be looked to. Largely this form of vertigo is also in the hands of specialists, who should be thoroughly familiar with both the local and general treatment. A great number of cases are due to local causes—i. e., to such as act indirectly upon labyrinthine pressure; they will be found in the external meatus, the tympanum, the middle ear, as well as in the pharynx, the mouth, the nose, and Eustachian tube.

Labyrinthine vertigo—i. e., vertigo in which the direct cause is in the labyrinth, or possibly in the vestibular branch of the eighth pair of nerves—requires special attention; this form of disease is called **Méniere's disease.**

The division into true and false Ménière's disease does not interest us for practical purposes, as a differential diagnosis cannot be made and the treatment is the same. In this form of vertigo the patient is forced to lie down; he should be kept absolutely quiet.

During the attack medication is of little value; I have tried the nitrites for the vasomotor symptoms, and at other times vasoconstrictors, depending upon blood-pressure readings for their administration; I have given bromides, have used counterirritation in the form of hydrotherapy or counterirritants; I have given laxatives during the attacks; and I cannot say that I have succeeded in cutting the attacks short or ameliorating the condition. In two of my patients, who always obtained relief from vomiting, I have encouraged the act by the giving of large quantities of warm water or of warm salt water; this is the only method of treatment that has, in my experience, been of value.

Between the attacks Charcot's treatment may be tried; it consists in the giving of quinine of from 0.6 to 1 gm. (gr. x to xv) a day, divided into four doses—i. e., one dose every four hours; this should be given for from seven to ten days, then stopped for a week and again given as before. The cycle may be repeated a number of times. If the method is successful, the vertigo ceases immediately the quinine is withdrawn. The objections to this method are that it increases the symptoms at first, and that it leads to deafness. The latter objection need not be taken too seriously because it must be of rare occurrence, and those of my patients who have well-marked Ménière's disease would willingly exchange it for deafness. The great objection to this method is that it does good in relatively a small number of cases; in my own experience with it I have seen no harm follow, but I have seen some good effects. In all these cases two causes should be looked for: the one in arteriosclerosis, the other in autointoxication. It is not astonishing, therefore, that a number of these patients have been improved by the use of iodine preparations administered as recommended for arteriosclerosis. Neither is it to be wondered at that those remedies which give relief for biliousness also give relief here. One of my patients has succeeded in warding off attacks by taking sodium phosphate every day; if he does not take it for a week he has an attack. As the physical evidences of intestinal insufficiency are clear enough, this should always be looked for; all sources of intoxications, whether endogenous or exogenous, should be removed where possible. The treatment between attacks is much more important than that during the attacks, therefore that of the direct cause should be applied. At the same time the patients, in those cases in which the attack comes on without warning, should be told to be careful not to put themselves in such positions that harm may come to them if an attack should develop. One of my patients, although sufficiently warned, had an attack while diving, and narrowly escaped drowning. The statement which has been made, that when the deafness increases the vertigo diminishes, is correct, as far as my experience goes, in a number of cases.

Stomachic vertigo, the *vertigo a stomacho laeso* of Trousseau, is probably a neurosis. Much relief may be given to some of these patients by ordering a hard cracker or a small sandwich to be eaten when the vertigo comes on. In some of these patients there is chronic gastritis, gastroptosis (q. v.). When there is no appreciable cause, nux vomica in small doses is valuable.

In the production of vertigo the *centers* themselves must also be taken into consideration as to treatment. Here the treatment of anæmia, especially in young subjects, is of great importance, as the composition of the blood is the controlling factor in their functional activity. As in Ménière's disease, here also the various intoxications, whether acute or chronic, must be treated. Vertigo is not an uncommon symptom of myocardial insufficiency, and it is controlled by the treatment of the heart condition (q. v.). In anæmia or hyperæmia of the brain such measures may be recommended as are found in the respective chapters devoted to them. The vertigo of neurasthenics should be treated as a part of the neurasthenia. But the cerebral cortex is not infrequently temporarily fatigued, which results in attacks of vertigo; here the best thing is to prescribe rest; stimulants should not be used. The vertigo of old people or of arteriosclerotic patients is best controlled by a combination of ergot and potassium bromide: ℞ Extract. secalis cornuti fluid., 15 gm. (℥ss.); potassii bromidi, 15 gm. (℥ss.); syrup. cort. aurant., 15 gm. (℥ss.); aq. menthæ piperitæ, 45 gm. (℥jss.). S.: One teaspoonful in water every four hours, to which the iodine treatment, as recommended in arteriosclerosis, should be added. For brain tumors the treatment may be followed which is recommended in the chapters devoted to this subject.

Seasickness.—In order to prevent this a great number of remedies and instructions have been recommended; they are successful in a number of cases, but utterly fail with a great many patients. While it may be accepted that psychical influences may have much effect in causing this trouble, I think the fact that no one is immune to it must be accepted as proving that this is not its primary cause. The production of this condition is due to a number of contributory causes, some of which may be removed in individual cases. The prime cause lies in the motion of the vessel, which causes improper afferent impulses from the muscles (general muscular sense), the stomach, the eyes, and occasionally in other ways. In the most modern steamships the principal cause has been much reduced by improvements due to modern naval architecture and by proper ventilation. Yet whatever view we may take of the contributory causes, the essential thing is to see to it that a trip upon the water is undertaken by the individual in the best possible condition as to his gastrointestinal tract. Before the trip the bowels should be thoroughly opened, and the last meal before embarking should be of the simplest kind, small in quantity, and especially limited as to fluids. This has a tendency to prevent improper afferent impulses from the stomach. In order furthermore to prevent improper afferent impulses or to counteract their effect, many remedies have been recommended. In my experience, nothing acts so well as the bromides; they should be given for two or three days before embarking, and be combined with ipecac, in small doses, by which a sedative effect is produced upon centers as well as upon the reflexes. The ipecac acts as a so-called stomachic; experience has shown that it frequently acts as an antemetic. The following prescription may be used: ℞ Pulv. rad. ipecac., 0.065 gm. (gr. j); sodii bromidi, 10 gm. (℥ijss.). Div. in partes No. x d. ad. chart. cerat. S.: One powder in water every four hours. These should not be continued for longer than the first two days of the voyage. The patient should be on deck as much as possible, in a recumbent position, and thoroughly covered, so that chilliness may be pre-

vented. If seasickness develops, small doses of alcohol should be taken—large doses increase seasickness—a tablespoonful or two of brandy poured into a tumbler filled with cracked ice, which the patient sips in small quantities. Cerium oxalate, given in doses from 0.15 to 0.3 gm. (gr. iij to v), may be tried. In the severer cases, chloral hydrate (1 gm.—gr. xv), cocaine hydrochloride (0.004–0.01 gm.—gr. $\frac{1}{15}$–$\frac{1}{6}$) may be used; even morphine, hypodermically, will sometimes be required, but under all circumstances it should here be combined with atropine. In the very severe cases, especially upon long voyages, the question of feeding is a very important one; sometimes after the hypodermic injection of morphine sufficient food is retained to prevent serious disturbance in nutrition; frequently, however, rectal alimentation must be resorted to, as in gastric ulcer (q. v.). In *car sickness,* the sodium bromide with ipecac is even more valuable than in seasickness.

INSOMNIA

While the phenomena of sleep are known, the ultimate cause of it is still a matter of conjecture. On the other hand, both the symptoms and causes of lack of sleep are quite thoroughly understood in most instances. As to the cause of sleep we have incomplete physiological and chemical knowledge; for the explanation of lack of sleep we rely principally upon clinical observation. As a result of our experience, we know that sleep can be produced by certain drugs, but nothing in experimental work has been able to tell us why these drugs produce sleep or how they act upon the cells in the central nervous system. Indeed, so little is known of the physiology of the nerve cell that for a time such an hypothesis as, that the dendrites of the neurones are in touch during the day time and contract at night during sleep, was seriously accepted as the cause of waking and of sleep. But aside from drugs, we possess many other means by which the phenomena of sleep, notably those of the general and cerebral circulation, may be produced, and these in their turn seem to produce sleep in a large number of cases. Again, the psychical centers may be influenced in various ways from within or without by suggestion.

Prophylaxis.—The prophylaxis of sleeplessness is usually impracticable. Insomnia, as we meet it in the daily routine of practice, is most common in the neuroses, especially in neurasthenia, and all that has been said there applies to the prevention of insomnia. It is found in brain workers as a result of curtailment of sleep with excessive cerebral activity during the time of waking. They find that, at first, they fall asleep as soon as they touch the bed; gradually, however, there develops nerve-cell fatigue; in addition, subconscious and conscious impressions which have been retained by the cell faculty of memory disturb the psychical area to the extent that sleep is impossible. For the first time, now, the individual begins to feel that, as to sleep, he is subjected to the same laws that apply to the average man, and he wishes that he were like the laborer in the fields, and not like Napoleon or the other great historical characters who habitually got on with four hours of sleep. But the laborer in the fields, or anyone, may have the same thing happen to him, provided a psychical effect may be intense enough or of sufficient duration to keep him awake with worry or anxiety. Indeed, the worry and the anxiety,

because of their intense psychical effect, do more harm than the mere loss of sleep. Yet, in practice, how can we prevent the ambitious young savant from overworking, the striving merchant from planning, the farmer from mortgaging his farm, or the mother from nursing her sick children?

A large number of brain affections lead to insomnia; the syphilitic troubles may be somewhat controlled by prophylactic measures; the same may be true for locomotor ataxia. But the psyche, the brain, call it what you will, is affected by all the organs and tissues of the body; here prophylaxis may be important in the treatment of disease of organs. Long-continued physical suffering, endogenous and exogenous toxæmias, digestive disturbances, and many other affections, lead to insomnia and must be taken into consideration as to prophylaxis.

TREATMENT.—As insomnia is but a symptom it naturally follows that its cause must be looked for and removed when possible. It is manifestly improper to prescribe a hypnotic to everyone who comes complaining of being unable to sleep. So simple a proposition, it would seem, is self-evident, yet it is frequently overlooked by the physician. On the other hand, the symptom of insomnia may itself do so much physical and psychical damage that direct intervention becomes necessary. When causal therapy is of no avail, the proper treatment for the symptom itself is paramount. When the causal treatment is successful in other directions and the insomnia does not disappear, which is the rule when the cause has been long active, the habit must be broken into.

A. *Causal Treatment.*—In the great majority of cases this will consist in removing *central causes*, and, at that, psychical causes. Here all those conditions which cause neurasthenia must again be taken into consideration. Their removal is paramount. With this form, provided there are no contra-indications (v. Neurasthenia), a change of scene, relaxation, diversion, are of great importance. A patient who is overworked, fretted by his usual occupation, worried by his daily routine, pestered by his thoughts or pursued by anxiety, gets relief by changing his environment. But it will not do for the physician to tell his patient in broad, general terms, to take a trip or to go away from home. Here, also, it is necessary for the physician to individualize; changes that are too radical do no good, they may do harm. A delicate, sensitive woman cannot be sent to such places where everything in the environment has a tendency to irritate her. A man who requires a certain amount of routine as to his food, his occupation, and his hours of work, must not be advised to go where all this is suddenly changed. The tastes of the patient must also be consulted; the one finds contentment upon a boat, the other in the woods, a third climbing mountains, and so on. I have seen some patients cured of their insomnia by an amount of incessant travel which would produce insomnia in others; patients from the country cured by going to a city, more commonly city folk relieved by going tc the country. That suggestion and autosuggestion have much to do with the production of sleep is not denied, and in the treatment of insomnia this must always be taken into consideration. Many will be found who, for many reasons, cannot leave their homes; for these much can be accomplished by changes in their mode of life (v. also Hygienic Treatment). The directions to be given should aim at reduction of working hours and increase of diversion. Here, again, the diversion should be prescribed for the individual indications; we so commonly

prescribe that form of diversion which seems the most pleasant to ourselves; thus, a bicycling doctor prescribes the bicycle, a golf-playing doctor golf, and so on. Many of these patients sleep well at night after a noonday interruption of their work; most of them after an evening spent in quiet diversion. A few of my patients have a rubber of whist before going to bed; in most this would add to the insomnia.

The medicinal treatment of the cause should always be applied; for this form of insomnia the bromides combined with ergot are most valuable; they should be given for some time in the form recommended in the chapter on Vertigo.

The removal of *toxic causes* is very important. Here the following intoxications must especially be taken into consideration: tobacco, alcohol, coffee, tea, the various autointoxications, and drug habits. In the *infectious diseases* insomnia is treated, usually with success, by the methods applied to the disease itself. In most of these cases relief of insomnia is a very important factor, in that by it the nerve tone is improved, destructive metabolism is prevented, and consequently autointoxication is diminished. Especially in pneumonia and typhoid fever, much good can be done by the proper treatment of the insomnia; in any acute infectious diseases opium is the remedy that can be relied upon. For special forms of insomnia the remedies to be mentioned must be given. In *arteriosclerosis*, the proper treatment of the cause is frequently sufficient to cure the insomnia, but for the latter the ergot and bromide combination is usually effectual. For the insomnia of *insanity*, hydrotherapy and drugs are required. In *diseases of the brain*, especially of the inflammatory type, good is accomplished by lumbar puncture. The causal treatment, when possible, with drugs directed toward the removal of the symptoms, is always indicated. Anæmia and hyperæmia are treated according to their local or general indications.

In *cardiac diseases*, sleeplessness may be produced by disturbance in circulation within the skull or by symptoms produced by the special form of heart disease. The treatment of acute and chronic myocardial insufficiency and of the cardiac neuroses covers the causal indications. The removal of *peripheral causes* of various kinds is very important in the treatment of insomnia. Pain should be relieved; paræsthesiæ and hyperæsthesiæ should be treated. There are many afferent impulses that must be taken into consideration here; they may come from any part of the body: from the ear, such as tinnitus aurium; attacks of suffocation; from the gastrointestinal tract; from the genitourinary apparatus; from the muscles, or the skin. In most of these cases there may be found local lesions, but in them all there is also some general cause which should be removed.

B. *Symptomatic Treatment.*—Aside from the effects of drugs, we try to produce the conditions that are found during sleep: reduction in excitability of nerve centers by reducing the number and character of afferent impulses, by the prevention of psychical activity, by the reduction of the quantity of blood contained within them. As has been before stated, the afferent impulses which disturb sleep may come from any part of the body. The reduction of the quantity of blood in the central organs is accomplished by all those methods that cause the circulation in the skin and muscles to be increased, and is the most valuable aid in our possession for the production

of sleep. As a result of its accomplishment, all the circulatory phenomena of sleep are brought about—viz., reduction of the activity of the heart, diminution in arterial blood pressure, diminution of the amount of blood within the brain, and their various consequences to respiration, secretion, heat production, movement in organic muscle, and irritability of central nerve structure.

C. *Regimen.*—In beginning the treatment of a patient suffering from insomnia, it is advisable to secure all the aid possible from proper suggestion and autosuggestion; the latter is even more important than the former. When the patient is sufficiently intelligent, an explanation of some of the physiological phenomena of sleep is of value; here special stress should be laid upon the relation of the subconscious processes to sleep, and also the effects of insomnia upon the physical condition. If the impression can be sustained that it does not matter very much how long the patient sleeps provided nothing else develops, much has been gained. A statement that can be made with safety to most of these patients is that ten hours' rest in bed is equal to six hours' sleep. The result of this suggestion is that the patient goes to bed and does not watch himself or his sleep, for by the mere remaining in bed for ten hours he gets the equivalent of a sufficient number of hours of sleep for a man. He now no longer fixes his attention upon the clock or the striking of the hours, and he can no longer say that he slept only so many hours. I have seen many patients cured of their insomnia in this or other ways that may suggest themselves for individual patients. Sometimes it is a purely autosuggestive mental process that causes the sleeplessness to disappear; one man who had been suffering from insomnia for years did not know anything about a most violent storm which happened during the night, and which aroused all the members of the household except himself; he felt sure he had not slept all night until he was told in the morning what had happened; he finally came to the conclusion that his sleep could not be so bad after all; the result was a perfect recovery. The more indifferent the patient is as to his sleeping or not sleeping, and as to any bad results, the better the chance of his sleeping. For this reason it is important that his occupation in the evening should be of such a nature as to prevent his thinking of his insomnia before he goes to bed. Again, this occupation should be of such a nature as not to produce excitement or too great circulatory activity. The individual usually knows what occupations are best for him; upon the whole, the reading of familiar books, even in bed, is the best occupation, but many find other diversions, even mild exercise, of greater benefit. The physician must see to it that in an active man or woman these various methods do not become a fixed habit, as thereby the usefulness of the individual becomes impaired, since when he cannot exercise them he cannot sleep. When the patient goes to bed and cannot stop thinking, he should be told to try to change the direction of his thoughts; this is rarely effected by the popular methods of counting, reciting, etc., the monotony of which is supposed to produce the soporific effect; but it may be accomplished by individual patients who divert the harmful mental effort into harmless channels. One of my patients can put himself to sleep by making imaginary addresses; another by playing imaginary games; a third by playing musical compositions. When the patient wakes up at night, he

should be taught autosuggestive methods similar to the above; he should not leave his bed; it is best if he can sufficiently control himself and lie quietly; when this is not possible, reading in bed may be resorted to; sometimes the taking of small quantities of food also acts beneficially.

The room in which the patient sleeps should be chosen because of its being quiet, well ventilated, easily darkened. In some instances the furnishings must be taken into consideration: a particular figure of wall paper will keep a patient awake in that he counts its various parts, or the hangings may be so thick that he does not get enough air. The bed should be so constructed that the general muscular sense is not irritated—soft enough, but not too soft or too elastic. In the matter of pillows, individual peculiarities, which may amount to nerve habit, must be taken into consideration as to their number and kind. Some sleep best upon one, others upon more than one, pillow; some like soft, others hard, pillows. The bed clothing is of paramount importance; it should be sufficient to keep the skin perfectly warm, but not to the extent of sweating. In keeping the skin warm we draw the blood to it, and thus imitate the normal condition of the skin in sleep. Occasionally we find a patient, notably in arteriosclerosis, who is kept awake by a feeling of inordinate warmth in the skin; but even here, after having cooled himself, he finds that he sleeps better with abundant covering. In sleepless children, an addition of an extra blanket is an excellent method of treatment.

The *food* of these patients should be arranged as to the causal indication. When there is no causal indication, the physical condition of the patient guides us as to the diet. As a result of genuine insomnia we always have loss of weight, so that the indication of sufficient food exists in all cases. When once the weight is regained and retained, psychical effects are overcome. The heaviest meal should be taken at noon; only very easily digested food should be taken in the evening; when this is not feasible, the patient should not be allowed to go to bed until stomach digestion is finished. Before going to bed a sandwich or a glass of milk conduces to sleep.

The caffeine and theobromine preparations should not be given, certainly not in the evening. A large number of patients would not feel happy or well without their morning cup of coffee, and as a rule this need not be withdrawn. But for coffee and tea, individuals have their idiosyncrasies: one sleeps after taking coffee, the other is kept awake by it but sleeps after taking tea; the one is kept awake by *café au lait*, but sleeps after black coffee; in another the opposite condition obtains.

Tobacco may be used, but only in moderation; a patient is frequently more injured by the withdrawal of his tobacco than by a reasonable continuance of it. When there is excessive use or the tobacco is the cause of the sleeplessness, withdrawal is the only method to be followed.

Alcohol should never be recommended. Here as elsewhere, when the patient has been taking alcohol moderately and habitually, it is not necessary to withdraw it any more than it is necessary to interfere with any other article of diet or food which seems to do no harm. In my opinion, it is always improper to use alcohol to produce sleep, for the simple reason that increasing doses become necessary to produce the required effect, and alcoholism is thus induced. There can be no doubt that good results are obtained

by alcohol, but they can be obtained equally well with other methods that do no harm.

D. *Exercise.*—In a normal human being the reaction to fatigue is healthy sleep; not so in insomnia, where fatigue of muscle may be followed by increased loss of sleep. This certainly is always the case when overfatigue has taken place. It frequently then becomes a question of how much exercise to order for these patients, and this must be controlled by the individual's needs and physical peculiarities. But in addition to the amount of exercise, the kind of exercise should also be determined upon by the physician. Whatever form is chosen (v. Neurasthenia), mental occupation, psychical training should be combined with it.

E. *Massage.*—This is of very great value in most cases of insomnia; it may be used as a substitute for exercise, but only in those cases in which there exists physical inability to take exercise. For insomnia, massage is given as general massage; it may be applied with ascending force or mildly, the latter method always to be tried first; if sleep does not follow, the first method should be tried. The success of massage depends largely upon the skill of the operator; it is best given at bedtime.

F. *Electricity.*—All forms of electricity have been tried and recommended. While one or the other form may be used to affect the peripheral or the central circulation, the effect of any application of electricity is largely that of suggestion. But good results sometimes follow the proper use of electricity, and therefore it should not be disregarded as a remedy for insomnia.

G. *Hydrotherapy.*—The most useful method of treating insomnia is that of hydrotherapy; it combines physical effects with those of suggestion, and can be applied to any form of insomnia. The physical effects are those of imitating the phenomena of sleep: changes in peripheral circulation, relaxation of nerves, general sedation. It is wrong to suppose that hydrotherapy can be prescribed as a drug can be, for the indications are not so sharply outlined and the effects are not so positive. Hydrotherapy is not a panacea, and much that has been written about it is purely hypothetical. On the other hand, it is a most valuable therapeutic adjuvant, and any physician can apply it without the complex apparatus that is now in use. Excellent results are obtained in private practice with the means at hand in an ordinary bathroom. It is only necessary that the physician should familiarize himself with the various hydropathic procedures which he can carry out; their application is that of a therapeutic experiment. In our present case we begin with the milder forms of hydrotherapy, and gradually go to the more complex; sometimes the one, sometimes the other puts the patient to sleep. At times hydrotherapy fails completely; whether the procedure is simple or complex, with or without apparatus, there is quite a number of patients who are not affected by any of them. Footbaths may first be tried: a hot footbath, with or without mustard and of ten minutes' duration; if this is not of service, the cold footbath in running water, as described in the chapter on Neurasthenia, may be recommended. Or hydriatic treatment may be begun with the local packs; these may be applied to the legs, around the abdomen (Neptune's girdle), or in the form of the dripping sheet (also described in the chapter on Neurasthenia). Then may be tried the bath—warm, gradually reduced to the degree of temperature which produces dila-

tation of the blood vessels of the skin, and followed by friction or massage. In a number of these patients a more lasting effect can be produced by putting them between blankets without drying them after the baths. The somniferous effects are increased by cold applications to the head, cold ablution to the eyes, the forehead, and the head. These baths may be given as whole baths, half baths, or sitz baths. The sitz bath is especially recommended in irritative sympathetic and sexual conditions. According to the Winternitz school, the patient takes a sitz bath of from ten to twenty minutes' duration, the temperature varying from 70° to 75° F.; the patient goes to bed without being dried; this is frequently followed by sleep. If the patient wakes up, the procedure is repeated. The whole baths are given warm (from 90° to 98° F.), hot (from 102° to 110° F.), or cool and of moderate duration. The half bath may be given at a temperature from 60° to 75° F., and be gradually reduced to as low as 50° F., the ablution always to be made with colder water than the bath itself. The best hydriatic measure is the general moist pack; the patient must, however, remain in it for from one to two hours, and it must be carefully applied.

H. *Balneological.*—Insomnia is sometimes cured by sea bathing; it is, however, impossible to foretell which individual patient may be improved or made worse at the seashore. All the various places referred to in connection with neurasthenia may be recommended for the sleeplessness of neurotics.

I. *Medicinal.*—The medicinal treatment of insomnia reduces itself to the removal of the direct cause or of the phenomena of sleeplessness, and to that of symptomatic treatment, which consists of the administration of hypnotics. The former has been considered under the heading of causal treatment.

Hypnotics should be prescribed for the following indications: when sleep cannot be obtained by other methods, or when the loss of sleep produces physical or nervous symptoms on account of its insufficiency as to quantity or quality. The number of drugs used for the purpose of producing sleep is very great, and it is not our province to enumerate them all, especially when the fact is taken into consideration that many of them act alike, with the same good and the same deleterious effects. First come the *bromides*, which may be looked upon as mild hypnotics; they have been mentioned so frequently that repetition is unnecessary. The next in importance is *chloral hydrate*; this drug may be given with safety in medicinal doses—1–2 gm. (gr. xv–xxx)—in all cases in which there is no myocardial difficulty (v. Chronic Myocardial Insufficiency). It should be given before the patient goes to bed in cases in which there is no pain, in the insomnia of the insane, and it is also used in delirium tremens. On account of the fact that a chloral habit may be formed, it should not be given for too great a length of time. In order to prevent the harmful effects of chloral upon the circulation, combinations of chloral have been introduced. The best substitute for chloral hydrate, and the best hypnotic of the whole class, is chloralamide, the formamide molecule contained within it counteracts the depressing circulatory effects of the chloral, and this dangerous effect is done away with. While the effects may not be so certain as those of chloral, it lends itself especially for use in those cases in which bad effects upon the circulation may be expected. Its greatest advantage, according to my observation, lies in the fact that no drug habit is formed. Chloralamide is given in powder,

in solution in water or spirits, in the dose of from 1 to 3 gm. (gr. xv to xlv). It is valuable in the sleeplessness of old age in addition to the forms of insomnia mentioned in connection with chloral hydrate. *Chloralose* is one of the many hypnotics that can be dispensed with; its soporific effects are unreliable, it depresses the psychical functions, produces serious reflex conditions, and upon the whole is untrustworthy, both as to its good and its bad effects. Chloretone is more like chloralamide, without the depressant circulatory effects of chloral and not irritating to the stomach. It may be given in doses of from 0.3 to 1 gm. (gr. v to xv), in tablets or in water (about one-per-cent solution). *Hypnal*, chloral-antipyrine, is valuable as a hypnotic in insomnia from pain or from coughing; it is given in an aqueous solution in doses of from 1 to 3 gm. (gr. xv to xlv). *Amylene hydrate* may be given in doses of from 3 to 5 gm. (gr. xlv to lxxv); it should be thoroughly dissolved in water, and is useful in nervous insomnia, in cardiac insomnia, in anæmics, convalescents, and tuberculous patients. *Paraldehyde* is in general one of the best soporifics; it has no bad effect upon the circulation, and its effects are reasonably sure. The objections to it are the taste, and the fact that it loses its effect when taken too long; however, after the drug has been discontinued for a while it may be again given with excellent results. In order to cover over the bad taste, it is given in beer, rum, whisky, or brandy, or in sweetened water flavored with bitters or aromatics. The elixir of paraldehyde contains about 0.6 gm. (gr. x) to the teaspoonful, and is an excellent way of giving this remedy. The dose as a sedative is from 0.3 to 0.6 gm. (gr. v to x); as a hypnotic it may be given in from 2 to 4 gm. (℥ss. to ℥j). *Sulphonal* is a valuable hypnotic; 1 to 2 gm. (gr. xv to ℥ss.) are given about two hours before bedtime, dissolved in some warm fluid; milk is usually the one chosen. Its use has been largely restricted, on account of bad effects produced upon the digestive and nervous systems, but especially on account of the production of hematoporphyrinuria. Instead of sulphonal, *trional* is used; this drug also possesses the bad properties of sulphonal, but to a much less degree. It is valuable in almost any form of sleeplessness; when there is pain it may be given combined with morphine. It is administered in the same way as sulphonal, but when used for some time care must be taken that it is eliminated; for this purpose large quantities of fluid, laxatives, the citrates and the tartrates are recommended. *Veronal* is indicated in all cases of simple agrypnia, administered in doses of from 0.3 to 0.6 gm. (gr. v to x); it produces from six to seven hours of normal sleep; it is not necessary, as a rule, to give larger doses. Of the modern soporifics, this remedy has been followed by fewer bad effects than any other. *Hyoscine hydrobromide* is to be used in agrypnia, with or from motor restlessness; it is doubtful whether it produces bad effects on the human heart, although collapse has been occasionally noted. It is most valuable in the sleeplessness of the insane, but is also valuable in delirium tremens—indeed, in any form of agrypnia which is due to motor restlessness. Here it is of more service than opium. It is given either by the mouth or hypodermically, in doses of from 0.33 to 0.5 mgm. (gr. $\frac{1}{200}$ to $\frac{1}{130}$). After one or more of these drugs have been used, there remains a certain number of cases in which sleep is not produced; we then come to the sovereign remedy—opium. *Opium* or morphine should be used in all those cases in which pain produces loss of sleep, provided this cannot

be relieved by other means. But in the insomnia connected with any other condition it should be used only when the other hypnotics have failed. Care should be taken that the opium habit is not formed; cases in which it is necessary to use morphine for a great length of time should be treated in an institution. Opium by the mouth should be preferred to morphine when it is possible to use it; it should always be tried first before having recourse to the hypodermic method of giving morphine. The effects of opium differ from those of morphine, but it has a local effect upon the gastric mucosa, and it has seemed to me that rapid increase in dose is not required as when morphine is used. Different people react differently, however, and sometimes morphine acts better in the beginning than opium. The giving of hypodermic injections of morphine should not be the first thing to be done after the decision has been arrived at to use morphine. It should first be tried by the mouth, no prescription being given for it, as it is not necessary that the patient should know what drug he is taking. When a hypodermic injection is given the suggestive effect of medication is enhanced, but at the same time the risk of morphinism is increased. In some neurotics a very few injections are sufficient to start the habit, and then the physician is blamed for it. The duty of the physician is to give morphine when the proper indications arise, and he can readily determine which patient has a tendency to morphinism; then he should take the proper steps for prevention. The derivatives of morphine can rarely be advantageously used as hypnotics, though they may be valuable as sedatives. Combinations of morphine with chloral hydrate, antipyrine, and many other drugs are in use, and are sometimes of great advantage. A small dose of morphine may be given with a full dose of opium; as the action of the opium is slower than that of the morphine, a much more prolonged beneficial effect is produced in this manner. The dose of morphine to be given hypodermically should be the smallest capable of giving relief to pain or producing sleep; for an adult, not less than gr. $\frac{1}{8}$ and not more than gr. $\frac{1}{4}$ should be given as the initial dose, as both very small and very large initial doses sometimes are followed by bad effects. *Codeine* may sometimes be used to advantage as a sedative, especially in diseases of the respiratory organs, and with some it gives relief for pain by combining it with antipyrine or phenacetin. As giving relief for pain, *belladonna* may also be used to advantage; especially will this be found to be the case in those who cannot take opium. In the same way *cannabis indica* may be given; it gives relief for pain, and may act as a hypnotic in a limited number of patients. It has the advantage over opium or morphine that digestive disturbances are not produced, that no depression follows its use, and above all that it is a very safe remedy, as even after enormous doses fatal results rarely occur. The great objection to its use is the unreliability of the drug; it deteriorates when kept, with the result that we rarely obtain active preparations. The tincture (1–2 c.c.—ɱ xv–xxx) or the extract (0.02–0.065 gm.—gr. $\frac{1}{3}$–j) may be given. It is frequently beneficial to combine cannabis indica with the bromides or with chloral; I have found it very valuable in some cases of migraine, in dysmenorrhea, and in neuralgia.

APPENDIX

APPENDIX

TABLE I

COMPOSITION OF FOOD MATERIALS, EDIBLE PORTION

Bulletin No. 21 United States Department of Agriculture.—W. G. ATWATER

FOOD MATERIALS.	Salt.	Water.	NUTRIENTS.					Fuel value of one pound.
			Total.	Protein.	Fat.	Carbohydrates.	Mineral matters.	
MEATS, ETC.		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
Beef:								
Neck ..... average	.....	62.0	38.0	19.5	17.5	.....	1.0	1,100
Chuck ribs ..... "	.....	58.0	42.0	17.6	23.5	.....	0.9	1,320
Ribs ..... "	.....	48.1	51.9	15.4	35.6	.....	0.9	1,790
Brisket	.....	47.4	52.6	14.6	37.2	.....	0.8	1,840
Cross ribs	.....	43.9	56.1	13.7	41.6	.....	0.8	2,010
Shoulder ..... average	.....	63.9	36.1	19.5	15.6	.....	1.0	1,020
Shin	.....	73.8	26.2	22.7	2.3	.....	1.2	520
Plate	.....	44.4	55.6	15.4	39.4	.....	0.8	1,950
Navel	.....	47.6	52.4	15.1	36.5	.....	0.8	1,820
Sirloin ..... average	.....	60.0	40.0	18.5	20.5	.....	1.0	1,210
Socket	.....	57.1	42.9	16.7	25.2	.....	1.0	1,375
Rump ..... average	.....	48.2	51.8	15.4	35.6	.....	0.8	1,790
Round ..... "	.....	68.2	31.8	20.5	10.1	.....	1.2	805
Leg	.....	72.1	27.9	21.0	5.7	.....	1.2	630
Top of sirloin	.....	42.2	57.8	13.3	43.7	.....	0.8	2,090
Flank	.....	27.4	72.6	12.0	59.9	.....	0.7	2,750
Fore quarter	.....	54.1	45.9	17.3	27.7	.....	0.9	1,490
Hind quarter	.....	55.7	44.3	17.1	26.3	.....	0.9	1,430
Side without kidney fat	.....	54.8	45.2	17.2	27.1	.....	0.9	1,465
Liver	.....	69.5	30.5	20.1	5.4	3.5	1.5	665
Kidney	.....	75.7	24.3	17.0	4.8	1.3	1.2	545
Heart	.....	56.5	43.5	16.3	26.2	.....	1.0	1,410
Tongue	.....	63.5	36.5	17.4	18.0	.....	1.1	1,085
Kidney fat	.....	4.3	95.7	0.9	94.6	.....	0.2	4,010
Marrow (leg bone)	.....	3.3	96.7	2.6	92.8	.....	1.3	3,965
Veal:								
Shoulder ..... average	.....	68.8	31.2	20.2	9.8	.....	1.2	790
Mutton:								
Shoulder	.....	58.6	41.4	18.1	22.4	.....	0.9	1,280
Breast	.....	37.6	62.4	14.2	47.2	.....	1.0	2,255
Rack	.....	54.9	45.1	18.4	25.9	.....	0.8	1,435
Neck	.....	55.7	44.3	16.2	27.3	.....	0.8	1,455
Leg	.....	61.8	38.2	18.3	19.0	.....	0.9	1,140
Loin	.....	49.3	50.7	15.0	35.0	.....	0.7	1,755
Flank	.....	38.7	61.3	15.8	45.0	.....	0.5	2,195
Fore quarter	.....	55.2	47.8	17.0	29.9	.....	0.9	1,580
Hind quarter	.....	54.7	45.3	16.9	27.5	.....	0.9	1,475
Side without kidney fat	.....	53.5	46.5	16.9	28.7	.....	0.9	1,525

COMPOSITION OF FOOD MATERIALS, EDIBLE PORTION—(*Continued*)

Food Materials.	Salt.	Water.	Nutrients.					Fuel value of one pound.
			Total.	Protein.	Fat.	Carbohydrates.	Mineral matters.	
Meats, etc.—*Continued.*		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
Lamb:								
Shoulder	.....	51.8	48.2	17.5	29.7	.....	1.0	1,580
Breast	.....	56.2	43.8	19.2	23.6	.....	1.0	1,355
Neck	.....	56.7	43.3	17.5	24.8	.....	1.0	1,375
Leg	.....	64.7	35.3	18.9	15.3	.....	1.1	1,000
Loin	.....	54.8	45.2	19.0	25.1	.....	1.1	1,410
Fore quarter	.....	55.1	44.9	18.1	25.8	.....	1.0	1,425
Hind quarter	.....	60.9	39.1	18.9	19.1	.....	1.1	1,155
Side without kidney fat	.....	57.9	42.1	18.6	22.5	.....	1.0	1,295
Liver	.....	52.7	47.3	24.2	13.2	7.9	2.0	1,155
Heart	.....	67.4	32.6	18.3	13.4	.....	0.9	905
Lungs	.....	74.6	25.4	21.5	2.6	.....	1.3	510
Pork:								
Shoulder roast, average	.....	50.3	49.7	16.0	32.8	.....	0.9	1,680
Poultry, etc.:								
Chicken	.....	72.2	27.8	24.4	2.0	.....	1.4	540
Chicken liver	.....	69.3	30.7	22.3	4.2	2.4	1.8	635
Chicken heart	.....	72.0	28.0	21.2	5.4	.....	1.4	620
Chicken gizzard	.....	72.5	27.5	24.7	1.4	.....	1.4	520
Turkey	.....	66.2	33.8	23.9	8.7	.....	1.2	810
Turkey liver	.....	69.6	30.4	22.9	5.2	0.6	1.7	655
Turkey heart	.....	68.6	31.4	17.2	13.2	.....	1.0	875
Turkey gizzard	.....	62.7	37.3	21.7	14.5	.....	1.1	1,015
Hens' eggs in shell, average	.....	73.8	26.2	14.9	10.5	.....	0.8	720
Preserved Meats:								
Corned beef, rump	.....	58.1	41.9	13.3	26.6	.....	2.0	1,370
Corned beef, flank, average	.....	49.8	50.2	14.2	33.0	.....	3.0	1,655
Corned beef, canned, "	.....	52.8	47.2	26.7	17.1	.....	3.4	1,220
Dried beef, "	.....	58.6	41.4	28.8	4.4	1.4	6.8	745
Tripe, soused	.....	84.0	16.0	13.9	1.8	.....	0.3	335
Salt pork, fat	.....	12.1	87.9	0.9	82.8	.....	4.2	3,510
Smoked ham	.....	41.5	58.5	16.7	39.1	.....	2.7	1,960
Pork sausage, average	.....	41.2	58.8	13.8	42.8	.....	2.2	2,065
Bologna sausage	.....	62.4	37.6	18.8	15.8	.....	3.0	1,015
Fish, Shellfish, etc.								
Fresh Fish:								
Sturgeon	.....	78.7	21.3	18.0	1.9	.....	1.4	415
Red Horse	.....	78.6	21.4	17.9	2.3	.....	1.2	430
Herring	.....	69.0	31.0	18.5	11.0	.....	1.5	810
Alewife, average	.....	74.4	25.6	19.2	4.9	.....	1.5	565
Shad, "	.....	70.6	29.4	18.6	9.5	.....	1.3	745
Smelt, "	.....	79.2	20.8	17.3	1.8	.....	1.7	400
Whitefish	.....	69.8	30.2	22.1	6.5	.....	1.6	685
Ciscoe	.....	76.1	23.9	19.1	3.6	.....	1.2	505
California salmon, average	.....	63.6	36.4	17.4	17.9	.....	1.1	1,080
Salmon, "	.....	63.6	36.4	21.6	13.4	.....	1.4	965
Lake trout, "	.....	69.1	30.9	18.2	11.4	.....	1.3	820
Brook trout, "	.....	77.7	22.3	19.0	2.1	.....	1.2	440
Pickerel, "	.....	79.7	20.3	18.6	0.5	.....	1.2	365
Pickerel, pike	.....	79.8	20.2	18.6	0.6	.....	1.0	370
Muscalonge	.....	76.3	23.7	19.6	2.5	.....	1.6	470
Eel, salt water, average	.....	71.6	28.4	19.3	9.1	.....	1.0	725
Mullet	.....	74.9	25.1	19.3	4.6	.....	1.2	555

COMPOSITION OF FOOD MATERIALS, EDIBLE PORTION—(*Continued*)

Food Materials.	Salt.	Water.	Nutrients.					Fuel value of one pound.
			Total.	Protein.	Fat.	Carbohydrates.	Mineral matters.	
Fish, Shellfish, etc.—*Continued.*								
Fresh Fish—Continued:		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
Mackerel .....average	.....	73.4	26.6	18.2	7.1	.....	1.3	640
Spanish mackerel.....	.....	68.1	31.9	20.6	9.8	.....	1.5	790
Pompano.....	.....	72.8	27.2	18.6	7.6	.....	1.0	665
Bluefish.....	.....	78.5	21.5	19.0	1.2	.....	1.3	405
Butter-fish	.....	70.0	30.0	17.8	11.0	.....	1.2	795
Black bass.....average	.....	76.7	23.3	20.4	1.7	.....	1.2	450
Yellow perch..... "	.....	79.3	20.7	18.7	0.8	.....	1.2	380
Wall-eyed pike.....	.....	79.7	20.3	18.4	0.5	.....	1.4	365
Gray pike.....	.....	80.8	19.2	17.3	0.8	.....	1.1	355
Striped bass	.....	77.7	22.3	18.3	2.8	.....	1.2	460
White perch .....average	.....	75.7	24.3	19.0	4.1	.....	1.2	525
Sea bass.....	.....	79.3	20.7	18.8	0.5	.....	1.4	370
Grouper .....average	.....	79.4	20.6	18.9	0.6	.....	1.1	375
Red snapper ..... "	.....	78.5	21.5	19.2	1.0	.....	1.3	400
Porgy..... "	.....	75.0	25.0	18.5	5.1	.....	1.4	560
Sheepshead ..... "	.....	75.6	24.4	19.5	3.7	.....	1.2	520
Red bass.....	.....	81.6	18.4	16.7	0.5	.....	1.2	230
Kingfish.....	.....	79.2	20.8	18.7	0.9	.....	1.2	385
Weakfish.....	.....	79.0	21.0	17.4	2.4	.....	1.2	425
Blackfish .....average	.....	79.1	20.9	18.5	1.3	.....	1.1	400
Hake	.....	83.1	16.9	15.2	0.7	.....	1.0	310
Cusk.....	.....	82.0	18.0	16.9	0.2	.....	0.9	325
Haddock .....average	.....	81.7	18.3	16.8	0.3	.....	1.2	325
Cod..... "	.....	82.6	17.4	15.8	0.4	.....	1.2	310
Tomcod.....	.....	81.5	18.5	17.1	0.4	.....	1.0	335
Pollock	.....	76.0	24.0	21.7	0.8	.....	1.5	440
Halibut .....average	.....	75.4	24.6	18.3	5.2	.....	1.1	560
Turbot.....	.....	71.4	28.6	12.9	14.4	.....	1.3	850
Flounder .....average	.....	84.2	15.8	13.9	0.6	.....	1.3	285
Lamprey eel.....	.....	71.1	28.9	14.9	13.3	.....	0.7	840
Skate.....	.....	82.2	17.8	15.3	1.4	.....	1.1	345
Preserved Fish:								
Desiccated cod.....	2.9	15.2	81.9	74.6	1.9	.....	5.4	1,470
Salt cod .....average	23.0	53.6	23.4	21.4	0.4	.....	1.6	410
Boned cod.....	21.5	54.3	24.2	22.2	0.3	.....	1.7	425
Salt mackerel.....	10.6	42.2	47.2	22.1	22.6	.....	2.5	1,365
Smoked haddock	0.2	72.5	25.4	23.7	0.2	.....	1.5	450
Smoked halibut .....average	12.9	49.4	37.7	20.6	15.1	.....	2.0	1,020
Canned mackerel.....	1.9	68.2	29.9	19.9	8.7	.....	1.3	735
Canned salmon .....average	1.0	61.9	37.1	20.1	15.7	.....	1.3	1,035
Canned sardines.....	.....	56.4	43.6	25.3	12.7	.....	5.6	1,005
Canned tunny.....	.....	72.7	27.3	21.5	4.1	.....	1.7	575
Canned salt mackerel...average	10.3	43.4	46.3	17.3	26.3	.....	2.6	1,430
Canned smoked haddock	5.6	68.7	25.7	21.8	2.3	.....	1.6	505
Shellfish, etc.:								
Oysters in shell.....average	.....	87.1	12.9	6.1	1.2	3.6	2.0	230
Oysters, "solids" ..... "	.....	87.2	12.8	6.3	1.6	4.0	0.9	260
Canned oysters..... "	.....	85.3	14.7	7.4	2.1	3.9	1.3	300
Long clams from shell.. "	.....	85.8	14.2	8.6	1.0	2.0	2.6	240
Long clams, canned.....	.....	84.5	15.5	9.0	1.3	2.9	2.3	275
Round clams from shell	.....	86.2	13.8	6.5	0.4	4.2	2.7	215
Round clams, canned.....	.....	83.0	17.0	10.4	0.8	3.0	2.8	285
Scallops .....average	.....	80.3	19.7	14.7	0.2	3.4	1.4	345
Mussels from shell	.....	84.2	15.8	8.7	1.1	4.1	1.9	285

COMPOSITION OF FOOD MATERIALS, EDIBLE PORTION—(*Continued*)

Food Materials.	Salt.	Water.	Nutrients.					Fuel value of one pound.
			Total.	Protein.	Fat.	Carbohydrates.	Mineral matters.	
Fish, Shellfish, etc.—*Continued.*								
Shellfish, etc.—Continued:		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
Lobster from shell .....average	.....	81.8	18.2	14.6	1.9	.....	1.7	350
Lobster, canned ..... "	.....	77.7	22.3	18.7	1.1	.....	2.5	395
Crayfish.....	.....	81.2	18.8	17.0	0.5	.....	1.3	335
Crab.....	.....	77.1	22.9	17.8	2.0	.....	3.1	415
Crabs, canned .....average	.....	80.0	20.0	16.5	1.5	.....	2.0	370
Shrimp.....	.....	70.8	29.2	25.6	1.0	.....	2.6	520
Terrapin	.....	74.5	25.5	21.0	3.5	.....	1.0	540
Green turtle	.....	79.8	20.2	18.5	0.5	.....	1.2	365
Dairy Products, etc.								
Milk	.....	87.0	13.0	3.6	4.0	4.7	0.7	325
Butter	.....	10.5	89.5	1.0	85.0	0.5	3.0	3,615
Cheese, full cream .....average	.....	30.2	69.8	28.3	35.5	1.8	4.2	2,070
Cheese, skim-milk	.....	41.3	58.7	38.4	6.8	8.9	4.6	1,165
Oleomargarine	.....	11.0	89.0	0.6	85.0	0.4	3.0	3,605
Vegetable Foods.								
Potatoes.....average	.....	78.9	21.1	2.1	0.1	17.9	1.0	375
Sweet potatoes ..... "	.....	71.1	28.9	1.5	0.4	26.0	1.0	530
Red beets..... "	.....	88.5	11.5	1.5	0.1	8.8	1.1	195
Turnips ..... "	.....	89.4	10.6	1.2	0.2	8.2	1.0	185
Carrots..... "	.....	88.6	11.4	1.1	0.4	8.9	1.0	205
Onions ..... "	.....	87.6	12.4	1.4	0.3	10.1	0.6	225
Squash, flesh..... "	.....	88.1	11.9	0.9	0.2	10.1	0.7	215
Pumpkin, flesh ..... "	.....	93.4	6.6	0.9	0.1	4.9	0.7	110
Cucumber ..... "	.....	96.0	4.0	0.8	0.2	2.5	0.5	70
Cabbage, entire..... "	.....	90.5	9.5	2.4	0.4	5.3	1.4	155
Cabbage, inner leaves..... "	.....	93.1	6.9	1.5	0.2	4.6	0.6	120
Cauliflower..... "	.....	90.8	9.2	1.6	0.8	5.0	0.8	155
Lettuce..... "	.....	93.1	6.9	1.6	0.5	3.7	1.1	120
Spinach	.....	92.4	7.6	2.1	0.5	3.1	1.9	120
Rhubarb, stems	.....	92.7	7.3	0.8	1.2	4.4	0.9	145
Asparagus .....average	.....	94.0	6.0	1.8	0.2	3.3	0.7	105
Tomatoes..... "	.....	96.0	4.0	0.8	0.4	2.5	0.3	80
Green peas	.....	78.1	21.9	4.4	0.5	16.1	0.9	400
String beans.....average	.....	87.2	12.8	2.2	0.4	9.5	0.7	235
Lima beans, green.....	.....	68.5	31.5	7.1	0.7	22.0	1.7	570
Okra.....	.....	87.4	12.6	2.0	0.4	9.5	0.7	230
Green sweet corn.....	.....	81.2	18.8	2.8	1.1	14.2	0.7	360
Egg plant	.....	92.9	7.1	1.2	0.3	5.1	0.5	130
Peas.....	.....	83.9	16.1	0.6	0.8	14.2	0.5	290
Peas, canned.....average	.....	85.4	14.6	3.6	0.2	9.7	1.1	255
Haricots, verts, canned ... "	.....	95.1	4.9	1.1	0.1	2.6	1.1	70
String beans, canned..... "	.....	94.3	5.7	0.9	0.1	3.5	1.2	85
Stringless beans canned... "	.....	93.9	6.1	1.1	0.1	3.5	1.4	90
Haricots flageolets, canned "	.....	81.6	18.4	4.6	0.1	12.5	1.2	320
Haricots panaches, canned.....	.....	86.1	13.9	3.7	.....	9.2	1.0	240
Little green beans, canned.....	.....	93.8	6.2	1.2	0.1	3.4	1.5	90
Wax beans, canned	.....	94.7	5.3	1.0	0.1	3.0	1.2	80
Lima beans, canned.....average	.....	79.7	20.3	4.0	0.3	14.4	1.6	355
Baked beans, canned..... "	.....	67.2	32.8	7.1	3.2	20.3	2.2	645
Red kidney beans, canned.....	.....	72.7	27.3	7.0	0.2	18.5	1.6	485
Corn, canned.....average	.....	75.4	24.6	2.8	1.3	19.6	0.9	470
Artichokes, canned..... "	.....	92.5	7.5	0.8	.....	5.0	1.7	110
Sweet potato	.....	68.4	31.6	1.3	0.3	29.2	0.8	580

COMPOSITION OF FOOD MATERIALS, EDIBLE PORTION—(*Continued*)

Food Materials.	Salt.	Water.	Nutrients.					Fuel value of one pound.
			Total.	Protein.	Fat.	Carbohydrates.	Mineral matters.	
Vegetable Foods.—*Continued.*		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
Okra, canned.....average	.....	94.4	5.6	0.7	0.1	3.6	1.2	85
Brussels sprouts, canned	.....	93.8	6.2	1.5	1.0	3.4	1.3	95
Tomatoes, canned .....average	.....	93.7	6.3	1.3	0.2	4.2	0.6	110
Asparagus, canned ..... "	.....	94.4	5.6	1.5	0.1	2.8	1.2	85
Pumpkin, canned..... "	.....	92.7	7.3	0.7	0.1	6.0	0.5	130
Squash, canned..... "	.....	86.6	13.4	0.5	0.3	12.2	0.4	250
Macedoine, canned..... "	.....	93.1	6.9	1.3	....	4.6	1.0	110
Succotash, canned ..... "	.....	76.2	23.8	3.5	0.9	18.5	0.9	445
Mixed corn and tomatoes, canned ..... "	.....	87.5	12.5	1.7	0.4	9.5	0.9	225
Mixed okra and tomatoes, canned ..... "	.....	91.8	8.2	1.2	0.2	5.2	1.6	130
Apples, flesh ..... "	.....	83.2	16.8	0.3	0.4	15.9	0.2	320
Cherries, flesh.....	.....	86.1	13.9	1.1	0.8	11.4	0.6	265
Strawberries .....average	.....	90.8	9.2	1.0	0.7	6.9	0.6	175
Blackberries	.....	88.9	11.1	0.9	2.1	7.5	0.6	245
Whortleberries	.....	82.4	17.6	0.7	3.0	13.5	0.4	390
Cranberries	.....	87.6	12.4	0.4	0.9	10.9	0.2	350
Grapes, Catawba	.....	74.8	25.2	1.6	1.7	21.3	0.6	500
Lemons .....average	.....	89.3	10.7	1.0	0.9	8.3	0.5	210
Banana, pulp.....	.....	66.3	33.7	1.4	1.4	29.8	1.1	640
Pineapple	.....	89.3	10.7	0.4	0.3	9.7	0.3	200
Watermelon, flesh or pulp	.....	91.9	8.1	0.9	0.7	6.2	0.3	160
Nutmeg melon, flesh or pulp	.....	76.4	23.6	1.4	0.2	20.5	1.5	415
Rice .....average	.....	12.4	87.6	7.4	0.4	79.4	0.4	1,630
Beans, dried ..... "	.....	12.6	87.4	23.1	2.0	59.2	3.1	1,615
Maize meal..... "	.....	15.0	85.0	9.2	3.8	70.6	1.4	1,645
White hominy..... "	.....	13.5	86.5	8.3	0.4	77.4	0.4	1,620
Oatmeal..... "	.....	7.8	92.2	14.7	7.1	68.4	2.0	1,845
Pearl barley	.....	11.8	88.2	8.4	0.7	78.1	1.0	1,635
Rye flour .....average	.....	13.1	86.9	6.7	0.8	78.7	0.7	1,625
Wheat flour..... "	.....	12.5	87.5	11.0	1.1	74.9	0.5	1,645
Graham flour..... "	.....	13.1	86.9	11.7	1.7	71.7	1.8	1,625
Entire wheat flour ..... "	.....	13.0	87.0	13.6	2.0	70.0	1.4	1,640
Cracked wheat ..... "	.....	10.4	89.6	11.9	1.7	74.6	1.4	1,680
Buckwheat flour..... "	.....	14.6	85.4	6.9	1.4	76.1	1.0	1,605
Buckwheat farina	.....	11.2	88.8	3.3	0.3	84.8	0.4	1,650
Buckwheat groats	.....	10.6	89.4	4.8	0.6	83.4	0.6	1,665
Wheat bread.....average	.....	32.3	67.7	8.8	1.7	56.3	0.9	1,280
Graham bread	.....	34.2	65.8	9.5	1.4	53.3	1.6	1,225
Rye bread.....	.....	30.0	70.0	8.4	0.5	59.7	1.4	1,285
Boston crackers	.....	8.3	91.7	10.7	9.9	68.7	2.4	1,895
Soda crackers.....	.....	8.0	92.0	10.3	9.4	70.5	1.8	1,900
Pilot (bread) crackers.....	.....	7.9	92.1	12.4	4.4	74.2	1.1	1,795
Oyster crackers	.....	3.9	96.1	11.3	4.8	77.5	2.5	1,855
Oatmeal crackers.....	.....	4.9	95.1	10.4	13.7	69.6	1.4	2,065
Graham crackers	.....	5.0	95.0	9.8	13.6	69.7	1.9	2,050
Starch	.....	2.0	98.0	....	....	97.8	0.2	1,820
Sugar, granulated	.....	2.0	98.0	....	....	97.8	0.2	1,820
Molasses	.....	24.6	75.4	....	....	73.1	2.3	1,360

TABLE II

LIQUORS CONTAINING ALCOHOL

Compiled from Koenig and other sources

	Alcohol (percentage).	Carbohydrates (percentage).	Calories (in 100 c.c.).
I.—Malt Liquors.			
Beer	3.95	5.78	51
Imported German beer	4.31	6.48	57
Ale	4.89	6.03	59
Porter	5.35	7.55	68
Bitter beer (English)	5.55	5.65	62
II.—Native Wines (H. B. Parsons).			
Dry wines	11.70	.....	82
Sherry	19.43	2.86	148
Sweet Catawba, Angelica	14.85	10.57	147
Sparkling wines	10.64	8.28	108
III.—Imported Wines.			
Sherry	20.89	3.47	160
Port	20.00	6.17	165
Madeira	19.20	5.28	156
Malaga	14.22	17.29	171
Greek wines	15.40	2.65–41.00	118–266
Tokay	14.89	7.22	144
Muscatel	16.05	18.59	228
Italian wines	13.06	3.259	104
Hock	12.06	1.885	92
Rhine wines	11.45	2.299	90
Champagne (French)	10.35	16.75	131
French white wines	10.30	1.88	87
Austrian red wines	9.49	2.706	77
French red wines	9.40	2.341	75
IV.—Strong Alcoholic Beverages.			
Arrack	60.05	0.082	420
Cognac	55.00	.....	385
Rye whisky	60.00	.....	420
Bourbon whisky	49.40	.....	346
Rum	51.40	1.260	365
Gin	49.00	.....	343

GENERAL PRINCIPLES IN THE TREATMENT OF POISONINGS

COMMON POISONS

THERE are some general principles concerned in the treatment of almost all cases of poisoning which it is well to bear constantly in mind. Generally the first and most important step is that of a rapid and complete emptying of the stomach, in order to prevent any further absorption of the poison; this procedure should be carried out even when some time has elapsed since the taking of the poison, as some poisons are slowly absorbed, while others are again excreted into the stomach. To empty the stomach the tube is the best method, as it is rapid and permits of a thorough washing of the organ. Emetics should not be used in those cases in which the cardiac depression is extreme. When neither stomach tube nor emetics are at hand, the household article of salt or mustard can be called into requisition and vomiting be produced without delay. In the case of powerful corrosives, whether or not the stomach tube should be used will depend upon the probable extent of corrosion.

In the use of physiological antidotes one should exercise a large amount of caution. Frequently their use means the addition of a powerful poison or drug to a patient already overwhelmed with one poison, and when such an antidote is injected hypodermically naturally it passes beyond the further control of the physician. In a serious case of poisoning by atropine one might well hesitate to inject the respiratory depressant, morphine, although its use as the physiologic antidote is constantly advised. Moreover, the entire subject of physiologic antidotes should be regarded with a large amount of scepticism. Many drugs and chemicals are antagonistic in their actions when given in medicinal doses; when taken in poisonous quantities they all become depressant. The results of animal experimentation are frequently very misleading when applied to the complex human body.

Judicious stimulation and the maintenance of body heat by external applications are of the greatest importance, as they often enable an individual to pass successfully through a dangerous period of shock and collapse. Experiments upon some of the lower animals have shown that they readily succumb to certain poisons if their temperatures are reduced, but if the normal temperature is maintained, they survive a dose of the poison which would have been fatal under the reduced temperature.

CARBOLIC ACID.—This is one of the substances which is most frequently taken for purposes of suicide, and in cases of poisoning much can be accomplished by proper treatment. The natural chemical antidotes to carbolic acid are the soluble sulphates, which form with it the less harmful sulphocarbolates. For this purpose magnesium sulphate (Epsom salt) or sodium sulphate may be used. In the stomach they will neutralize any carbolic acid present, and they will also be absorbed and unite with the acid in the blood. Under their administration the carbolic acid is said rapidly to disappear from the urine. This is the action that will take place theoretically, but it must always be borne in mind that the reactions in the human body are very dif-

ferent from those of the chemical laboratory. Moreover, the sulphates are but slowly absorbed, and the damage may be done before they enter the blood. A further discussion of the method of the action of these salts is, however, unnecessary here; in the laboratory they will form a harmless compound with carbolic acid, and they are a well-recognized means of treatment in poisoning from it.

Within quite recent years alcohol has been used as an antidote to cases of carbolic-acid poisoning, and the results reported have been most flattering; it is well to bear in mind, however, that in these reported cases the usual other means of treatment had been employed in addition to the alcohol, and therefore the part which the alcohol played is always open to question. Nevertheless, there are some extremely interesting facts as regards the action of alcohol upon carbolic acid when rubbed upon the skin or mucous membranes. About 1894 Drs. Powell and Phelps demonstrated that strong carbolic acid could be rubbed upon the skin, and then if alcohol were at once applied to the region no injury to the skin followed—the carbolic acid was apparently neutralized. In a similar manner the mouth could be rinsed with pure carbolic acid, then with alcohol, and no injury nor poisoning followed. In these instances it is difficult to see how the alcohol acts, but it is very much more difficult to explain its action when administered internally to an individual who has been comatose for thirty minutes from swallowing an ounce of the acid. It has been supposed that the alcohol neutralizes the acid, but recent experiments in the laboratory seem to show that there is no chemical action whatever of alcohol upon carbolic acid. The subject will require further investigation.

Treatment.—First empty the stomach by means of the stomach tube; the use of an emetic is very apt to be unsatisfactory and especially so if the individual is comatose at the time. The cauterized condition of the mouth and throat is no objection to the use of the tube. After the stomach has been washed out, administer immediately an ounce of sodium sulphate or of magnesium sulphate dissolved in eight ounces of water. Symptoms of collapse are usually present and a rapidly acting stimulant, such as strychnine or ether, must be given hypodermically. Maintain the body heat by means of blankets and hot-water bottles.

In the place of the sulphates alcohol may be used, either in the form of whisky or as alcohol very slightly diluted. Two or four ounces may be given by mouth after the stomach has been emptied; an additional amount may be injected into the bowel. The alcohol may be repeated at intervals of one or two hours according to the demands of the case.

After consciousness returns and the collapse is over, the treatment usually consists of careful feeding and good nursing for a short time.

Prussic or Hydrocyanic Acid.—If the dose taken is large, there is practically no hope for the individual, as prussic acid is one of the most fatal and rapidly acting poisons known. Artificial respiration should be made and ammonia and alcoholic stimulants administered, yet the fearful rapidity of the poison generally renders treatment useless. If the dose taken has not been very large and the individual survives for twenty minutes, there is some hope, and treatment should be vigorously continued. As the acid is both absorbed and eliminated with great rapidity, owing to its extreme vola-

tility, there is some hope in the event of survival for the first twenty or thirty minutes.

Illuminating Gas.—Deaths from illuminating gas, water gas, and the "after-damp" of mine explosions are due to carbon monoxide, which forms a part of these gases. The action of carbon monoxide or carbonic oxide is that of a narcotic, calming the nervous system, and gradually producing sleep which ultimately passes into coma and death. It enters into direct combination with the hemoglobin of the blood, forming carboxyhemoglobin, a compound so stable that the red corpuscles become incapable of carrying oxygen to the tissues. It is an element in the fumes escaping from coke ovens, and tramps who have lain down in the genial warmth of these ovens have been lulled into a heavy sleep, which has occasionally ended in death. The farmer, in his first hotel experience, blows out the gas, retires for the night, and the following morning his body is found with cheeks bearing the rosy hue of health and with a cherry-red tongue. In the "choke damp" of mines there is no odor to the gas to give a warning to the miners, and it has been suggested by Kaldane that as mice are very susceptible to carbon monoxide, they should be carried into the mines. They succumb in periods varying from about twelve to forty minutes before man, so that their death would give notice to the miners in sufficient time for them to generally reach fresh air.

The immediate treatment of one poisoned by carbon monoxide consists first in the removal of the individual to fresh air and the injection of strychnine. If the respiration is failing, artificial respiration must be started, and persisted in possibly for hours. Oxygen inhalations may be given, and the body heat maintained by artificial means. Death does not supervene rapidly in these cases, and every effort should be made to permit of the hemoglobin combination being gradually destroyed.

Cocaine.—It is seldom that this drug is taken for purposes of suicide, and the majority of cases of acute poisoning from it result from its use as an anæsthetic in surgical operations and as local applications. The most important form of treatment of the poisoning is really prophylaxis or the prevention of poisoning by the use of dilute solutions, using them conservatively according to the principles laid down by our best surgeons, and always bearing in mind that many individuals are extremely susceptible to even small quantities of cocaine.

Treatment.—Should the cocaine have been swallowed, wash out the stomach immediately. In all serious cases stimulants are required, and strychnine or ether may be injected hypodermically; alcohol may be given by mouth or by rectum, and inhalations of chloroform may be given if convulsions are severe. Atropine and amyl nitrite are well spoken of as antidotes, but the latter should be used only in those few cases where the blood pressure is high, as its effect is to lower the blood pressure.

Mineral Acids: Hydrochloric, Sulphuric, and Nitric.—The action of these acids when taken in poisonous doses is that of powerful corrosives or strong irritants, and the line of treatment is quite evident. The acid in the stomach should be neutralized rapidly by giving alkalies, but the alkalies themselves must not be given in corrosive form. Magnesium carbonate, lime, or baking soda may be used, or even soap; also demulcents, as milk, sweet oil, and white of egg, should be administered. The alkalies should not be

used in unlimited quantities, as the carbonic acid generated might in some cases rupture a badly corroded stomach wall. The stomach tube may be used in those cases in which there is reason to believe that no extensive corrosion has taken place. Morphine must be given to relieve pain, and if symptoms of collapse occur, the diffusible or rapid stimulants—strychnine, ether, or alcohol—must be employed.

In many cases the after-condition is that of a gastroenteritis, which must be treated accordingly.

ALKALIES.—These corrode or irritate violently, and the treatment of poisoning by them is similar to that for the acids, using, however, acid solutions for purposes of neutralization. The stomach tube is to be used with the same caution as in poisoning from the mineral acids. Give weak solutions of the vegetable acids; acetic or citric acid or vinegar may be used. Demulcents of oil, milk, or white of egg may follow, and pain may be relieved by the use of morphine. If symptoms of collapse appear, stimulate hypodermically and apply external heat.

BELLADONNA AND ATROPINE.—The stomach should first be washed out. If there is great excitement or delirium, sedatives may be used, especially chloroform or ether, as their effects are so very transient. As depression or stupor develop, heart stimulants must be administered and the respiration stimulated by means of strychnine, or if necessary by artificial means. Pilocarpine, physostigmine, and opium are recommended as physiological antidotes, but if they are used at all they must be used cautiously. The final depressing effect of belladonna upon the respiratory center may simply be augmented by morphine.

CHLORAL.—This is one of the most powerful of the hypnotics, and yet some enormous doses—480 grains—have been taken without producing a fatal result; on the other hand, the ordinary dose of 20 grains has proved quite toxic, and 30 grains have produced death. In view of these results, it should always be used with care. Unlike opium, however, it is well borne by infants and children.

Poisoning by the drug occurs in both acute and chronic forms. Treatment of the chronic cases is that of a drug habit, and is generally best conducted in a sanitarium. Treatment of Acute Poisoning: Evacuate the stomach at once by means of the stomach tube. As chloral produces great reduction of the temperature, the body heat must be maintained by means of warm blankets, hot-water bottles, and rectal injections of hot coffee. Animals succumb much less readily to the chloral when their temperature is kept up by artificial means. Somnolence must be combated by means of slapping, striking with a wet towel, douches, or friction. Unlike opium, however, chloral is a great cardiac depressant, and the patient may become extremely weak; therefore no attempt must be made to keep him awake by walking him up and down. Stimulate the heart and respiration by means of strychnine, and if necessary resort to artificial respiration.

STRYCHNINE.—In cases of poisoning by strychnine the first step in treatment is the evacuation of the stomach by means of the stomach tube or by an emetic. In case the attempt to pass the tube produces violent convulsions, chloroform may be administered. A solution of tannic acid, which is the chemical antidote, may be given; it forms with strychnine an insoluble tan-

nate, which must be removed from the stomach quickly, as it is broken up by the acid gastric juice and the strychnine absorbed. Large doses of potassium bromide or chloral should be injected into the rectum; the convulsions may, however, be controlled by chloroform or ether, and these have an advantage in that they can be easily controlled and their effect is transient. An excellent theoretically physiologic antidote is physostigmine, but according to actual experience it does little or no good.

PHOSPHORUS.—Suicide by phosphorus is not so common in America as it is abroad, where match heads and vermin pastes are taken occasionally for this purpose. Cases of chronic poisoning mainly occurred in the manufacture of matches, but since the substitution of the slightly poisonous red phosphorus for the more dangerous yellow form, together with improved methods of match making and greater care on the part of the operatives, chronic poisoning, or phosphorism, has become very much less common.

Treatment.—The main object of treatment in acute cases of poisoning is to prevent absorption of the phosphorus, as after absorption has once taken place the subsequent organic changes are usually inevitable. Absorption, however, generally takes place slowly, and phosphorus has been found in the stools as late as three days after ingestion. The use of a purge, therefore, is quite rational. All fats and oils must be avoided, as they dissolve the phosphorus and facilitate its absorption.

Wash out the stomach by means of the stomach tube to remove the phosphorus rapidly. Sulphate of copper may be used as an emetic for this purpose, giving three to five grains every few minutes until vomiting occurs. The copper is also a chemical antidote, and forms with the phosphorus an insoluble copper phosphide, which is supposed to be easily eliminated by the kidneys. This treatment is often sufficient, but for the next few days all fats, oils, milk, and eggs must be withheld.

Another method of treating these cases is by the use of oil of turpentine, the turpentine forming with the phosphorus a much less poisonous compound, and probably oxidizing a part of it. This is an old method of treatment, and is very widely used. In 1868 Andant was called to see a man who had attempted suicide by swallowing some phosphorus paste, and had followed this by a drink of oil of turpentine to insure the work of the phosphorus. Not only were the man's symptoms slight, but he made a good recovery. Experiments upon dogs showed that turpentine either delayed the toxic effects of the phosphorus or prevented them altogether. These experiments were made with old French oil, but the turpentine of other countries is somewhat different, so that it does not give such satisfactory results, as recent experiments have shown. Nevertheless a fairly large percentage of recoveries follows the use of this method, and ordinary commercial oil of turpentine, administered in thirty- or forty-drop doses after washing out the stomach, remains a favorite method of treatment. In any method of treatment the bowels should be emptied by a brisk purge.

PHOSPHORISM.—The most important part in the treatment of chronic phosphorus poisoning is the prevention of its occurrence. This is accomplished by modern methods of match manufacture, the use of the red phosphorus in place of the more poisonous yellow, the proper care of and precautions on the part of the operatives. Any beginning inflammation of the

gums should compel the operative to cease work and use a mouth wash until cured. Among the French, who have had a large experience with the chronic cases, a favorite line of treatment in actual phosphorism consists of an exclusive milk diet, frequent small doses of oil of turpentine, and light exercise. Among American workmen it is customary to carry a small bottle of turpentine suspended from the neck, as they believe that the fumes of the turpentine neutralize those of the phosphorus.

Should necrosis of the jaw appear, it is to be treated according to surgical principles.

Copper.—This generally produces vomiting; but should it not do so, wash out the stomach thoroughly by means of the stomach tube. After the stomach has been emptied give milk, eggs, or tannic acid. Potassium ferrocyanide is a chemical antidote, forming an insoluble copper cyanide, but if used at all it must be employed in a small dose.

Mercury.—Cases of poisoning from mercury result accidentally, from attempts at suicide, and from its use in solutions for the washing of large cavities in surgical practice. In cases of acute poisoning from corrosive sublimate or other of the mercurial salts it is necessary to empty the stomach at once by means of an emetic, such as apomorphine hypodermically. The stomach tube, if used, must be employed cautiously, and if it is probable that much corrosion has taken place, it is probably best not to use it at all. After evacuation of the stomach give eggs, milk, or tannic acid. If collapse occurs, the usual supporting measures will be required.

Mercurialism, or Chronic Poisoning.—If chronic poisoning develops in a worker in mercury he should cease his employment immediately; in cases in which the poisoning is the result of mercury used medicinally the mercury should be stopped at once. If ptyalism or stomatitis occurs the best remedy is a mouth wash of potassium chlorate in two- or three-per-cent solution; various other astringent and antiseptic washes may be used. To eliminate the mercury from the system, potassium iodide has served as a standard remedy, but it is doubtful if it accomplish its object.

RARER POISONS

Aconite.—Place the patient in a horizontal position and empty the stomach at once. Give strychnine or ether hypodermically, and these may be followed by digitalis, alcohol, or atropine. Atropine will frequently save animals that have received otherwise fatal doses of aconite, and it is the antidote from which most is to be expected in cases of poisoning in man.

Veratrum Viride.—The treatment of poisoning by this drug is the same as that for aconite poisoning.

Tartar Emetic.—Poisonous doses of this drug usually provoke vomiting, but it is a good plan to wash out the stomach in addition, using a solution of tannic acid, which will precipitate the antimony in the stomach. After evacuation of the stomach give demulcent drinks, and if symptoms of collapse develop, cardiac stimulants and external heat must be used.

Iodine.—After washing out the stomach give large quantities of starch in the form of arrowroot or starch water. Relieve pain by the use of opium, and if necessary resort to stimulants hypodermically.

For the chronic poisoning, or iodism, withdraw the iodine completely.

Creosote.—Treatment of poisoning by creosote is the same as in cases of carbolic-acid poisoning.

Acetanilide, Antipyrin, and Phenacetin.—The symptoms produced by poisonous doses of these drugs are the result of cardiac weakness, and treatment should consist in lowering the patient's head and using strychnine, digitalis, or alcohol hypodermically. If much cyanosis is present, inhalations of oxygen are valuable.

Colchicum.—When a decidedly poisonous dose of colchicum is taken a fatal termination is almost inevitable, and the individual is doomed to a slow and torturing death. About all that can be done is to relieve his pain by the use of morphine.

Digitalis.—In poisoning from this drug the stomach should be emptied at once by the stomach tube; if the heart is very weak, emetics should not be used for this purpose. Give tannic acid as a chemical antidote, place the individual in the horizontal position, and keep up the body heat by means of external applications. Stimulate the circulation by strychnine or alcohol. Aconite and saponin are said to be useful physiological antidotes.

Silver Nitrate.—Give large amounts of ordinary salt water, which both dilutes the nitrate and forms with it the insoluble silver chloride; following this the stomach should be immediately washed out. Opium will be required for pain, and if collapse occur, heat and stimulants will be necessary.

Argyria, or chronic silver poisoning, is practically not amenable to treatment. Potassium iodide is given to eliminate the silver, but little or no good is accomplished by it. Potassium cyanide is an excellent solvent for the silver particles, but it is so poisonous that its use is dangerous.

Oxalic Acid.—The stomach should be immediately washed out, and then powdered chalk or magnesia should be administered, which forms the harmless oxalate of lime or of magnesia. It may be necessary to resort to morphine for pain, and to stimulation if collapse follow.

LIST OF DRUGS

THE list of drugs comprises those which are mentioned in the book. The doses are those prescribed for adults, from which the dosage for children can be calculated. In the column on the mode of administration will be found general rules. The formulary which is added has for its object the giving of details as to the mode of administration. Both the list of drugs as well as the formulary are arranged in alphabetical order. Wherever a drug is marked by an asterisk it will also be found in the formulary.

NAME OF DRUG.	Dosage.	Mode of Administration.
A.		
Acetanilid* (antifebrin).	0.06–0.30 gm. (gr. j–v).	Powders, tablets three or four times daily.
Aconite. Fluidextractum.	0.05 c.c. (♏ j).	Every two to four hours, tablets.
Tinctura.	0.06 c.c. (♏ x).	Every two to four hours.
Aconitina.	0.15 mgr. (gr. $\frac{1}{100}$).	In pills.
Adonis Vernalis.*	0.30 gm. (gr. v).	In infusion, every two to four hours.
Adonidin.	0.004–0.015 gm. (gr. $\frac{1}{16}$–$\frac{1}{4}$).	Four times daily in pills or tablets.
Adrenalin.	1.0 c.c. (♏ xv). 1:1000 solution.	Either by the mouth or hypodermically.
Ætheris Nitrosi, Spiritus.	1.0–5.0 c.c. (♏ xx–xc).	To be dropped on sugar, not given in water. The first dose to be repeated in one to two hours.
Agaricin.	0.5–60 mgm. (gr. $\frac{1}{12}$–j).	In pill form and administered five or six hours before bedtime.
Aloes.*	0.1–0.5 gm. (gr. ij–vij).	In pills, at bedtime.
Aloes et Ferri, Pilulæ.	1–5 pills.	
Aloes et Myrrhæ, Pilulæ.	1–5 pills.	
Aloes, Extractum.	0.2–0.5 gm. (gr. ij–vijss.).	In pills.
Aloes, Pilulæ.	1–5 pills.	
Aloin.	0.05–0.2 (gr. j–iv).	In pills.
Ammonia, Aromatic Spirits of.	1.0–4.0 c.c. (♏ xv–lx).	Diluted with water.
Ammonium bromidum.*	0.30–1.00 gm. (gr. v–xv).	Well diluted, given four times daily.
Ammonii, Carbonas.	0.2–0.6 gm. (gr. iij–x).	In syrup, in milk, in effervescing water. Every two to four hours.
Ammonii Chloridum.*	0.30–1.00 gm. (gr. v–xv).	In solution, in troches.
Ammonii Valerianas.	0.50 gm. (gr. vijss.).	In solution. Also as an elixir of which one teaspoonful is the dose. Every two to four hours.
Amylis Nitris.	♏ ij–v.	To be inhaled either by being dropped upon a handkerchief or by breaking "pearls" containing the proper dose.
Amyleni Hydras.	3–5 c.c. (♏ xl–lxxx).	At bedtime. Administered in aqueous solution, flavored with Extractum Glycyrrhizæ.
Anæsthesin (Ritsert).	0.30–0.50 gm. (gr. v–xv).	In lozenges, 0.02–0.04 gm. to relieve cough.

LIST OF DRUGS—(*Continued*)

Name of Drug.	Dosage.	Mode of Administration.
Analgen.	1.0–2.0 gm. (gr. xv–ʒss.).	In powders three or four times daily.
Anodyne, Hoffmann's (Spiritus Ætheris Compositus).	2–4 c.c. (ʒss.–j).	In milk, in water, or upon sugar.
Antipyrina.	0.50–1.00 gm. (gr. vijss.–xv).	Three or four times daily, dissolved in water which may be flavored at will.
Apocynum Cannabinum Fluidextractum.	0.3–1.0 c.c. (♏ v–xv).	Three or four times daily.
Apomorphinæ	Expectorant 2 mgm. (gr. $\frac{1}{30}$).	Given in the usual expectorant mixture.
Hydrochloridum.	Emetic, 5 mgm. (gr. $\frac{1}{10}$).	Hypodermically.
Arsenic:		
Liquor Potassii Arsenitis (Fowler's Solution).	0.2 c.c. (♏ iij.)	Diluted with water. The dose to be increased when necessary.
Pilulæ Asiaticæ.*	One pill.	Three times daily after meals, to be increased.
Sodii Arsenatis.*	1–5 mgm. (gr. $\frac{1}{60}$–$\frac{1}{12}$).	In pill form or as the Liquor Sodii Arsenatis. (Dose the same as Fowler's solution.)
Sodii Cacodylas.	0.05 gm. (gr. j).	Either by the mouth or hypodermically.
Asafœtida, Emulsio.	15–30 c.c. (ʒss.–i).	
Asafœtida, Pilulæ.	One to three pills.	
Asafœtida, Tinctura.	2–4 c.c. (♏30–60).	The former dose for repeated administrations.
Aspirin.	0.30–1.00 gm. (gr. v–xv).	In powders, four to five times daily.
Atropinæ sulphas.	0.5 to 1 mgm. (gr. $\frac{1}{200}$–$\frac{1}{100}$).	
B.		
Belladonna:		
Extractum Belladonnæ Foliorum.	0.005–0.03 gm. (gr. $\frac{1}{12}$–$\frac{1}{2}$).	In pill form.
Tinctura Belladonnæ Foliorum.	0.3–1 c.c. (♏ v–xv).	Every three to four hours, or three times daily.
Beta-Naphthol.	0.30 gm. (gr. v).	In intestinal-coated pills.
Benzoinum, Acidum.	0.3–1.0 gm. (gr. v–xv).	In powder or pill.
Benzoas, Sodii.	0.3–2.0 gm. (gr. v–ʒss.).	In solution every two to four hours.
Benzoas, Lithii.*	0.3–2.0 gm. (gr. v–ʒss.).	In powder.
Bismuthi Subnitras.	0.30–2.0 gm. (gr. v–ʒss.).	In powder.
Bismuthi Subcarbonas.	0.30–2.0 gm. (gr. v–ʒss.).	In powder.
Bismuthi Subgallas.	0.30–0.50 gm. (gr. v–vijss.).	In powder every four hours.
Bromides:		
Potassii Bromidum.*	1–4 gm. (gr. xv–ʒi).	Dissolved in large quantities of water.
Sodii Bromidum.	1–4 gm. (gr. xv–ʒi).	
Strontii Bromidum.	2–4 gm. (ʒss.–j).	Dissolved in large quantities of water.
Bromipin.	2.0 c.c. (♏ xxx).	Every four hours.
Bromoform.	In children one drop for each year of age.	Administered internally in whooping cough.
Buchu, Fluidextractum.	2–4 c.c. (fʒss.–j).	In plenty of water.
*Butylchloral Hydras (Croton Chloral).	0.3–1.0 gm. (gr. v–xv).	At bedtime.

LIST OF DRUGS—(*Continued*)

Name of Drug.	Dosage.	Mode of Administration.
C.		
Cactus Grandifloris.	Tincture G. } 0.20–0.30 c.c. Fluidextractum G. } (m 4–5).	Three or four times daily.
Caffeini Sodiosalicylas.	0.20 gm. (gr. iij).	Hypodermically or by the mouth, two or three times daily.
Caffeini Sodiobenzoas.	0.20 gm. (gr. iij).	Dissolved in water.
Calabar Bean:		
Extractum Physostygmatis.	0.015–0.06 gm. (gr. ¼–i).	In pill, two or three times daily.
Tinctura Physostygmatis.	1–3 c.c. (m xv–xlv).	Two or three times daily.
Calcii Carbonas (Præcipitatus).	1–4.0 gm. (gr. xv–lx).	Twice or three times daily.
Calcii Chloridum.	0.30–1 gm. (gr. v–xv).	In aqueous solution, well diluted.
Calomel:		
Hydrargyrum Chloridum Mite.	0.03–0.30 (gr. ½–v).	For special purposes much less and much more may be given.
Calumba:		
Fluidextractum.	1–2 c.c. (m xv–xxx).	
Tinctura.	4–15 c.c. (f℥j–iv).	
*Camphor.	0.10–0.60 gm. (gr. ij–x).	In pill or emulsion.
Camphoræ Monobromas.	0.30–1.00 gm. (gr. v–xv).	In pill or emulsion.
Spiritus Camphoræ.	0.3–2.0 c.c. (m v–xxx).	
Cannabis Indica:		
Extractum.	0.02–0.06 gm. (gr. ⅓–i).	In pill.
Fluidextractum.	0.10–0.30 c.c. (m ij–v).	
Tinctura.	1.0–2.0 c.c. (m xv–xxx).	
*Carbolic Acid (Phenol).	0.03–0.20 gm. (gr. ss.–v).	Given in some emulcent fluid.
Cascara Sagrada (Rhamnus Purshiana):		
Extractum, R. P.	0.15–0.250 gm. (gr. ij–iv).	In pill.
Fluidextractum, R. P.	1–2 c.c. (m xv–xxx).	Given at bedtime.
Fluidextractum R. P. Aromaticum.	1–2 c.c. (m xv–xxx).	Given at bedtime.
*Catechu:	0.15–0.50 gm. (gr. ij–viij).	In pill or tablet form.
Pulvis Catechu.	1.0–2.0 gm. (gr. xv–xxx).	Three or four times daily.
Tinctura Catechu Compositæ.	2–12 c.c. (f℥ss.–iij).	Three or four times daily.
Cerii oxalas.	0.1–0.6 gm. (gr. iss.–x).	In powder every four hours.
Chinatropinum.	0.50 gm. (gr. vijss.).	Dissolved in 250 c.c. of water or carbonated water, taken two or three times daily.
*Chloral Hydras.	0.50–1.00 gm. (gr. vijss.–xv).	Given at bedtime. The dose may be repeated every four hours.
*Chloralamidum.	1.0–3.0 gm. (gr. xv–xlv).	In powder, water or whisky, in wafer.
Chloralose.	0.15–0.30 gm. (gr. ijss.–v).	In capsules.
Chloretone.	0.3–1.0 gm. (gr. v–xv).	In tablets for internal use.
		1% solution in water for inhalation.
Chloroform (Aqua chloroformi).	8–16 c.c. (℥ij–℥ss.).	
Cimicifuga:		
Cimicifugæ, Fluidextractum.	1 c.c. (m xv).	
Cimicifugæ, Tinctura.	4 c.c. (f℥iss.).	

LIST OF DRUGS—*(Continued)*

Name of Drug.	Dosage.	Mode of Administration.
*Cinchona:		
Fluidextractum Cinchonæ.	1 c.c. (♏ xv).	
Tinctura Cinchonæ.	4 c.c. (f℥i).	
Tinctura Cinchonæ Composita.	4 c.c. (f℥j).	
*Cocaini Hydrochloras.	0.01–0.06 gm. (gr. ⅙–j).	As tablet, in wafers or in solution.
Codeinæ Phosphas.	0.015–0.12 gm. (gr. ¼–ij).	In aqueous solution, in pills, in tablets.
Colchicum:		
Fluidextractum C. Seminis.	Average dose 0.2 c.c. (3 ♏).	} (U. S. P. 1900).
Tinctura C. Seminis.	Average dose 2.0 c.c. (♏ xxx).	
Colchicina.	0.50 mgm. (gr. $\frac{1}{128}$).	In tablets.
*Collargolum.	0.10–0.50 (gr. iss.–vijss.).	For intravenous or rectal injection.
*Condurango.	Fluid Extract 2 c.c. (♏ xxx).	Three times daily.
Convallaria Majalis.	Fluid Extract 0.3–1 c.c. (♏ v–xv).	Four times daily.
Copaibæ Oleum.	0.5–1.0 c.c. (♏ x–xv).	In capsules or emulsion.
Creosotal.	2 c.c. (♏ xxx) increasing to 5 c.c. (♏ lxxv).	In wine, brandy, cod-liver oil, or capsules t. i. d.
Creosote.	0.05–0.3 c.c. (♏ i–v) ter in die.	In capsules, with or without cod-liver oil, in milk, wine, bitter tinctures
Croton Oil (Oleum Tiglii).	0.02–0.05 c.c. (♏ ⅓–i).	On sugar, in oil, or in pill form.
Cubebs (Oleum Cubebæ).	0.5–1 c.c. (♏ v–xv).	In capsules t. i. d.
Cupri Sulphas.	0.30–0.60 gm. (gr. v–x).	In aqueous solution, as an emetic.
Curare.	The dose cannot be stated, as every specimen of curare differs as to strength. It is necessary before using the drug in the human being to test its strength upon a lower animal. One-tenth of the lethal dose for the animal has been tried upon the human being as the initial dose.	
D.		
Digitalin.	1–6 mgm. (gr. $\frac{1}{60}$–$\frac{1}{10}$).	Given internally in tablets or solution. The smaller dose may also be given subcutaneously.
Digitalis:		
Fluidextractum Digitalis.	0.05–0.20 c.c. (♏ j–iv).	Three or four times daily.
Folia Digitalis (Pulvis).	0.05–0.10 (gr. j–ii).	In powder or in pill.
Infusum Digitalis.	4–8 c.c. (1–2 f℥).	
Tinctura Digitalis (fat-free).	0.3–1 c.c. (♏ v–xv).	
Digitoxin.	0.00025–0.001 gm. (gr. $\frac{1}{240}$–$\frac{1}{60}$) Squibb; ¼ mgm. (gr. $\frac{1}{240}$) 2 or 3 times daily, Merck.	Insoluble in water, but soluble in alcohol.
Dionin.	0.03 gm. (gr. ss.) 2 or 3 times daily, maximum dose 0.08 gm. given hypodermically in one dose of 0.03 gm.	
Dover's Powder. Pulvis Ipecacuanhæ Compositus.	0.30–1.00 gm. (gr. v–xv).	In powder.
Duboisine Sulphate.	0.0008–0.002 gm. (gr. $\frac{1}{80}$–$\frac{1}{60}$).	Given like hyoscine hydrobromate.
Duotal.	0.2–0.5 gm. (gr. iv–vijss.).	In powder three times daily.

LIST OF DRUGS—(*Continued*)

Name of Drug.	Dosage.	Mode of Administration.
E.		
Elaterium.	0.005–0.03 gm. (gr. $\frac{1}{12}$–$\frac{1}{2}$).	In pill.
Elaterinum.	1–5 mgm. (gr. $\frac{1}{60}$–$\frac{1}{10}$).	In pill, or Trituratio Elaterini 15–60 mgm. (gr. $\frac{1}{4}$–j).
Eosot (Creosoti Valerianas).	0.2 gm. (gr. iij).	In capsules, given like creosote, the number of capsules to be increased.
*Ergot, Fluid Extract.	1–8 c.c. (♏ xv–f℥ij).	
Ergotin.	0.065–0.15 gm. (gr. j–ijss.).	In pill. Also hypodermically.
*Eucalyptus (Oleum).	0.03–0.5 c.c. (♏ v–viij).	In capsules three times daily.
*Eucalyptus (Extract).	0.20–0.50 gm. (gr. iij–vijss.).	In pills or capsules.
Euonymus (Extract).	0.05–0.2 gm. (gr. j–iij).	In pill.
Euonymine.	0.03–0.06 gm. (gr. ss.–j).	In pill.
Euquinine.	0.30–2.00 gm. (gr. v–℥ss.).	In aqueous solution without sugar, or in pills, capsules, or wafers.
Erythroltetranitrite.	0.05 gm. (gr. j).	In pills, tablets, or alcohol.
Exalgin.	0.25–0.50 gm. (gr. iv–vijss.).	4 gm. (℥j) in a day, the maximum given in powders.
F.		
Fel Bovis Purificatum.	0.3–1 gm. (gr. v–xv).	In pills.
Ferratin.	0.5–1.5 gm. (gr. vijss.–℈j).	Given in powders, pills, or alkaline solution in one day.
*Ferrum:		
Ferri Chloridi, Tinctura.	0.5–2 c.c. (♏ viij–xxx).	Well diluted in water and taken through a glass tube.
Ferrum Reductum.	0.05–0.3 gm. (gr. j–v).	In pills or powder.
Ferri Carbonatis, Pilulæ (Blaud).	.....	1–3 pills three times daily.
Ferri Oxidi Hydratum.	15–20 gm. (℥ss.).	Arsenical antidotes which must be given freshly prepared and frequently.
Ferri Oxidi Hydratum cum Magnesia.		
Ferri Lactas.	0.05–0.3 gm. (gr. j–v).	In pills.
Ferri Iodidi, Syrupus.	1–4 c.c. (♏ xv–℥j).	Taken through a glass tube as the Tinct. Ferri Chloridi.
Ferri Iodidi, Pilulæ.	.....	1–2 pills three times daily.
Filix Mas (Oleoresina Aspidii)	2–8 c.c. (f℥ ss.–ij).	In capsules without oil.
Formin.	0.25 gm. (gr. jv).	Well diluted in water, three times daily.
G.		
Gallic Acid.	0.30–1.00 gm. (gr. x–xv).	In wafers or capsules three or four times daily.
Gelsemin.	0.008–0.12 gm. (gr. j–ij).	Soluble in alcohol. The dose may be given twice daily.
Gelseminine.	0.0005–0.002 (gr. $\frac{1}{130}$–$\frac{1}{30}$).	Soluble in water; it is also given hypodermically, once or twice daily.
Gelsemium:		
Fluidextractum G.	0.3–0.6 c.c. (♏ v–x).	Three or four times daily.
Tinctura G.	0.3–1 c.c. (♏ v–xv).	
Geosot (Guiacol Valerianas).	From 0.2–0.6 c.c. to 1.2 c.c. (♏ iv–x to xx).	Administered in the same manner as creosote, three times daily.
Glycerophosphates:		
Sodii Glycerophosphas.	0.10 gm. dissolved in 1.00 gm. (gr. jss. dissolved in ♏ xv).	For hypodermic use.
Calciiet Sodii Glycerophosphas.	Elixir, one dessertspoonful.	Three times daily.
Calcii Glycerophosphas.	0.30 gm. (gr. v).	In tablets, three times daily.

LIST OF DRUGS—(*Continued*)

Name of Drug.	Dosage.	Mode of Administration.
Gold, Auri et Sodii Chloridum	0.005 gm. (gr. $\frac{1}{10}$).	In pills three times daily, or in solution.
Guacamphol.	0.2–1.0 gm. (gr. iij–xv).	In powder at night for night sweats.
Guaiacol Carbonate.	0.05–0.2 gm. (gr. j–iij).	In cod-liver oil, in tinctures or in pills.
Guaiacum:		
Tinctura Guaiaci.	4 c.c. (f℥j).	
Tinctura Guaiaci Ammoniata.	2–4 c.c. (f℥ss.–j).	
Trochiscus Guaiaci Resinæ.	0.20 gm. (gr. iij).	One lozenge every two to four hours.
Guarana:		
Elixir Guaranæ.	4–8 c.c. (f℥j–ij).	Once or twice daily as required.
Fluidextractum Guaranæ.	3–8 c.c. (♏ xlv–f℥ij).	
H.		
Hæmogallol.	0.30–0.60 gm. (gr. v–x).	In powder, in tablets, three times daily.
Hæmol.	0.30–0.60 gm. (gr. v–x).	
Helleborein.	0.01 gm. (gr. $\frac{1}{6}$).	Either by mouth or hypodermically.
Herniariæ Glabræ, Fluidextractum.	0.60–1.00 c.c. (♏ x–xv).	Three or four times daily.
Heroin Hydrochloride.	0.0025–0.005 gm. (gr. $\frac{1}{24}$–$\frac{1}{12}$).	In solution or in tablets, three or four times daily.
Hetol (Sodæ Cinnamas).	0.0025–0.025 gm. (gr. $\frac{1}{24}$–$\frac{1}{3}$).	Injected into veins in a 1–5% aqueous solution, the first dose to be used and gradually increased.
Hydrargyrum (Mercury):		
Hydrarg. Chloridum Corrosivum.	0.002–0.02 gm. (gr. $\frac{1}{32}$–$\frac{1}{3}$).	In aqueous solution, or tablet.
Hydrarg. Chloridum Mite vide Calomel.		
Hydrarg. cum Creta.	0.1–0.5 gm. (gr. jss.–vijss.).	In powders.
Hydrarg. Oxidum Flavum.	1–10% for external use.	In salves.
Hydrarg. Massa.	0.2–0.5 gm. (gr. iij–vijss.).	In pill.
**For hypodermic use:*		
Hydrarg. Chlor. Corrosivum.	10% solution in normal saline solution.	
Hydrargyrum Formamidate.	1% solution of which 0.5–1.0 c.c. is injected. 2–5% solutions are sometimes used at longer intervals.	
Hydrargyrum Carbamidate.		
Hydrargyrum Amidosuccinidate.		
Hydrargyrum Bichloridum Carbamidatum.		
Hydrargyrum Carbolicum.		
Hydrastis Fluidextractum.	1–4 c.c. (♏ xv–lx).	
Hydrastis, Tinctura.	1–4 c.c. (♏ xv–lx).	
Hydrastininæ Hydrochloras.	0.03–0.1 gm. (gr. $\frac{1}{2}$–iss.).	Soluble in water; it may be given hypodermically or in solution, in tablets or pills by the mouth.

LIST OF DRUGS—(*Continued*)

Name of Drug.	Dosage.	Mode of Administration.
Hydriodic Acid (Syrup).	4 c.c. (ʒj).	Syrupus Acidi Hydriodici.
Hydrobromicum, Acidum Dilutum.	6–12 c.c. (fʒss.–iij).	Every three to four hours.
Hydrocyanicum, Acidum Dilutum.	0.1–0.5 c.c. (♏ ij–viij).	
Hyoscyaminæ Hydrobromas.	½–1 mgm. (gr. $\frac{1}{200}$–$\frac{1}{100}$).	In tablets every four hours (gr. $\frac{1}{100}$).
Hyoscinæ Hydrobromas.	0.0003–0.0005 gm. (gr. $\frac{1}{200}$–$\frac{1}{100}$).	Either hypodermically or by the mouth.
Hypnal.	To be administered like chloral hydrate.	
I.		
Ichthyol.	0.2–0.5 gm. (gr. iij–vijss.).	Administered internally in capsules, three times daily.
*Iodides:		
Ammonii Iodidum.	0.10–1.0 gm. (gr. ij–xv).	
Potassii Iodidum sive Sodii.	0.30–1.00 gm. (gr. v–xv).	Well diluted, three times daily. The dose may be increased (v. Syphilis).
Strontii Iodidum.	0.30–1.0 gm. (gr. v–xv).	
*Iodine (Tincture).	0.10–0.40 c.c. (♏ ij–viij).	Three times daily, well diluted.
Iodoform.	0.03–0.20 gm. (gr. ss.–iij).	In pills or capsules, three times daily.
Iodol.	0.03–0.15 gm. (gr. ss.–ijss.).	In pills ter in die.
Iodonucleoid.	0.30–1.00 gm. (gr. v–xv).	In powder or tablets, ter in die.
Iodopetrogen.	5%.	For external use.
Iodothyrin.	For adults, 0.30–0.60 gm. (gr. v–x). For children, 0.10–0.50 gm. (gr. jss.–vijss.).	Three times daily.
Iodovasogen.	4–8%.	For external use.
*Ipecac.: Pulvis.	2.0 gm. (ʒss.) emetic. 0.06–0.30 gm. (gr. j–v), expectorant.	
Fluidextractum.	The same doses.	
Iron. Vide Ferrum.		
J.		
Jaborandi.	Fluid extract ½–2 c.c. (♏ vij–xxx).	
Jalap:		
Pulvis J. Compositus.	1–4 gm. (gr. xv–lx).	
Jalapæ, Resina.	0.125 gm. (gr. ij).	In pill.
Juniper Oil.	0.20 c.c. (♏ iij).	In capsules, three times daily.
Juniperis, Spiritus Compositus.	8 c.c. (fʒij).	
K.		
Krameria, Extract.	0.30–1.00 gm. (gr. v–xv).	
Tincture.	2–8 c.c. (fʒss.–ij).	
Kryofine.	0.5 gm. (gr. vijss.).	In powder.
L.		
*Lactophenine.	0.60 gm. (gr. x).	Three times daily.
*Lead Acetate (Plumbi Acetas).	0.05–0.30 gm. (gr. j–v).	In pill.
Licorice Powder, Comp.	4–8 gm. (ʒj–ij).	At bedtime.

LIST OF DRUGS—(*Continued*)

Name of Drug.	Dosage.	Mode of Administration.
Lipanin.	4–15 c.c. (f℥j–℥ss.).	Three times daily.
Lithii Benzoas.	0.30–2.0 gm. (gr. v–xxx).	Dissolved in a large quantity of water.
Lobelia, Fluid Extract.	0.06–0.30 c.c. (♏ i–v).	
Lobelia, Tincture.	0.6–4.0 c.c. (♏ x–lx).	
Lysidin.	1.0–5.0 dissolved in CO_2 water or in a solution of 2–20 gm. of Rochelle Salts.	
M.		
*Magnesium Oxidum.	2.0 gm. (℥ss.).	Powder.
*Malakine.	0.5 gm. (gr. vijss.).	In powder, three times daily.
*Menthol.	0.06–0.30 gm. (gr. j–v).	In intestinal coated pills. Also lozenges.
Mercury. Vide Hydrargyrum.		
Methylene Blue.	0.1–0.25 gm. (gr. jss.–iij).	In capsules, three to five times daily, frequently given with equal parts of myrstica to prevent strangury.
Morphinæ Hydrochloridum.	0.01–0.015 gm. (gr. $\frac{1}{6}$–$\frac{1}{4}$).	
Musk.	0.5–1.0 gm. (gr. vijss.–xv).	In powder.
Myrtol.	One to two drops.	In capsules, three to five times daily.
N.		
Naphthol, α and β.	0.2–0.6 gm. (gr. iij–x).	In intestinal pills, three times daily.
Nitre, Sweet Spirits of. Vide Spiritus Ætheris Nitrosi.		
Nitrite of Amyl. Vide Amyl.		
Nitroglycerine:		
Spiritus Glonoini.	0.03–0.1 c.c. (♏ ss.–ij).	Every two to four hours in water.
Tablettæ Trinitrini.	gr. $\frac{1}{100}$.	One or two tablets.
*Nitrite of Soda.	0.05–0.1 gm. (gr. j–ij).	In solution, three or four times daily.
Nux Vomica, Extract.	0.015–0.065 gm. (gr. $\frac{1}{4}$–j).	In pills.
Tincture.	0.3–1.0 c.c. (♏ v–xv).	Three or four times daily.
O.		
Oleoresina Aspidi. Vide Filix Mas.		
Opium Preparations: (The doses are those for adults. For children the doses must be carefully calculated.)		
Pulvis Opii.	0.02–0.1 gm. (gr. $\frac{1}{3}$–jss.).	Powder.
Extractum Opii.	0.015–0.06 gm (gr. $\frac{1}{4}$–j).	Pills.
Tinctura Opii.	0.3–1.0 c.c. (♏ v–xv).	
Tinctura Opii Deodorata.	0.3–1.0 c.c. (♏ v–xv).	
Tinctura Opii Camphorata.	4–15 c.c. (f℥j–iv).	
Pulvis Ipecacuanhæ et Opii	0.3–1.0 gm. (gr. v–xv).	
Pilulæ Opii.	Each containing 0.065 gm. (gr. j).	

LIST OF DRUGS—(*Continued*)

Name of Drug.	Dosage.	Mode of Administration.
Orexinum Tannicum.	0.25–0.5 (gr. iij–vijss.).	In tablets ter die.
Basicum.	0.10–0.3 gm. (gr. iss.–v).	In pills or wafers, ter die.
Orthoform.	0.30–0.60 gm. (gr. v–x).	
Osmic Acid.	0.003–0.01 gm. (gr. $\frac{1}{20}$–$\frac{1}{6}$).	For hypodermic use. Administered in a 1% aqueous solution.
P.		
Pancreatin.	0.10–0.30 gm. (gr. ij–v).	In powder or intestinal pills ter die.
Papayotin.	0.10–0.30 gm. (gr. ij–v).	In water or pills.
*Paraldehyde.	1–4 c.c. (♏ xv–lx).	At bedtime.
Paullinia Sorbilis.	2–3.0 gm. (gr. xxx–xlv).	In powder.
Pelletierinæ Tannas.	0.75–1.50 gm. (grs. x–xx).	v. Treatment of Tænia.
Pepo.	60–180 gm. (℥ij–vj).	v. Treatment of Tænia.
Pepsin.	0.3–0.60 gm. (gr. v–x).	In powder, or dissolved in 0.20% solution of hydrochloric acid.
Phenacetine.	0.30–0.60 gm. (gr. v–x).	Dissolved in whisky or in tablets.
Phenocoll.	0.50–1.00 (gr. vijss.–xv).	Dissolved in water.
*Phosphorus, Elixir of.	1–4 c.c. (♏ xv–℥j).	Ter die.
Picrotoxine.	0.001–0.003 gm. (gr. $\frac{1}{60}$–$\frac{1}{20}$).	Soluble in alcohol.
Pilocarpini Hydrochloras.	0.003–0.03 gm. (gr. $\frac{1}{20}$–$\frac{1}{2}$).	In aqueous solution or hypodermically.
Piperazine.	1.0 gm. (gr. xv).	Dissolved in large quantities of water.
Piperine.	0.4–0.5 gm. (gr. vj–vijss.).	Insoluble in water.
*Podophyllin.	0.01–0.03 gm. (gr. $\frac{1}{6}$–$\frac{1}{2}$).	In pills or alcoholic solution.
Pomegranate, Decoction of.	20–30 gm. in 250.0 c.c. of water.	To be taken in two or three doses.
Potassium Acetate.	1–4 gm. (gr. xv–℥j).	Dissolved in water, three to four times daily.
Potassii Cantharidas.	0.00006 gm. in aqueous solution to be gradually increased.	By hypodermic injection.
Potassii Chloras.	0.30 gm. (gr. v).	Three times daily.
Potassii Citras.	1–3 gm. (gr. xv–xlv).	In water.
Potassii Permanganas.	0.05–0.20 gm. (gr. j–iij).	In intestinal or salol coated pills, ter die.
Pyramidon.	0.30–0.50 gm. (gr. v–vijss.).	Twice a day.
Pyridine.	Eight to ten drops in water.	For inhalation.
Q.		
Quassia, Infusion of (P. B.).	15–30 c.c. (℥ss.–j.).	
Fluid Extract of.	0.5–2.0 c.c. (♏ viij–f℥j).	
Quillajæ Cortex, Tincture of.	2–4 c. c. (f℥j–ij.)	
Quininæ Bisulphas.	0.3–1.0 gm. (gr. v–xv) to be increased when necessary.	All except the sulphate and tannate may be used hypodermically. All may be prescribed in pills, wafers, capsules, or solution. Licorice and chocolate disguise the bitter taste to a limited extent.
*Quininæ Hydrobromidum.		
Quininæ Hydrochloridum.		
Quininæ et Ureæ Hydrochloridum.		
Quininæ Sulphas.		
Quininæ Tannas.		

LIST OF DRUGS—(*Continued*)

Name of Drug.	Dosage.	Mode of Administration.
R.		
Resorcin.	0.30–0.60 gm. (gr. v–x).	Administered internally in a .2% solution, four times daily. Externally applied in 5–10% ointment.
Rhatania, Tincture of. Vide Krameria.		
*Rhubarb (Powdered Root).	0.60–2.00 gm. (gr. x–xxx).	
Rhei, Pulvis Compositus.	1–4.0 gm. (gr. xv–℥j).	
Syrupus and S. Aromaticus.	4–10 c.c. (f℥j–ij).	Principally used for children.
Fluidum Extractum.	1–2 c.c. (♏ xv–xxx).	
S.		
Salacetol.	0.60–1.00 gm. (gr. x–xv)	In powders, or dissolved in castor oil.
Salicin.	0.5–2.0 gm. (gr. vijss.–xxx).	Every two to four hours in capsules or wafers.
Salicylic Acid.	0.5–2.0 gm. (gr. vijss.–xxx).	In solution with neutral salts.
Salicylate, Soda of.	Same dose as Salicylic Acid.	
Salicylate, Methyl of.	0.3–1.0 c.c. (♏ v–xv).	In capsules.
Salicylamide.	0.15–0.25 gm. (gr. iij–iv).	Every three hours, in capsules or powder.
Saline Cathartics:		
1. Sodii Sulphas (Glauber's Salt).	2–30 gm. (℥ss.–℥j).	Dissolved in plenty of water.
2. Magnesii Sulphas (Epsom Salts).	2–30 gm. (℥ss.–℥j).	Also given 4.0 (℥j) every two hours until effect is produced.
3. Sodii Phosphas.	4–8 gm. (℥j–ij).	Dissolved in hot water, to be taken cool.
4. Potassii Bitartras (Cream of Tartar).	1–4 gm. (gr. xv–℥j).	
5. Potassii et Sodii Tartras (Rochelle Salts).	8–10 gm. (℥ji–ijss.).	May be given in lemonade.
6. Pulvis Effervescens Compositus (Seidlitz Powder).	. . . . .	One powder may be given every two hours.
7. Liquor Magnesii Effervescens.	150–400 c.c. (f℥v–xij).	One wine glass may be given every two hours.
8. Sodii Phosphas Effervescens.	One to two teaspoonfuls or more.	In water.
Salipyrine.	0.50–1.0 gm. (gr. vijss.–xv).	Three or four times daily in powders or capsules.
Salophen.	0.30–1.0 gm. (gr. v–xv).	Three or four times daily.
Salol.	0.30–2.00 gm. (gr. v–℥ss.).	Every two to four hours in small doses, in capsules, tablets, wafers.
Sandal Wood Oil.	0.5–1.00 c.c. (♏ vijss.–xv).	In capsules, three times daily.
Santonin.	0.065 (gr. j) for children.	In powders or lozenges.
Scilla Maritima (Squills).	0.065–0.2 gm. (gr. j–iij).	In pills, three times daily.
Tincture of.	0.3–1 c.c. (♏ v–xv).	
Syrup of.	2–4 c.c. (℥ss.–j).	
Senega, Fluid Extract of.	0.5–1 c.c. (♏ x–xv).	The smaller dose every two to three hours.
Senna, Fluid Extract of.	2.0–4.00 c.c. (℥ss.–j).	
Sidonal (new).	1.00 gm. (gr. xv).	Three times daily in much water.

LIST OF DRUGS—(*Continued*)

Name of Drug.	Dosage.	Mode of Administration.
Silver, Nitrate of.	0.01–0.03 gm. (gr. $\frac{1}{6}$–$\frac{1}{2}$).	In kaolin pills. The dose may gradually be increased.
Simulo, Tincture of.	0.30–0.60 c.c. (♏ v–x).	Three times daily.
Sodium Bicarbonate.	0.3–2.0 gm. (gr. v–xxx).	
Sodium Sulphocarbolate.	0.3–1.00 gm. (gr. v–xv).	Three times daily, after meals.
Solanine.	0.01–0.065 gm. (gr. $\frac{1}{6}$–j).	Several times daily, in pill or tablet.
Sparteini Sulphas.	0.1 gm. (gr. jss.).	Hypodermically, one-half this dose.
Squills. Vide Scilla.		
Strophanthus, Tincture of.	Average dose 0.50 c.c. (♏ viij).	The tincture of the new Pharmacopœia (1905) is twice as strong as that of the old.
Strychninæ Sulphas.	0.001–0.004 gm. (gr. $\frac{1}{60}$–$\frac{1}{15}$).	Either in pill form or solution, given hypodermically.
Sulphonal.	1–2 gm. (gr. xv–xxx).	At bedtime in hot milk or water.
Sulfosote.	℥j ter die.	
Sulphuric Acid, Dilute.	0.6–2 c.c. (♏ x–xxx).	
T.		
Tannigen.	0.5–1.0 gm. (gr. vijss.–xv).	In capsules or powders, three or four times daily.
Tannalbin.	0.5–1.0 gm. (gr. vijss.–xv).	In capsules or powders, three or four times daily.
Tannin.	0.10–0.30 gm. (gr. jss.–v).	Every four hours in solution, wafers, or capsules.
Tartar Emetic.	0.005 gm. (gr. $\frac{1}{10}$).	Expectorant, in water.
	0.03 gm. (gr. $\frac{1}{2}$).	Emetic, in water.
Terebene.	0.25–1.0 c.c. (♏ iij–xv).	In capsules, three times daily.
	6 c.c. (℥ss.).	To be inhaled during the course of a day.
*Theobromine, Sodiosalicylate of (Diuretin).	0.5–1.0 gm. (gr. vijss.–xv).	Three times daily, in solution.
Theosiamine.	0.2–0.3 c.c. of a 15% solution.	Hypodermically.
	0.01–0.03 gm. (gr. $\frac{1}{6}$–$\frac{1}{2}$).	Internally once a day.
Thiocoll.	2–4.0 gm. (℥ss.–j) in a day.	In pills or solution.
*Thymol.	0.30–2.00 gm. (gr. v–xxx).	
Thymus Gland, Desiccated.	1.0–2.0 gm. (gr. xv–xxx) in a day.	In powder.
Thyroid Gland, Desiccated.	0.15–0.30 gm. (gr. ijss.–v).	Three times daily, in tablets.
Thyreoidin.	0.03–0.10 gm. (gr. ss.–jss.).	In tablets, three times daily.
Trional.	0.50–1.0 gm. (gr. vijss.–xv).	In hot water or milk at bedtime.
Turpentine, Oil of.	0.1–0.5 c.c. (♏ ij–viij).	In emulsion or sugar.
U.		
Urea.	0.5–2.0 gm. (gr. vijss.–℥ss.).	Three times daily, in water.
Urol (Quinate of Urea).	0.50 gm. (gr. vijss.).	Three times daily, in a large quantity of water.
Urosine (crystal) 50 % solution.	2–3 c.c. (♏ xv–xlv).	Three times daily.
Urotropine.	0.30–0.60 gm. (gr. v–x).	In tablets, three or four times daily.

LIST OF DRUGS—(*Continued*)

Name of Drug.	Dosage.	Mode of Administration.
Uva Ursi, Fluid Extract of.	4–15 c.c. (f℥j–f℥ss.).	In water.
Infusion of (B. P.).	30 c.c. (f℥j).	
V.		
Valerian, Tincture of.	5–10 c.c. (1–3 f℥j).	
Fluid Extract of.	2–4 c.c. (f℥ss.–j).	
Valerydine.	0.50–1.0 gm. (gr. vijss.–xv).	In powder several times daily.
Validol.	15–20 drops.	On sugar, given when necessary.
Valyl.	0.125 c.c. (♏ ij).	In capsules, two or three times daily.
Veratrine.	0.002 gm. (gr. $\frac{1}{30}$).	In alcoholic solution or in pills.
Veratrum Viride, Tincture of.	0.2–0.5 c.c. (♏ iij–vj).	As frequently as required, but to be very carefully watched for physiologic effects.
Veronal.	0.30–1.00 gm. (gr. v–xv).	In hot water or milk, at bedtime.
Z.		
*Zinci pnosphidi.	0.003–0.005 (gr. $\frac{1}{30}$–$\frac{1}{20}$).	In pills, three times daily.
Zinci sulphas.	0.05–0.2 gm. (gr. i–iij).	In water as an emetic.
Zinci Valerianas.	0.065–0.60 gm. (gr. –x).	In gelatin-coated pills, ter in die.

LIST OF PRESCRIPTIONS

A.

℞ Acetanilid ..... 2.00 (ʒss.);
Caffein. sodiobenzoat ..... 0.30 (gr. v);
Pulv. aromatic ..... 1.00 (gr. xv).
M. Div. in pulv. No. vi.
S.: As directed (v. text in Typhoid Fever, and in Neuralgia).

℞ Infus. herb. adonis vernalis,
e 3.00 ad 180.00
S.: One teaspoonful every two to four hours.

℞ Ammonii bromidi,
Potassii bromidi,
Sodii bromidi, } āā. ..... 5.00 (℈jv);
Syr. cort. aurant ..... 20.00 (ʒss.);
Aq. menth. piperit ..... 40.00 (ʒiss.).
S.: One teaspoonful in water every four hours.

℞ Antipyrin ..... 8.00 (ʒij);
Syrup. zingiberis ..... 30.00 (ʒj);
Aquæ ..... q. s. ad 90.00 (ʒiij).
M. D. S.: One-half to one tablespoonful every four to six hours.

℞ Antipyrini ..... 0.80 (gr. xij);
Caffein. sodiosalicylatis ..... 0.20 (gr. iij).
M. Ft. pulv.
S.: To give relief in Bronchial Asthma.

℞ Argenti nitratis ..... 0.10 (gr. $\frac{1}{10}$);
Aq. destil. ..... q. s. ad 100.00 (ʒij).
S.: One tablespoonful in a wineglass of water before meals (gastric ulcer).

℞ Sodii arsenatis ..... 0.065 (gr. j);
Extract. nucis vomicæ ..... 0.30 (gr. v);
Extract. gentianæ ..... q. s.
M. Ft. pil. No. xxx.
S.: One pill after meals.

℞ Arsenii trioxidi ..... 0.50 (gr. vijss.);
Pulv. piperis nigris ..... 0.50 (gr. vijss.).
M. Ft. in pil. No. C (100).
S.: Pilulæ Asiaticæ.

℞ Acid arseniosi ..... 0.0005–0.001 (gr. $\frac{1}{130}$ – $\frac{1}{60}$);
Quininæ hydrochloridi,
Ferri lactatis, } āā. ..... 0.05 (gr. $\frac{3}{4}$);
Extract. gentian. q. s. ut ft. pil. No. i.
D. tal. dos. No. xxx.
S.: One pill three times daily.

B.

℞ Extract. belladonnæ fol. } āā. ..... 0.05 (gr. ⅚);
Camphoræ, }
Potassii bromidi ..... 5.00 (gr. lxxv).
M. Div. in pulv. No. v.
S.: One powder in water every four hours.

℞ Bismuth. subgallat. } āā..... 5.00 (gr. lxxv).
Salol., }
M. Div. in pulv. No. xv.
S.: One powder every two to four hours. (In diarrhœa, enteritis, typhoid fever.)

℞ Butyl. chloral hydratis..... 10.00 (ʒijss.);
Aquæ..... 100.00 (ʒiijss.);
Glycerinæ..... 20.00 (ʒss.).
S.: One teaspoonful every ten minutes until three or four doses are given.

C.

℞ Camphoræ..... 1.00 (gr. xxv);
Olei amygdalæ express..... 10.00 (ʒss.).
M. S.: Fifteen minims to be used hypodermatically. (Cardiac stimulant.)

℞ Camphoræ..... 1.5 (gr. xv);
Olei amygdalæ express..... 6.0 (ʒj);
Æther..... 4.0 (℥ij).
M. S.: 1 c.c. for hypodermatic injection.

℞ Chloralamidi..... 8.00 (ʒij);
Spirit. vini gallici, } āā..... 15.00 (ʒss.);
Syr. tolutani, }
Aquæ..... 90.00 (ʒiij).
M. S.: One tablespoonful at bedtime.

℞ Chloral hydratis..... 8.00 (ʒij);
Syr. cort. aurantii..... 20.00 (ʒss.);
Aq. menth. piperit..... 100.00 (ʒiijss.).
M. S.: One tablespoonful at bedtime.

℞ Tincturæ cinchonæ compositæ } āā. ..... 30.00 (ʒj).
Tincturæ rhei, }
M. S.: Teaspoonful before meals.

℞ Cocain. hydrochloratis ..... 0.10 (gr. j);
Aquæ.....q. s. ad 100.00 (ʒij).
M. S.: One teaspoonful every two to three hours. (In toxic vomiting.)

℞ Collargoli..... 4.00 (ʒj);
Aquæ.....q. s. ad 120.00 (ʒiv).
M. S.: One tablespoonful, diluted with water, to be injected into the rectum twice daily. (Septicopyæmia.)

℞ Condurango..... 15.00 (℥ss.);
Coque cum aquæ 500 c.c. ft. colatura 250 c.c.
S.: One tablespoonful every four hours.

D.

℞ Pulv. fol. digitalis } āā..... 0.05 (gr. j);
Quininæ sulphat., }
Extract. gentianæ q. s. ut ft. pilula, d. tal. dos. No. xx.
S.: One or two pills three times daily. (Skoda's pills.)

E.

℞ Fluidextract. ergot..... 15.00 (℥ss.);
Potassii bromidi..... 15.00 (℥ss.);
Syr. cort. aurant..... 15.00 (℥ss.);
Aquæ fœniculi..... 30.00 (℥j).
M. S.: One teaspoonful in water every four hours.

℞ Ergotini..... 1 part,
Camphor water..... 2 parts,
The Injectio ergotini (Ph. B.). From three to ten minims are given hypodermatically, representing from 0.065 to 0.20 (gr. j-ijss.) of ergotin.

℞ Extract. eucalypt. globul..... 4.00 (℥j);
Sodæ arseniat..... 0.065 (gr. j).
M. Ft. pil. No. xxx.
S.: One pill three times daily.

℞ Ol. eucalypt. globul., } āā..... 30.00 (℥j).
Spts. vini rectificat., }
M. S.: Twenty to thirty drops for inhalation.

F.

℞ Ferri lactatis..... 2.00 (℥ss.);
Quininæ sulphat..... 4.00 (℥j).
M. Ft. pil. No. xxx.
S.: One pill three times daily.

H.

℞ Hydrarg. chlorid. mit..... 0.30–0.60 (gr. v–x);
Sacch. lactis..... 1.00 (gr. xv).
M. Div. in pulv. No. ij.
S.: To be given at bedtime in the beginning of typhoid fever.

Hydrargyrum.

Unguentum cinereum lanolinatum forte is prepared as follows:

Lanolin.....15 gm. (℥iv);
Chloroform..... 50 gm. (℥jss.).

Evaporate in a large mortar under constant stirring until reduced to 30 gm. (℥j); then add:

Pure mercury..... 30 gm. (℥j).

Stir slowly until the chloroform is evaporated and the mercury is no longer distinguishable. From this the "gray oil" is prepared as follows:

℞ Unguent. ciner. lanolat. fort..... 9 gm. (gr. cxxxv);
Olei vaselini (pure liquid paraffin)..... 3 gm. (gr. xlv).

The oil is added very gradually to the ointment with constant stirring until a smooth mixture is obtained. Of this, 0.05 gm., containing 0.04 gm. (gr. ⅔) metallic mercury, is injected deep in the back every three to five days, later five to eight days, and the same amount as an extra dose is given once in seven, fourteen, or twenty-one days. Usually eight to twelve doses are sufficient. Early relapses often require only half the quantity.

I.

℞ Iodin..... 0.30 (gr. v);
Potassii iodidi..... 0.60 (gr. x);
Solve in Aq. destil..... 1,000.00 (Oij).
(Anthrax.)

℞ Infus. radicis ipecacuanhæ.....e 0.50–0.10 (gr. ss.–j);
ad ..... 75.00 (℥jss.);
Ammonii chloridi..... 0.30–1.00 (gr. iij–x);
Syrupi tolutani..... 25.00 (℥ss.).
S.: One teaspoonful every two hours. (Expectorant for children.)

K.

℞ Kryofini..... 4.00 (℥j).
Div. in pulv. No. viij.
S.: One powder three times daily.
(Best administered in wafers.)

L.

℞ Lactophenin..... 0.50–1.00 (gr. vijss.–xv).
D. tal. dos. No. x.
S.: One powder three or four times daily (as antipyretic.)

℞ Lithii benzoatis,
Sodii salicylatis e gaultheria, } āā..... 5.00 (gr. lxxv).
M. Div. in pulv. No. xv.
S.: One powder in Vichy or Rubinat Condal water before breakfast.

M.

℞ Malachin..... 4.00 (℥j).
Div. in pulv. No. viij.
S.: One powder twice or three times daily.

℞ Magnesii oxidi, } āā..... 10.00 (℥ss.);
Sodii bicarbonatis, }
Pulv. radicis rhei..... 5.00 (℥ij).
M. S.: One-half to one teaspoonful as directed.

℞ Menthol., } āā..... 1.00 (gr. x).
Camphoræ, }
Lanolini..... 50.00 (℥j).
M. S.: For external use. (For pain produced by glandular swelling, as in mumps.)

℞ Menthol..... 10.00;
Solve in Toluol ad..... 36. c.c.;
Alcohol. absolut..... 60. c.c.;
Liq. ferri perchloridi..... 4. c.c.
S.: Löffler's solution, for local application in diphtheria, or follicular tonsilitis.

℞ Menthol..... 10.00;
Guaiacol..... 2.00;
Olei olivar..... 88.00.
M. S.: 4. c.c. (℥j) for intratracheal injection.

P.

℞ Paraldehydi..... 8.00 (℥ij);
Elixirii aromatici..... 120.00 (℥iv).
M. S.: One to two tablespoonfuls at bedtime.

℞ Phenol. (Acid. carbolic.)..... 1.00 (gr. xv);
Syr. acaciæ..... 60.00 (℥ij).
M. S.: One teaspoonful every one to four hours. (In vomiting.)

℞ Phosphori..... 0.01 (gr. $\frac{1}{10}$);
Olei morrhuæ..... 100.00 (℥ij).,
S.: One-half to one teaspoonful two or three times daily. (Kassowitz.)

℞ Phosphori..... 0.01 (gr. $\frac{1}{10}$);
Olei olivarum..... 5.00 (♏ l);
Pulv. acaciæ, } āā..... 10.00 (ʒ v);
Sacch. alb., }
Aquæ..... 75.00 (℥ss.).
M. S.: One-half to one teaspoonful two or three times daily according to age. (Kassowitz.)

℞ Plumbi acetatis,
Pulv. fol. digitalis, } āā ..... 1.00 (gr. xv).
Ft. pil. No. xx.
S.: One pill every hour. (In œdema of the lungs.—Traube.)

℞ Potassii bromidi,
Chloral. hydratis, } āā ..... 8.00 (ʒij);
Syr. cort. aurant ..... 40.00 (ʒss.);
Aq. menth. piperit ..... 80.00 (ʒiijss.).
S.: One tablespoonful as directed.

℞ Potassii bromidi ..... 8.00 (ʒij);
Infus. quassiæ ..... 120.00 (ʒiv).
S.: One tablespoonful every four hours.

℞ Potassii chloratis ..... 2.00 (ʒss.);
Syr. simpl ..... 15.00 (ʒss.);
Aquæ ..... 45.00 (ʒjss.).
M. S.: One-half to one teaspoonful every two hours. (Stomatitis ulcerosa.)

℞ Potassii iodidi ..... 30.00 (ʒj);
Aq. dest ..... 30.00 (ʒj).
M. S.: From five to forty drops or more, as directed.

℞ Potassii permanganatis ..... 0.10 (gr. jss.);
Aquæ dest ..... 15 c.c. (ʒss.).
M. S.: For the mouth.

℞ Plumbi acetatis ..... 2.00 (ʒss.);
Extracti opii ..... 0.50 (gr. vijss.).
M. Ft. pil. No. xv.
S.: One pill every four to six hours.

℞ Podophyllin ..... 0.30 (gr. v);
Aloes ..... 2.00 (ʒss.).
Extracti gentian ..... q. s. ut ft. pil. No. xxx.
S.: One pill at bedtime.

Q.

℞ Quininæ hydrobromidi ..... 10.00 (ʒijss.);
Ergotinæ ..... 2.00 (ʒss.).
Ext. gentian ..... q. s. ut ft. pil. No. xxx.
S.: One pill three or four times daily.

℞ Quininæ hydrochloratis ..... 1.00 (gr. xv);
Sodii chloridi ..... 0.75 (gr. xij);
Aquæ ..... q. s. ad 10 c.c. (ʒijss.).
S.: Baccelli's solution for intravenous injection in pernicious malarial fever.
(The above quantity represents one dose.)

℞ Quininæ sulphatis..... 2.00 (gr. xxx);
Sodii bicarbonatis, } āā ..... 1.00 (gr. xv).
Pulv. acaciæ, }
S.: For insufflation in whooping cough.

℞ Quinin. tannat., } āā..... 5.00 (gr. lxxv).
Bismuth. subgallat., }
M. Div. in pulv. No. xv.
S.: One powder every four hours. (In diarrhœa.)

R.

℞ Pulv. radicis rhei..... 5.00 (ʒj);
Magnesiæ ustæ, } āā ..... 10.00 (ʒij).
Sodæ bicarbonatis, }
M. S.: One-half to one teaspoonful as directed.

S.

℞ Santonini, } āā..... 0.065 (gr. j);
Hydrarg. chlorid. mite, }
Sacch. lactis..... 1.00 (gr. xv).
M. Div. in pulv. No. iij.
S.: One powder three times daily. (Ascaris lumbricoides.)

℞ Fluidextracti sennæ..... 30.00 (ʒj);
Fluidextracti glycyrrhizæ..... 15.00 (ʒss.);
Elixir aromatici..... 15.00 (ʒss.).
M. S.: One-half to one teaspoonful at bedtime.

℞ Sodæ arseniat..... 0.065 (gr. j);
Extract. eucalypt. globul..... 4.00 (ʒj).
M. Ft. pil. No. xxx.
S.: One pill three times daily. (Malarial cachexia.)

℞ Sodæ benzoat..... 8.00 (ʒij);
Aq. menth. piperit..... 120.00 (ʒiv).
M. S.: One tablespoonful every two hours. (For influenza, bronchitis, and bronchitis with much secretion.)

℞ Sodii nitritis..... 1.00 (gr. xv);
Aq. menth. piperit..... 60.00 (ʒij).
M. S.: One to two teaspoonfuls every four to six hours.

℞ Sodæ salicylat. e gaultheria ..... 8.00 (ʒij);
Essenciæ pepsinæ..... 30.00 (ʒj);
Aquæ..... 90.00 (ʒiij).
M. S.: One tablespoonful as directed. (v. Rheumatic Fever.)

℞ Sodæ salicylat. e gaultheria..... 1.50 (gr. jss.);
Syr. rub. idæi ..... 25.00 (℥ss.);
Aquæ..... 75.00 (℥jss.).
M. S.: One teaspoonful every hour. (In follicular sore throat; scarlatina.)

℞ Strychnin. sulphatis..... 0.03 (gr. ss.);
Acid. nitrohydrochloridi dilut..... 15.00 (℥ss.).
M. S.: From six to ten drops in a glass of water three times daily.

T.

℞ Theobrominæ sodiosalicylatis (Diuretin) .... 4.00–8.00 (℥j–ij);
Aquæ menthæ piperitæ..... 120.00 (℥iv).
M. S.: One tablespoonful every four hours.

℞ Thymol..... 4.00 (℥j);
Div. in part. æqual. No. viij. D. ad capsul. gelatinous.
S.: Two capsules every two hours until all are taken. To be followed by a purgative after twelve to eighteen hours. (Unciniaris.)

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