was there an agglutination reaction. In these various respects, therefore, their results failed to confirm those obtained by Hofer.

Turning to the clinical aspect of the subject we find that the American observers carried out vaccine treatment by means of the Perez organism in twenty of their patients. Twelve of these were under treatment from three to eight months, and upon these they report. Doses varying from 50,000,000 to 500,000,000 were administered at intervals of seven days. No other treatment, either local or general, was carried out. Improvement was obtained subjectively and objectively in a proportion of the cases. There was undoubted objective improvement in crust formation in two cases. There was subjective improvement in fætor and in the dry pharyngitis in a large proportion of the cases. A sufficient length of time had not elapsed since the cessation of treatment to enable them to state whether the improvement obtained was permanent and whether it could be considered that a cure was effected in any case. While clinical results were regarded as encouraging in some instances they did not believe that the clinical evidence was sufficient to warrant the belief that the Perez bacillus was the true cause of ozena, and the literature will show that equally good results have been obtained by other observers who have used different vaccines in the treatment of ozena cases.

It is evident from this short review that there is still further work to be done in connection with the bacteriology and causation of ozena.

A. L. T.

INFECTIONOUS DISEASES.

UNDER THE CHARGE OF

CLAUDE B. KER, M.D.

SERUM TREATMENT OF CEREBRO-SPINAL MENINGITIS.

The greatly increased incidence of this disease in this country since the beginning of the war has made the question of the value of serum treatment one of considerable importance. A large number of papers have been published, some referring to very small numbers of cases, others to cases collected from various sources, and in many of them, perhaps indeed in the majority, serum treatment has been reported to be disappointing or useless. This is so entirely contrary to the experience of Robb, myself, and others in the epidemic of some years ago that an article by Netter (The British Journal of Children's Diseases, December 1915) may be welcomed as emphasising that the only real treatment of cerebro-spinal meningitis is that with anti- meningococcal serum. Netter reports the results of the treatment in a series of 226 cases, all under his own care, and of which 45 occurred in the first half of 1915 and therefore were presumably of the type of disease
at present existing. This latter group he considers was of at least average severity and indeed showed a greater proportion of extra meningeal localisations than his earlier cases, and also more frequently a meningococcal septicemia.

The gross mortality of the 226 cases was only 27.4 per cent., a most remarkably successful result. Netter reduces this considerably by making certain deductions of patients who died within 24 hours and so forth, but we cannot regard such deductions as justifiable in the case of an acute infection which is not infrequently fatal in a few hours after the onset, and the gross mortality rate seems to be quite striking enough without such corrections. Flexner's figures show a percentage mortality of 30.9 in 1294 cases, and Netter estimates the mortality before the use of serum as 48.5 per cent. for sporadic and 83.3 per cent. for epidemic cases. He lays emphasis, quite justly, on the high percentage of infants (34) in his own series, for it is generally admitted that the disease is exceptionally dangerous at this early age, and his results appear all the more remarkable in consequence. The gross mortality for the 1915 cases was 24.4 per cent. of the 45 treated. Of the 34 patients who recovered, 24 improved rapidly and 10 slowly. Emaciation was never observed. Permanent deafness persisted in three patients, in all of whom it was already present before the first injection of serum was given. One child who was seized with sudden blindness at the onset of meningitis, without appreciable changes in the eye, recovered her vision the day after the first injection. Intra-articular injections caused a rapid cure of suppurative arthritis, and intravenous injections were apparently responsible for the complete recovery of a child with vegetative endocarditis.

These brilliant results can be doubtless attributed to the method chosen for administering the serum—that is to say, daily injections for the first three days at least and more if the fluid still contained meningococci. The advantages of this procedure were recognised in Belfast and Edinburgh in the 1907 outbreak, and it is almost certain that many of the recent failures to obtain results with serum have been due to neglect of the principles at that time clearly laid down by Robb, Dunn, and others.

Netter's figures also show the importance of early injection. Of 13 patients treated in the first three days of their illness only one died, and that from a tubercular broncho-pneumonia. The conclusion is that bacteriological findings should not be waited for, but that serum should be injected in every case in which turbid fluid is found in the spinal canal. On the other hand, Netter believes that if there is a reasonable suspicion of the disease being present, even clear fluid should not necessarily negative serum treatment, as one of his cases showed lymphocytes only in the fluid.

The serum to be used is naturally a question of the highest import-
ance. So far as I can judge personally the serums obtainable in this country are not acting nearly as well as that of Flexner did in the last outbreak. Netter used for his earlier cases the serums of Flexner and of Dopter, both of which were admittedly highly efficacious. For the more recent cases he employed a mixed serum, two-thirds of which consists of anti-meningococcal serum and one-third of Dopter's anti-parameningococcal serum, and also a polyvalent serum from the New York Laboratory of Hygiene. He points out that the recognition of the parameningococcus explains many cases of failure of serum treatment, and advises that a polyvalent serum should always be used. This, I think, is very desirable, when it is possible, as my experience in 1907 was that Flexner's serum, while ideal for epidemic cases, absolutely failed in those of the sporadic type, and was incapable even of agglutinating their cocci. It is to be hoped, therefore, that we will be able to obtain in this country also a serum prepared from animals immunised against a large number of strains, both of the meningococcus and the parameningococcus. With such a preparation and with its systematic employment on successive days, until no cocci can be found in the spinal fluid, it is not to be doubted that results equal to Netter's will be secured. In the meantime, many workers have been content to inject every two or three days, or have stopped injecting on a temporary improvement of the patient, and have then concluded that, after all, lumbar puncture is as useful as serum treatment.

TREATMENT OF TYPHUS FEVER.

Escluse (La presse médicale, 11th November 1915) reports an interesting experiment in the treatment of this fever by means of the intravenous injection of the blood of convalescents. The blood from a convalescent, on the eighth or tenth day after his crisis, was drawn into a syringe, containing a pinch of citrate of soda to prevent coagulation, and at once introduced into the vein of the patient. No accident occurred, so the method was regarded as satisfactory. Only three cases were treated, and all were considered in a desperate condition at the time of the first injection. The amount injected as a dose was 10 c.c. of blood, and one patient received three such doses in 24 hours, and six in all. Two of the three patients made good recoveries. Escluse gives the charts of the cases, which are very interesting. Curiously enough, in all three the first injection was not given until the crisis was complete, or nearly complete, so far as the temperature was concerned. In all the cases, however, the pulse and respirations had remained very rapid, and this want of correspondence, together with the intense toxic symptoms, was apparently regarded as the indication for interference. One cannot help thinking that an earlier use of the treatment would have tested its efficacy better. It would, for instance, have been interesting to see if the injections
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precipitated the critical change. It is, however, difficult to resist the conclusion that they were of considerable value, even at so advanced a stage of the disease. For obvious reasons, nevertheless, treatment of this kind can never be generally employed. Similar experiments have been made with scarlet fever and cerebro-spinal meningitis, but, owing to the difficulty of procuring blood, have never been carried out on a convincing scale.

Results of Vaccination against Typhoid Fever.

Tournade (La presse médicale, 25th November 1915) discusses the incidence of typhoid fever among those inoculated against it. His observations, made at Verdun, refer to 142 patients admitted suffering either from typhoid fever or fever of an allied type. All the men had received two or more inoculations. Tournade did not identify the causal micro-organisms by means of blood cultures, but states that in the laboratories of the First Army it was found that 75 per cent. of typhoid infections were due to paratyphoid organisms; and he, therefore, assumes that a similar proportion of his cases might reasonably be regarded as cases of paratyphoid fever. In 26 instances the fever commenced within three weeks of the inoculation, and infection had therefore probably taken place previously. Tournade does not suggest that the patients may have been infected during a negative phase, which might well have been the case, and which would not have in any way detracted from the value of inoculation as a practice. He mentions the interesting fact that, of 749 soldiers straight from the trenches presenting themselves for inoculation, he found no less than 67 had a temperature of over 100·5°, and that 8 of these had actually typhoid fever. He points out with justice that these men, if inoculated, would have been regarded as examples of the risk of inoculation.

Of the 142 men who suffered from either typhoid or paratyphoid fever, 76 had been inoculated twice, 36 thrice, and 30 four times. The general death-rate was low, 7 per cent., a very moderate figure for men straight from the fighting line. This points either to a high percentage of cases of the milder, or paratyphoid, infection, or to the beneficent action of an inoculation which was not entirely protective. Of the 30 men inoculated four times none died.

Tournade concludes that protection is not absolute, just as the protection conferred by a previous attack of the disease is not absolute. He also refers to the bacteriological results of Lippman and Pénau, who found that among non-inoculated subjects the proportion of typhoid to paratyphoid cases is two to one, whereas in the inoculated the proportion is one to four.

A similar study of the question has been made by Rimbaud (La presse médicale, 11th November 1915), who was able to make a more
thorough investigation of his cases, cultures from the blood being made in every instance. Of 203 patients inoculated from one to four times, the bacillus of Eberth was found in 51, the paratyphoid A in 106, and the paratyphoid B in the remaining 46. Of the 203, only 10 had received the four inoculations demanded by French practice. Moreover, the protective effect of inoculation was observed to be greater in proportion to the larger number of injections. Rimbaud treated 656 men for various forms of typhoid infection. Of 222 who had never been inoculated, 50.9 per cent. suffered from genuine typhoid fever. Of the inoculated men, on the other hand, 19 per cent. only of those who had been inoculated once showed the bacillus of Eberth, 16 per cent. of those twice inoculated, and 11.6 per cent. of those thrice inoculated. Of 145 men who had undergone the full course of four injections, only 6.8 per cent. suffered from real typhoid fever. All the remaining cases were instances of one or the other paratyphoid infections.

Rimbaud considers his results show the advisability of four inoculations. In the British service we are content with two, and it will be interesting to see how far our statistics agree with those of the French military surgeons. It is remarkable that we shall owe a great deal of our knowledge of paratyphoid fever to the inoculations undertaken against the more severe disease. As Rimbaud says, very justly, without typhoid inoculation the paratyphoid cases would have passed unnoticed in a terrible epidemic of the true fever. As it is, both the French and ourselves have taken measures to protect the troops against both diseases either by the use of mixed vaccines or by separate courses of inoculations. It is probable, therefore, that we shall hear less of paratyphoid infection during the remainder of the war.

PATHOLOGY.

UNDER THE CHARGE OF

THEODORE SHENNAN, M.D., AND JAMES MILLER, M.D.

BOVINE ACTINOMYCOSIS.

Attention has recently been directed (Griffith, Journ. Hygiene, January 1916) to the subject of bovine actinomycosis and its bearing on the public health by the discovery on the part of the health authorities at various ports in this country of large numbers of imported ox tongues showing evidence of actinomycotic infection. A considerable amount of work has been done, both in this country and abroad, upon the pathological condition known as actinomycosis in animals and in man, and it has been shown that the disease, in relation