extent, and to me it emphasizes the importance of beginning this treatment at the earliest stage possible. In Case 5 it will be observed that treatment was not begun until six days after the initial attack and four days after she became paralyzed, but certain measures had been taken before I saw her which I believe aided the hyperemic action.

I do not presume to hold that this treatment will cure all cases of infantile paralysis no matter in which stage it may be applied, but I strongly believe that if it is applied before the fourth day of the attack it will in many instances prevent a paralysis resulting, and in the majority of cases at least insure a useful and serviceable limb.

ACTINOMYCOSIS TREATED WITH VACCINES.

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ACTINOMYCOSIS, as described by Dr. J. H. Wright, is a definite process characterized by destruction of tissue and abscess formation, and by an excessive formation of connective tissue, caused by a specific organism, the actinomycetes bovis. A complete review of the whole subject, written by him, is to be found in Osler's "Modern Medicine." The micro-organism causing the disease is an anerobe, and from pure cultures of this organism alone we have made our vaccines.

Actinomycosis appears usually about the head and neck, probably in 50% of all cases, and of the remainder 20% are abdominal and 15% thoracic. In the cervico-facial type the mortality is probably from 25% to 40%. In the thoracic type the prognosis is very bad, only five or six recoveries being reported. The abdominal type is a little less grave, having a mortality of 70% to 80%, and the cases that recover are always those in which the infection is pretty sharply defined and localized.

The treatment up to the present time has consisted of excision or curetting where possible, followed by the use of copper sulphate both internally and locally, and large doses of iodide of potash. In going over the literature, we have been able to find only four cases of so-called actinomycosis which were treated by the use of vaccines. Winn reports a thoracic case in which an abscess of the lung and liver existed. He says: "It is now admitted, there are many forms of actinomycosis, and the significance of the term has been widened to include a class of diseases caused by a distinct species of parasites. Two generic names for this organism are in use, viz., streptothrix and actinomycetes. The former name is accepted by British and most American investigators, while the latter is still in use on the continent."

This, and the description of the organism and its cultural characteristics, particularly the fact that it was not an anerobe, leads us to believe that it does not conform to the description as laid down by Wright, or, in other words, is not

actinomycetes according to the best usage of the term, but rather a streptothrix. Winn made his vaccine from surface agar cultures, taken directly from the pus without attempting to obtain the organism in pure culture. These cultures were dried at 60° for one hour, and the dried surface growth scraped off. This dried substance he called "actinomycotin." The patient received six doses of .001 mgm. of this actinomycotin in all, showed a rise in opsonic index after inoculation and made a complete recovery in three months.

Whittier, in April, 1909, at the meeting of the American Association of Pathologists and Bacteriologists, reported a case of a growth at the angle of the ribs on the left side. An operation was performed and actinomycetes found. A vaccine was made from surface growths or bouillon, and there was no attempt made to obtain the organism pure. He also stated that his dosage was from fifty to one hundred million. Because of the character of the growth of true actinomycetes in bouillon, it is impossible to standardize vaccines, except in a very rough way. It seems probable that in this case also we may be dealing with streptothricosis, or if actinomycosis, that the cultural growth was some secondary infection and not actinomycetes.

Harbitz and Grondahl have studied the subject very thoroughly in Norway. The organism which they have accepted as the causative factor conforms very closely with Wright's description. They used a pure culture vaccine on two cases, with recovery in one and death in the other. Although it is very hard to judge, it seems probable that the vaccine was very much less concentrated than the one which we have used. They report no general reaction, whereas we have found that both general and local reaction might be obtained often with a rather small dose.

METHOD OF PREPARATION OF VACCINE.

Pure cultures are obtained by thoroughly washing separate granules gotten from the pus in five or six changes of sterile, normal salt solution. This is necessary because of the usual secondary infection accompanying the disease. In many cases the secondarily invading bacteria are so numerous and so intimately mixed with the filaments of the granule that it is impossible to obtain the actinomycetes in pure culture; but as we have found that the stock vaccine is apparently as effective as an autogenous one, when the organism has once been obtained in pure culture, it can be left growing in the laboratory to be used when needed.

After a number of granules have been thoroughly washed, each one is placed in the bottom of a tube of melted glucose agar at a temperature of about 45° C.

Some may be broken up on the side of the tube, thus scattering the filament through the medium in the hope of obtaining single, isolated colonies; and others, if the secondary infection is not too marked, may be planted whole.

Colonies of actinomycetes as a rule do not begin to

show any growth until after forty-eight hours or more at 37° C. When a fine growth is obtained, the single colonies are cut out of the solid medium and transferred to tubes of plain bouillon in the bottoms of which they grow as single, irregular, granular, white, yellow or occasionally brownish-black colonies, with no clouding of the bouillon. For a vaccine, at least a dozen bouillon tubes should be inoculated, and the colonies transferred to fresh bouillon tubes at least every four days. After a week or ten days, the colonies attain a moderate size and are then transferred to a sterile test tube, preferably made of thick glass, in which they are ground up as much as possible. This is most easily done by means of a sterile glass rod over one end of which has been slipped an ordinary rubber nipple. To the ground-up colonies is added a little normal salt solution. The test tube is then drawn out, sealed in the ordinary way, and kept in a water bath at 60° C. for one hour. After sterilization, the contents of the tube are transferred to a bottle containing 50 ccm. of sterile normal salt solution and 1:400 lysol or carbolic acid, the bottle being covered with a sterile rubber cap.

It is impossible to standardize such a vaccine except in a very rough way, because the filaments composing the colonies are not evenly broken up. We have used test tubes of approximately the same caliber, filled them for a definite distance with the actinomyces colonies, and added a definite amount of sterile salt solution. Because of the inability to determine the strength of the vaccines, and as it was found that large doses might cause a marked general reaction, treatment was always begun with very small doses, which were generally increased in strength.

The routine method of treatment is to give 0.1 ccm. of the "vaccine" subcutaneously for the first dose. This is repeated every three or four days, increasing the amount given 0.05–0.1 ccm. each time until a dosage of 0.75 ccm. has been reached. A greater amount than this we have only given in one case, when we ran the dosage up to 4 ccm., but with no evident benefit, although the constitutional symptoms were quite severe. Of course, as in all abscesses, if there are any collections of pus, incisions should be made and drainage established.

We have treated or had treated with "vaccines" eight cases of actinomycosis, two with abdominal, two with pulmonary, and four with cervico-facial actinomycosis. The thoracic cases were all advanced when first seen, both showing actinomycotic lesion of the chest wall, and one of them a large indurated area containing pus pockets over one side of the neck. Both these cases grew rapidly worse and died. A very interesting result of the use of the vaccine was the immediate large increase of actinomycotic granules in the sputum. This effect lasted several days.

Of the two abdominal cases, one, after operation and drainage of a large abscess in the left inguinal region, followed by treatment with "vaccine" for two months, has apparently made a complete recovery. The other case was operated upon

Nov. 19, 1908, for appendicitis, and an abscess containing actinomycotic granules found. Since March 14, 1909, the patient has been given auto-genous actinomyces "vaccine" off and on up to three months ago, when she died following involvement of the lungs. There were periods of apparent improvement, but the results on the whole were not striking, except for the fact that the general reaction was very marked with large doses, and that the patient, before vaccine treatment was begun, was growing worse so rapidly, and the process spreading so fast, that a fatal termination seemed certain in a short time. There was marked improvement at first under vaccine treatment, although at the same time the use of iodides and copper sulphate was stopped.

Of the four cases of actinomycosis of the jaw and neck, three have apparently completely recovered, and one is rapidly improving under that treatment. The improvement in one of these cases was particularly striking. When admitted to the hospital, he had been suffering from actinomycosis of the jaw for over six months, had been treated thoroughly with iodide of potash, and had had numerous small abscesses which had formed, opened and cured, but in spite of this, the induration had extended down his neck below the clavicle and a short distance beyond the median line to the other side. He was given actinomyces vaccine subcutaneously, and all other treatment omitted. A few days after the first injection, two small fluctuating areas appeared in the neck which were opened and found to contain pus loaded with actinomyces granules, and no other micro-organisms. After this the lesion rapidly softened and diminished in size, and at the end of a month and a half all induration had disappeared. He was given vaccine every three or four days for about three months, and, at the present time, a little over a year after treatment was begun, he is perfectly well and shows no evidence of the disease except for two small scars, the remains of incision made in opening abscesses.

In cases of actinomycosis of the jaw, the starting point is usually a bad tooth, so, of course, the offending tooth should be removed. It is impossible to draw any general conclusion from these few cases, but it does seem that the use of vaccines in superficial actinomycosis does do good. In lung actinomycosis with the severe secondary infection which invariably accompanies it, vaccines are apparently useless.

Clinical Department.

THREE CASES OF PELLAGRA.

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SINCE seeing the case of pellagra reported in the BOSTON MEDICAL AND SURGICAL JOURNAL of Sept. 7, 1911, I have seen three other cases, making a group of four. Three of this group were in the Northampton State Hospital. The geographical distribution, however, shows that this is by no means a pellagrous center. One case