alkaline being necessary, because the spirillum of Asiatic cholera will not develop in an acid medium.

Doyen has shown that by introducing alcohol into the stomach the alkaline solution and the tincture of opium may be dispensed with. But, however the experiments may be conducted, they all show one important thing—the great necessity for a healthy condition of the gastro-intestinal tract for the avoidance of infection with cholera. Dyspeptics and alcoholics have been shown in all epidemics to be especially fatally attacked by the disease. It cannot yet be affirmed that the absolute proof of the production of cholera by the specific spirillum has been obtained, because the methods employed in the experiments mentioned above leave too many loop holes open for the occurrence of accidents, and yet the evidence is so nearly complete that there seems to be no reason for any doubt; the more especially as the exact experimental evidence can probably never be obtained, because none of the lower animals, so far as is known, are susceptible to cholera under natural conditions. The nearest approach to an actual experiment upon man is the case of one of the members of one of the cholera courses held in Berlin in the winter of 1884–85. This man, a physician, was attacked with "cholerine," and after some suffering, but no dangerous symptoms, recovered, the cholera spirillum being isolated from the discharges at various times during his illness. There seems to be no doubt that this was a case of true cholera, arising from some carelessness upon the victim's part in handling the cultures with which he had to deal in the laboratory, for there were no cases of cholera in Berlin at the time, nor had there been for a long time previous.

The famous experiments of Pettenkofer and his pupils and similar experiments by Metschnikoff, in which cultures of cholera spirilla were deliberately swallowed, do not militate against the etiological importance of that spirillum. These experimenters suffered from symptoms similar to those observed in the milder forms of epidemic cholera, and the dejecta were similar in character and contained the spirilla in like numbers.

The entrance of the spirilla is undoubtedly effected by means of the gastro-intestinal tract, and there has not been a particle of evidence from experimental work to favor the theory of Pettenkofer that it may enter from the air and through the respiratory organs.

The acidity of the gastric juice is extremely unfavorable to the growth of the organism, and this explains the liability of the persons with functional or organic disease of the stomach to attacks of the disease, for in these instances the reaction of the gastric juice is altered or modified so as to allow the spirillum to pass this point of danger and reach the intestine, where there are more favorable conditions for its development. Diluted hydrochloric acid (0.05 per cent.) is said to kill the spirillum in six minutes. In the presence of pepsin 0.019 per cent. of acid suffices. Water, taken on an empty stomach, excites very little acid secretion—in fifteen minutes from 0.011 to 0.03 per cent. These quantities are entirely too small to prevent the passage of the organism.

Nicati and Rietsch, and Van Ermengen determined the toxicity of cultures of this organism when they had been deprived of the bacteria by filtration or when the bacteria had been killed by heating. In 1885 Nicati and Rietsch, by treating similar cultures with alcohol, succeeded in extracting a substance that killed guinea-pigs and rabbits, with the production of cramps and a lowering of temperature. Brieger studied the various chemical bodies that appeared in the cultures of the cholera spirillum; among the number there were convulsivants, methyl guanidin and a base, $C_5H_8N_2$, a febricant poison, and compounds that produced inflammation and necrosis. More recently, Brieger and Fraenkel have isolated a toxalbumin, and Petri has determined the presence of a less active substance, toxopeptine.

Hueppe and Scholl have perhaps made as important researches as any in their work upon cultures that have been deprived of free access of oxygen. From such cultures they succeeded in obtaining a peptoxin that in a dose of 5 c.c., killed guinea-pigs in forty minutes, the animal presenting paralytic symptoms after ten minutes and convulsions after a quarter of an hour. This is a more active poison than was obtained before and was got in larger quantities; an egg after inoculation with a pure culture produced at the end of eighteen days enough to cause the death of ten guinea-pigs. The importance of this is seen when it is remembered that the spirilla are deprived of the access of oxygen when they are developing in the human intestine, and according to these experiments are therefore under the most favorable conditions for the development of this particular toxin.

Numerous experiments have shown that fluid artificial media do not usually become very toxic when cholera spirilla are grown in them. If they be filtered before the vibrios have died off to any considerable extent the filtrate is not highly toxic, while the residue, consisting largely of the bacteria themselves, is toxic in very much greater degree, even if heated sufficiently to kill the bacteria. That diffusible toxins may be produced in the animal body was shown by Metschnikoff, Roux, and Taurelli, who sealed cultures of cholera in collodium capsules which were introduced into the peritoneal cavities of animals with fatal results. The chemical nature of these various toxic substances is unknown.

A temperature of from 30° to 40° C. is the most favorable for the development of the cholera spirillum, but it will grow slowly at a temperature as low as 17° C. It ceases to grow at a temperature lower than this, but its vitality is not destroyed, and it grows well when the temperature is again raised; at −10° C. its vitality has been retained, but, on the other hand, heating to a temperature as low as 56° or 60° C. is sufficient to destroy its vitality in a short time.

Inasmuch as no true spore formation has been seen to occur in the development of this organism, it is not surprising that drying was shown, first by Koch, to destroy its vitality in a very short time—less than twenty-four hours. But conclusions drawn from his experiments may be misleading, for while this destruction of vitality by drying does occur in a very short time in the case of thin layers, it does not take place under less favorable conditions. This was shown by Kitasato, and by Berkholtz, who saw the vitality retained, the one for thirteen days and the other for thirty-eight, in experiments in which silk threads were used for holding the organism during their subjection to desiccation. It should be said, however, that these experiments were conducted in a desiccator, which did not permit the free access of oxygen to the bacteria, and it is undoubtedly the case that this agent is as important as any in the production of the result that it was desired to obtain. On the other hand, desiccation was probably more complete than would usually be the case under more natural conditions.

The organism has been found in ordinary drinking-water by Koch in one of the tanks in India, in the neighborhood of which an epidemic of cholera had broken out. It does not live long in distilled water, however, as shown by Meade Bolton, Wolfhügel and Riedel, and others. Strauss and Dubarry found that it lived for fourteen days in one case, and Kraus, for two days only. Other observers have not seen it retain its vitality for anything like so long a time. In ordinary sterilized water it lives longer, according to the experiments of Wolfhügel and Riedel, as well as Pfeiffer, who found that it existed for seven, nine, and twelve months, while Hochstetter lengthened this time to three hundred and ninety-two days. And more recently viability has been observed after nearly two and a half years. Its vitality appears to be shorter again in non-sterilized water. Strauss and Dubarry found it to be thirty days in one specimen, and thirty-nine in another; while a mixture of other bacteria shortens the time still more. This latter point is one of great importance and has been studied by many experimenters. Koch determined that the organisms ceased to live in ordinary drinking-water at the end of six or seven days, and that after twenty-four hours' contact with sewer water they appeared to be dead;

while Schiller, on the other hand, found that they retained their vitality in the same medium for fourteen days. Petri, in an effort to find out how long they lived in the intestine after burial, was able to demonstrate them in cultures at the end of nineteen days. Certain foods may be of great importance in transmitting the organism, as in the case of milk, in which it grows with great energy and without producing the least visible alteration; it has been shown that it will live for at least four days in milk and forty-eight in butter.

Most of these experiments were conducted with the idea that this organism is an aërobic one, but Hueppe has shown that it is also anaërobic, and that grown under these conditions the spirillum is possessed of a greater virulence, but it is also easier of destruction. As suggested by Proust, this may explain the comparative rarity of *immediate* infection. The bacterium coming from the intestine as an anaërobic organism is possessed of feeble resisting powers and is therefore easily destroyed, and it is only after it has taken on the conditions of aërobic growth that are furnished it in the medium in which it develops outside of the body that it finds itself possessed of the power of resistance sufficient to enable it again to enter the human body. Such observations are of especial interest in connection with the theory of Pettenkofer (*vide supra*), as seeming to show that his idea of the influence of locality is exact, in so far as this influence is exerted in changing the anaërobic to aërobic conditions of growth and effecting an adaptation of the organism to this change.

According to Koch, solutions of 1 in 400 of carbolic acid, 1 in 2,500 of sulphate of copper, and 1 in 10,000 of corrosive sublimate are sufficient for the arrest of the development of the spirillum of Asiatic cholera. Esmarch and Eisenberg show that creolin will destroy it more quickly than carbolic acid in solutions of the strength of from 1 in 1,000, or 1 in 2,000. Liborius, Kitasato, and Pfuhl have shown the active effect of freshly prepared milk of lime, while Hueppe and Loewenthal convinced themselves of the important prophylactic and therapeutic value of salol in the management of cholera.

Treatment.—*Inoculation Against Cholera.*—The first efforts to confer active or passive immunity to cholera in the human subject were made by Ferran, a Spanish physician (Report to the Academy in Barcelona, July 16th, 1884), who attempted to immunize more than twenty-five thousand people during 1885, when cholera was epidemic in Spain. His method consisted in the subcutaneous injection of increasing amounts of virulent cultures of the cholera vibrio, five or six days being allowed to elapse between successive injections. Three such injections were regarded by him as fully protective against the disease. He also employed injections of blood from those who had recovered from cholera to protect others from attacks of the malady. His enthusiastic claims for the efficiency of these prophylactic measures were discredited by other observers, and there appears to be no doubt that his methods were faulty. The purity of his cultures is open to question and his claims were exaggerated. But his conceptions were the same as those which subsequently led to more careful and promising work in this direction, and the credit of priority belongs to him.

Since these early attempts of Ferran, which were based upon studies of the immunization of guinea-pigs at a time when proper methods had not been elaborated, numerous investigators have experimented on animals in this direction and have obtained results which throw considerable light on the character of the immunity that can be conferred upon animals, and presumably upon man.

One of the difficulties encountered in this work is due to the fact that the lower animals do not respond to cholera infections so as to present a well-defined disease comparable to human cholera. Fatal results may follow intravenous, subcutaneous, or intraperitoneal inoculations with cholera cultures, and also after the introduction of cultures into the stomach. But special preparation of the animals for this last mode of inoculation is usually necessary. The procedure for this purpose, devised by Koch for guinea-pigs, was the neutralization of the stomach contents with sodium carbonate, and the checking of intestinal peristalsis with a subcutaneous injection of tincture of opium. If, after this preparation, the animals receive cultures of the cholera vibrio, introduced through a stomach tube, they develop symptoms which bear some resemblance to the algid stage of cholera. The temperature falls, the skin becomes cyanotic, and great muscular weakness is manifested by inability to walk or stand. Occasional muscular spasms are frequently observed and the animals die after several hours. These symptoms do not develop immediately after the inoculation, and there is evidently a very considerable multiplication of the vibrios in the intestine. At autopsy the serous coat of the intestine is injected, the intestinal wall is swollen, and a serous fluid containing desquamated epithelium fills the bowel. There are usually no evacuations, though occasionally a thin serous fluid escapes from the anus.

While these manifestations bear some resemblance to the algid stage of human cholera, the results of such inoculations cannot be regarded as satisfactory reproductions of this disease. In 1893 Metschnikoff published observations showing that young, suckling rabbits might be inoculated with minute quantities of cholera vibrios placed in the mouth, and that they then developed a fatal disease more closely resembling human cholera than that obtained in guinea-pigs by Koch. This was subsequently shown to be the case when very young kittens or puppies were employed. We shall have occasion to refer to these experiments again.

Experiments with a view of determining the possibilities of immunizing against cholera have been very numerous. Most of the observations have been made on guinea-pigs, though other animals have also been employed. It has not been difficult to attain positive results in many different ways. Intraperitoneal, subcutaneous, or even intravenous inoculations with non-lethal amounts of living cultures of cholera vibrios is followed within a few days by a species of immunity manifested by bactericidal or bacteriolytic properties of the serum of the animal. Such animals will then survive inoculations with virulent cultures in amounts which considerably exceed those regularly fatal to normal animals. Similar results may be obtained by the use of dead cultures, whether the vibrios have been killed by heat or by the addition of germicides. Such animals also are immune against inoculation with virulent cultures in considerable amount. This immunity, whether caused by living or by dead cultures, protects the animals against inoculations into the blood, peritoneum, or beneath the skin; but appears to have little if any effect upon the course of the disease when cultures are introduced into the mouth or stomach. This fact was strikingly manifest in experiments in very young animals, which, as stated above, readily acquire a form of cholera when very small amounts of cultures are introduced into the mouth. Moreover, very large amounts of cholera cultures introduced into the blood or peritoneal cavity cause death in immunized animals in spite of their protection against moderate lethal doses. Large doses of dead cultures also cause death. A fact worthy of note is that filtered recent cultures of the cholera vibrio are neither very toxic nor useful for immunization.

The results of the experiments mentioned above lead to the inference that the introduction into the body of non-lethal quantities of the vibrio calls forth the production of anti-bodies that are destructive to the vibrio if they are brought into contact with it, but that they are not capable of neutralizing toxic substances that appear to be closely associated with the bodies of these micro-organisms if not actually a part of their structure. The immunity obtained is due to bacteriolysis and not to antitoxins. We may, therefore, fatally poison an immune animal with cholera cultures though it be capable of destroying a limited number of cholera vibrios which are brought into its tissue fluids.

It has been shown that the blood and serum from patients who have recovered from attacks of cholera also contain these or similar bacteriolytic substances, but there appears to be no antitoxic substance in these fluids.

These bacteriolytic anti-bodies do not exist to an appreciable extent in the blood of convalescents immediately upon recovery, but are distinctly active about three weeks after the attack, then gradually accumulate or increase in potency until a maximal efficiency is reached between the fourth and sixth weeks. At this time 0.01 c.c. of the blood may be enough to protect a guinea-pig from the effects of an otherwise fatal intraperitoneal infection with cholera. After the sixth week the bacteriolytic value of the blood gradually declines and is lost after about three months.

To emphasize still further the character of this immunity, experiments may be cited which show that animals which have been inoculated with cholera vibrios in amounts ordinarily sufficient to kill, may be saved if they receive injections of serum from immunized animals within from one-half to two hours after the inoculation, before symptoms referable to intoxication have developed. When these symptoms have declared themselves the treatment is without avail, *i.e.*, if the disease can be checked by destroying the vibrios already in the system, the immune serum will protect; but if there is already in the body a dose of toxic substances sufficient to kill, the immune serum is powerless to neutralize them. These toxic substances appear to be present in lethal quantities in the majority of cases, as soon as symptoms of disease become manifest.

A question of great practical importance is whether these protective, bacteriolytic anti-bodies which are present in the blood and lymph can pass into the digestive tract and act upon cholera vibrios present in the intestinal contents. Experiments upon animals, already cited, appear to answer this question in the negative, but it is doubtful whether these results can be directly applied to man. If Ferran's claims are justified by the facts, such direct application of animal experiments cannot be made; for an active immunity caused by subcutaneous injections of cholera vibrios would appear to protect against infection by way of the mouth in human subjects, though they failed to do so in animals. It was the belief that such was the case that induced Haffkine to undertake the immunization against cholera by a method essentially similar in principle to that employed by Ferran, but safeguarded by a more highly developed technique.

Haffkine experimented with his method of immunization in India, aided by the Government, and between 1893 and 1895 had subjected about forty thousand people to his prophylactic treatment. This consisted in the subcutaneous injection of living cultures of the cholera spirillum of definite and known virulence. The first injection was made with a culture of moderate virulence, attenuated by long artificial cultivation and taken by him to India from the European laboratories.

These injections were made only after a microscopical examination of a stained smear had failed to reveal contamination of the culture and revealed well-formed, apparently normal cholera vibrios. The injections were made under strictly aseptic conditions. During the first two hours after the injection there were no appreciable effects either locally or constitutionally. Between the third and twelfth hours there was a gradually developing tenderness at the point of inoculation with general malaise and fever. In normal cases the fever reached 101° F., but would sometimes reach 104° when the susceptibility of the patient was great. The amount of culture injected depended upon the age of the patient; for an adult man the amount being about 1 c.c. From the twelfth to the thirty-sixth hour after the inoculation the general symptoms gradually but completely vanished and a painful induration at the point of inoculation developed. This also subsided in the course of a few days. No digestive disturbance was occasioned by the inoculation, and no change of diet or occupation was necessary.

The second inoculation was made about five days after the first. For this purpose a highly virulent culture, kept active by passage through susceptible animals, was employed, the dosage being determined by the reaction obtained after the first injection. The effects of this inoculation were essentially the same as those obtained after the first, but were usually less pronounced. The immunizing action was believed to be complete six days after the first inoculation. Up to 1896 over one hundred thousand people are said to have received this treatment.

The results of this treatment, which was purely preventive, not curative, are reported as being very promising. Several of those so treated contracted cholera shortly after the first injection, showing that its protective action was not immediate. Haffkine believed that the full protective action was attained in about twenty days. Comparative statistics, when of a given group about half were inoculated, were greatly in favor of the value of the method. The protection was not lasting, however, and seems to have gradually passed away, some twelve months being the probable limit of its efficiency. The protection is not absolute, and the mortality among those who have been inoculated and yet acquired the disease is but slightly less than among the uninoculated. About one-nineteenth as many cases occurred among the inoculated and about one-seventeenth as many deaths. Of late years this method appears to have fallen into disuse. This is not surprising when the difficulty of inoculating a whole population, the evanescent character of the protection, and the uncertainty of its absolute value are considered.

Upon theoretical grounds, as already stated, but little can be expected from a bacteriolytic serum injected beneath the skin in human cholera; for the vibrios are situated in the intestinal contents and the crypts of the intestinal mucosa.* To be effective the protective constituents of the serum must come in contact with the bacteria they are to destroy. It appears doubtful whether these elements enter the intestinal lumen when present in the blood. A serum which had antitoxic properties should be much more efficient. Pfeiffer has shown that the most active toxic substances produced by the cholera vibrio are intimately connected with the bodies of the organisms when the latter are grown in artificial media. In 1896 Metschnikoff, Roux, and Taurelli-Salimbeni made experiments with a view of demonstrating that soluble toxins might be obtained from the cholera vibrio as a species of secretion. They obtained a highly poisonous toxin, not destroyed by boiling, of which one-fourth of a cubic centimetre killed a guinea-pig weighing 300 gm. in eighteen hours. They also showed that it was possible to obtain an antitoxic serum by immunizing animals with this toxin. But this serum failed to cure young animals infected by the mouth with cholera vibrios. As yet, therefore, there is no known serum therapy for cholera.

In the absence of a specific antitoxic or other remedy for cholera, recourse must be had to measures directed against morbid conditions as they arise.

A very great number of remedies have been employed with a view of destroying the cholera spirilla in the intestinal tract, or, at least, of inhibiting their multiplication. Among these remedies are: chlorine water, mercuric salts, salts of copper, iodine, iodoform, creosote, creolin, cresol, resorcin, thymol, pyoktanin, benzoic acid, salicylic acid and its salts, salol, tribromsalol, tribromphenol, bismuth, benzoyl-acetyl peroxide, etc. It cannot be said that the clinical evidence in favor of any of these remedies is strong, and upon theoretical grounds their utility is very doubtful since the great dilution they suffer in the intestinal tract must render them almost inert. The same appears true of the proposed treatment with mineral acids in eight- to ten-drop doses, diluted with water.

We have already seen that during epidemics of cholera mild cases of this disease are of not infrequent occurrence. These cases are indistinguishable in many instances from attacks of simple diarrhœa due to intestinal irritation or indigestion, though frequently unaccompanied by pain. The only safe rule at such times is to regard all cases of diarrhœa as choleraic and as the possible beginning of a serious attack. The patient must be put to bed and isolated. The dejecta should be regarded as likely to contain the cholera spirilla, and carefully disinfected before being disposed of. A warm bath, with warm compresses on the abdomen, has been recommended. The diet should be restricted to fluids, previously boiled. Thirst may be relieved with boiled or carbonated (not alkaline) water. There are differences of opinion regarding the measures appropriate to the treatment of the diarrhœa. The usual practice is to employ some preparation of opium to check the discharges. The tincture given in small, frequently repeated doses has given good results. As it is important to allay all intestinal irritation it must be a matter of judgment in each individual case whether it be wiser to endeavor at once to check the diarrhœa or whether a freer evacuation of the bowels to discharge any irritating contents should be attempted. For the latter purpose calomel in repeated moderate doses, given until the stools become greenish, has a good reputation. Castor oil, emulsified with mucilage of acacia, peppermint water, and syrup, has also been employed. It is thought that calomel is partially converted into mercuric chloride in the intestine, and that it thus exerts some antiseptic action; but to what extent this is true is not known. As an antiseptic sodium sulphocarbolate, in fifteen- to twenty-grain doses for children and thirty-grain doses for adults, repeated every three or four hours, has been used with asserted beneficial effects. To check the diarrhœa, besides opium, astringents have been used and recommended, and to relieve pain the compound tincture of camphor has been employed. The prevalent opinion, however, is that opium fulfils the requirements better than other drugs, and that rest, warmth, and an appropriate diet are of the utmost importance. Tea and moderate stimulation with brandy may be used according to the indications.

Should the symptoms persist and vomiting set in notwithstanding the treatment indicated above, the copious enemata of tannic acid, recommended by Cantani, may be resorted to.

Long before the epidemic of 1866 Dr. Murray, in India, had recommended the half-hourly injection of a pint of a weak solution of common salt and carbonate of sodium into the rectum at a temperature of 120° F., and is said to have obtained very striking results. Similar means were employed by Sansom (*The Practitioner*, November, 1892), in 1866. Cantani advises the addition of tannin to the hot water. From eighty to three hundred and twenty grains are dissolved in three pints or a quart of water or chamomile infusion at a temperature of 102° to 105° F., and twenty drops of laudanum and an ounce or an ounce and a half of gum acacia are added. Instead of tannin, thymol in solution of hot water (1 in 1,000) has been recommended by other authorities. In the recommendations of the Royal College of Physicians (1892), benzoate of sodium, two drachms to a quart of water, has been suggested as an alternative to the tannic acid. In every case the injection should be made with much gentleness. The best position of the patient is that on the back with the hips well raised and the legs well drawn up as for lithotomy. The reservoir douche enema should be used and not the ordinary pump. There is much room for doubt as to whether the addition of any medicament to the hot water is of any special value, the favorable results being due probably to the clearing away of irritant and offensive *débris*, to the absorption of fluid from the intestinal surface, and to the relaxation of the arterial spasm by the hot and moist application; but up to the present time the use of tannic acid persists and is recommended. If more than two quarts are injected, a weaker solution should be employed. These enemata may be repeated several times in twenty-four hours. As shown by Cantani, the hot saline solution may pass through the ileo-cæcal valve into the small intestine.

If signs of improvement do not soon follow the procedure described above, and the algid stage of the disease supervenes, recourse should be had to the second method, of introducing fluid recommended by Cantani and called by him "hypodermoclysis," and consisting in the injection of a hot saline solution into the subcutaneous tissue. About one drachm of common salt is dissolved in a quart of distilled water at a temperatnre of 100° to 105° F. The apparatus for this should consist of a glass funnel with a long rubber tube attached to a hypodermic needle of fairly large calibre. The needle is introduced in the gluteal, interscapular, lumbar, or iliocostal region, the funnel being held at about the level of the patient, and the needle pushed so far in that it may be moved freely in the subcutaneous tissue. The reservoir is then elevated slowly so that the fluid runs into the tissue by the force of gravity and its distribution is aided by the manipulation of the fingers. When about half of the fluid has been introduced the needle is removed and the remainder is injected in another place. The method seems to be rational and is supported by strong evidence by Cantani, who has made extensive use of it. It was also extensively employed in the Hamburg epidemic. It is easier of application than the older method of intravenous injection that has been employed for many years, and it seems to be attended with better permanent results. Either or both of these methods must be employed earlier than is usually the case, and before the actual symptoms of death have made their appearance; to wait too long is to throw away all chances of success. The amelioration of the symptoms is usually very striking and prompt, due to the introduction of fluid and warmth; but improvement is frequently of short duration. The procedure may be repeated if the indications for it return; but experience has led to the belief that three or four injections of a quart or more are all that are likely to be beneficial.

Rest and quiet being of the greatest importance, owing to the exhausting nature of the disease, it must be a matter of judgment to what extent active measures to combat the conditions as they arise are wise. The patient should be kept as quiet as is compatible with proper care.

During collapse the condition of the circulation excites most solicitude. When the pulse at the wrist is lost and cyanosis appears, the most efficient remedy is the injection of fluid either intravenously or beneath the skin, as already described. Where the loss of fluid is less pronounced, careful stimulation with cold champagne or brandy and water may be tolerated by the stomach. Subcutaneous injections of ether or nitroglycerin, if used with care and not contraindicated by the condition of the patient, may give good results. Inhalations of small doses of amyl nitrite may also prove beneficial. In the early stages of the disease opium may be used to relieve pain, for it also tends to check the diarrhœa. But in the later stages, when there is danger of collapse, this drug should be avoided. Pain must then be relieved by other means, such as hot applications, moderate counter-irritation, inhalations of chloroform, or subcutaneous injections of camphor rubbed up with olive oil in the proportion of one part of camphor to nine parts of oil sterilized by heat. Gentle massage may give relief from pain, but is likely to disturb the patient more than is wise.

Thirst can best be relieved by ice held in the mouth, cold carbonated water, or nourishing fluids given in small amounts and at frequent intervals.

To prevent loss of heat, the patient should be kept in a warm room, the skin should be kept as dry as possible without disturbing the patient, and he should have dry heat applied by means of hot-water bottles or warm bricks; or the temperature may be maintained by hot compresses.

After recovery from the severe stage of the disease the treatment must follow the indications as they arise. Particular attention must be given to the diet, relapses being frequently traceable to neglect in this direction.

Prophylaxis.—Two principles govern the measures

* The efficacy of the bacteriolytic serum when administered by mouth or in enemata does not appear to have been tested. It would be worthy of trial.