The initial dose in the enormous majority of cases was half a million. The daily weight has been found to be a satisfactory method of controlling the dosage. The interval with small doses has been three to four days; with larger doses a week. Patients do not seem to have been quite so sensitive to the secondary organisms when present, but still great caution had to be exercised; streptococci were given in doses of half a million to 5 million and *B. coli* the same.

Length of Treatment.

It has been difficult to obtain reliable information as to the total length of the treatment in a good many of the cases, where the treatment had been either continued or carried out in full by the patient's own doctor, but taking those known and averaging out the rest, a method which could to some extent be checked by noting the dates of the cessation of correspondence, it works out at five months. Excluded from this are two or three whose treatment extended intermittently over two years or more, and also some where interruptions occurred.

Discussion.

I do not bring forward these cases as proof that the *M. deformans* is the primary cause of rheumatoid arthritis, but as evidence tending in that direction. I do, however, claim that, used as a working hypothesis, better results have been obtained than by any other method of treatment. Among the sixty-two cases of whom the notes are fairly complete, only 21 per cent. failed to respond in some degree. Other 95 per cent. improved but slightly or relapsed early; 70 per cent. may be said to have been cured for the time being as far as cure was possible, and of these it is known that 15, or 25 per cent. of the total, still maintain their position. From recent experience it is suggested that those who have relapsed would have regained their health under further vaccines, and only the war, in the majority of the cases, prevented this.

There is no other method of treatment which can show anything like these results in rheumatoid arthritis. Hitherto the results of vaccine treatment have been unsatisfactory, and in fact the method seems largely to have fallen out of fashion. Professor Stockman does not even mention the possibility in his book on arthritis published this year. S. Boorstein, of the Montefiore Home in America, whose experience must be considerable, made the following statement as recently as last March²¹:

VACCINE TREATMENT: A great deal has been written on, and many patients abused by, vaccine treatment. As shown before, it is very hard to state definitely the bacteria which are the true etiological factors in a given case. Even if the source of entry is exactly found, it is doubtful whether the organism in the joint is the same as in the focus, as the organism changes under different environments. It is, therefore, absolutely worthless to give vaccines, perhaps even harmful. Some have injected non-specific protein antigen with the idea that the proteins of the bacteria are responsible for the cures. Those cases which I have observed following all forms and kinds of vaccine injection have turned out badly, and I have therefore abstained from using them.

One very substantial benefit conferred by the treatment has been that after a course of vaccines, when the active signs of the disease have subsided, joints can be manipulated under an anaesthetic without fear of lighting up further trouble. In three of the recent cases operations have been performed. Tendons have been cut, joints cleaned up and freed, and in several others adhesions have been broken down under gas, so that limbs have been brought into use again after long periods of inactivity.

In conclusion, the author desires to make his best acknowledgements to all those of his medical confrères, too numerous to mention individually, who have so kindly assisted him with notes of their cases, and many of whom have taken great pains in the matter of tracing their patients.

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A DIPHtheria CARRIER OF UNUSUAL TYPE.

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A CASE of pharyngeal diphtheria occurred on July 26th, 1920, in one of the sons of a family consisting of father, mother, daughter, and three sons. The patient was removed to the Isolation Hospital the same day, and the premises and eating utensils disinfected. Another son developed the disease on July 28th, 1920, and was removed to the Isolation Hospital, and disinfection was again carried out. On August 10th, at 5 p.m., an interval of twelve clear days having elapsed since the last case, the sister complained of sore throat and malaise; no membrane or nasal discharge could be seen, but there was some increased redness of the pharynx and tenderness of the cervical glands. A swab was taken from the throat. On visiting her the next day a patch of membrane the size of a florin was seen on each tonsil, and there was marked narrowing of the space between the tonsils; the swab was reported to show *B. diphtheriae*.

The remaining brother, who slept in the same room, also had a small patch of membrane on one tonsil. After removal of these two cases and disinfecting, swabs were taken from the father and mother. That from the latter was reported to show *B. diphtheriae*, but no clinical signs of diphtheria were present. On admission to hospital she was found to have pediculi capitis, and a small area of impetigo on the scalp; a swab from this was returned showing *B. diphtheriae*; she had therefore *B. diphtheriae* present both in the throat and in the scalp lesion.

It was then found that another son had died from diphtheria in September, 1914. The mother may have been the cause of this case, or she may have become a carrier after contact with it. She herself had never had any marked illness which might have been diphtheria. It appears probable that she was at least the infecting agent in the last two cases, the interval of twelve days being overlong for infection from the first two. As no other source of infection could be traced for the first two cases, it is possible that she was the infecting agent here also.

In view of the possibility that the bacillus found on the head of the mother, though morphologically indistinguishable from *B. diphtheriae*, might be merely a diphtheroid bacillus, this bacillus was isolated, and its pathogenicity proved by animal inoculation. The strain proved to be of medium virulence; 2 c.cm. of a forty-eight hour broth culture killed a guinea-pig weighing 600 grams in less than three days; the post-mortem examination showed haemorrhagic oedema at the site of inoculation, and marked congestion of the suprarenal glands.

The impetigo of the scalp had been "present for several months." The series of cases indicate very strongly the necessity of swabbing all contacts in the home irrespective of age, and also of searching for and examining any other lesions.

LIFE-HISTORY OF ASCARIS LUMBRICOIDES.

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THE following is a note of work on the life-history of *Ascaris lumbricoides*, in continuation of that published in the BRITISH MEDICAL JOURNAL, July 1st, October 7th, December 2nd, 1916, January 25th, 1919, and in *Parasitology*, February, 1917, January, 1918, October, 1919.

Four sucking-pigs three days old were fed with ripe eggs of *Ascaris suilla*, Dujardin (the round worm of the pig, probably identical with *A. lumbricoides*, the common round worm of man). All four suffered from ascaris pneumonia on the seventh and eighth days after infection, proving that the larvae of the worm were then passing through the lungs. One died during the night of the seventh-eighth. The remaining three pigs were killed on the fifteenth, seventeenth, and nineteenth days, and larvae of ascaris,