

his posterior nasal passages and not at the same time suffering clinically—did not, as matter of fact, develop the disease subsequently. Age alone would scarcely explain this.

Coming to the position of affairs now existing, there was, he thought, in association with the explosive period in Glasgow a certain substratum of low temperatures which fostered catarrhal conditions. Mainly, he thought, however, that the continuance over some months of cases not numerous but widespread might tend to give the organism increased virulence and lead to an explosion, as it did in February, 1907. It was too late, he believed, to spread the population out after a particular overcrowded house had been invaded. The practical question, how carriers were to be dealt with, resolved itself very much into a question of getting quit of the meningococcus. If the absence of subsequent disease in carriers did cause some hesitation in accepting the variety of organism found post-nasally and entirely unassociated with clinical symptoms as being the true organism of the disease, he doubted at the moment whether this was sufficiently strong to warrant the discarding of nasal douching; and, for his own part, he believed that quite as rapid results had been obtained in free douching of the nose with slightly alkaline lotions as with any special disinfectant. He meant not nasal syringing only but douching.

In conclusion, he was disposed to approach cerebrospinal fever administratively on the basis of a typhus fever outbreak—that was to say, virulence grew up under overcrowding—but for executive purposes diphtheria seemed to afford the closest parallel.

Dr. GARDNER ROBB (Belfast) thanked the Section for giving him the opportunity of being present, as he was greatly interested in cerebrospinal fever, as every person must be who had had anything like the experience which Belfast afforded in 1907-08, especially if they had been in any way responsible for the treatment of these cases. The Belfast visitation started at about this time of year. The remark had been made to-night that there had not been many deaths from the disease in the present outbreak, but it must be remembered that we were now only at the season when it commenced. He believed the disease was fairly general all over the three countries, for during the last three weeks he had had applications for supplies of Flexner's serum from many districts not only of Ireland but also of this country. In the extensive outbreak in Belfast, the first cases came into hospital at the end of December, 1906. Then there was a month of complete

rest, and a real start was made at the end of January. The first admissions were five members of one family, who were taken ill within thirty hours of each other. Then there were no more admissions to hospital for a month. (Up to that time he had seen only two or three cases in the small epidemic in Dublin; there had been forty or fifty cases in that city some five years before.) After the first five there were five more. Again all of one family in a separate part of the town, 2 miles away. These last five children were taken ill within ten hours of each other, and within thirty hours four of them were dead. The fifth child had a mild attack from which it recovered.

Sir William Osler had expressed the hope that good results might be expected in regard to ascertaining what were the different strains, in various parts of the country, now that there were so many opportunities for study. There were one or two points which he (the speaker) thought should be settled fairly definitely. He was particularly interested in the position of posterior basic meningitis in relation to the epidemic variety, the organisms of which were indistinguishable by cultural methods. There were very few cases of posterior basic meningitis in the north of Ireland, but the few which were seen gave a quite different agglutination; the serum from the posterior basic cases did not agglutinate the meningococcus from the epidemic cases, and vice versa. Also the posterior basic form failed to give the high opsonic index found in the epidemic variety. Houston and Rankin worked this out very thoroughly, and they obtained cocci from cases in several different localities, including Great Ormond Street Hospital, also specimens of blood from some of those cases. It was found in Belfast that the serum from these cases did not agglutinate the meningococcus from the epidemic variety, and vice versa. When using the serum in treatment, the few cases there were of posterior basic meningitis failed to respond to Flexner's serum. He had not had the opportunity of using more recently prepared sera in posterior basic cases; but possibly now that endeavours had been made to collect various strains from widely separated localities, perhaps good results were obtained from this polyvalent serum in posterior basic cases.

It would also be interesting to know how their cases compared with the French cases. Dopter found that there was one definite strain, which he called a parameningococcus, which did not respond to the polyvalent serum made in America. In France they were now combining the sera obtained from different sources, and if a case was too severe to await differentiation both kinds were immediately injected.

In the Belfast epidemic, just as in that of Glasgow, there were some extraordinary house infections. In several instances there occurred multiple cases in one house *at one time*; there were not many instances in which one case occurred in a house, and then at a reasonable period another, which might be assumed to have originated from the first. There were either several cases occurring at once, or a certain house got a name as being infected with cerebrospinal fever, and cases occurred in it *at long intervals*. For instance, one case was admitted from a house in a district where there had previously been no cerebrospinal fever; that one case was admitted into hospital in March; it recovered, and was discharged in May. No more cases occurred in that district until October, seven months after the occurrence of the first case, when there were two more cases *in that same house*; it was one of a row of small houses in a long street. These last two cases from this house were taken ill on the same day. One, which did not come to hospital and did not have serum, died in three days. The other had the serum in hospital, and made a good recovery. Again, a child was taken ill in a country district, 15 miles from the town, and there had been no previous cases there; neither were there any in that district for months afterwards. The nature of the disease was not there at once recognised; the patient was a school teacher's sister, and the school teacher went home from Belfast and nursed the child through its attack. After four days the patient died, and the teacher returned to town in September. The following Christmas she returned and spent a week in the place, which was her home. On the day following her return to Belfast she developed a severe attack of the disease, though there had been none in the district in which she resided in town. It seemed, therefore, that she had contracted the disease while spending Christmas in the house in which her sister was attacked over three months before. There were several other peculiar instances of the same kind.

As had been the experience elsewhere, no official contracted the disease—no member of the sanitary staff, and no nurses, even though the epidemic taxed the nurses and staff more than he had ever known before. Sometimes more than half the patients in a ward had to be restrained and were nasally fed, and at one time the patients were dying at the rate of twenty per week. Therefore the risk of working in association with these patients did not seem to be very great. Another peculiar point was that practically all the nurses were drawn from the local population, and when on leave they mixed freely with their relatives, and yet amongst their friends there did not seem to have been

any cases at all. There were no instances traced of the disease having been conveyed out of the hospital, and none of the nurses nor other officials in close contact with the patients appeared to have acted as carriers.

Though an embargo had been placed on the discussion of treatment, it was a subject in which he was much interested; he did not feel that prevention was his sphere. With the President's permission he desired to refer to the absolute and complete revolution which was produced by Flexner's serum. He had no personal experience of any other kind of serum injected into the spinal canal. In some seventy cases he used by hypodermic injection various German sera, which were greatly lauded, and representatives even came over and persuaded the authorities to buy large quantities of these sera, quoting good statistics from other places. But in the seventy cases, though in some he pushed the dosage and frequency beyond that laid down for hypodermic injection, he did not find it of the slightest use; in fact, the death-rate in those cases was rather higher than in the generality. In Belfast during the first eight months of the epidemic there were in hospital 275 cases with a death-rate of 72 per cent.; and anything more depressing than the work there among these cases it was impossible to imagine. They had come to the conclusion that they could do practically nothing to check the death-rate, though occasionally good nursing and frequent lumbar puncture for drainage purposes seemed to turn the scale in the patient's favour. But he thought the number of cases thus benefited was very small. In practically every epidemic the death-rate had been between 70 and 80 per cent., though a smaller rate had been shown in smaller visitations.

On September 1, 1907, they began at Belfast the intraspinal injection of Flexner's serum. In the three months immediately before starting this forty-five cases were admitted, and thirty-seven of them died, giving a mortality of 82 per cent. After the new injections were started the results were so striking that he felt afraid to publish the cases, or to say what he thought of the treatment. It not only produced a complete revolution in the death-rate, but it altered the whole appearance of the wards set apart for cases of the disease. In the first thirty cases they treated with the serum eight died and twenty-two recovered—a death-rate of 26 per cent. At that date only 50 per cent. of the cases in Belfast were being sent into hospital; friends of patients had understood that it was not a very infectious disease, and it was reported that medical men could do little for it; hence there was a

tendency to keep patients at home. During the four months that the thirty cases were treated in hospital, thirty-four were under treatment at their own homes, *not* with the serum, and of those thirty-four, twenty-nine died, giving a death-rate of 85 per cent.

Since the use of the serum was commenced there had been 117 cases admitted to his hospitals, with twenty-eight deaths—a case mortality of less than 24 per cent. Every case admitted since had been treated with the serum. *All* are included in these figures, even when death took place within thirty-five minutes of first injection. He was satisfied that this would be improved upon when the recent knowledge as to dosage and methods had been applied generally. And since the serum was used the “chronic” cases had disappeared from the wards. In the earlier series, cases were quite frequently of several months’ duration, often lying unconscious and being kept alive by nasal feeding for weeks, only to die of progressive emaciation; some such cases lasted up to four months. Now that the serum was being used it almost always happened that if the patient did not die in the first fierce onset he was well in a fortnight, often much earlier. Since the use of Flexner’s serum was begun “chronic” cases had been no longer met with. The same kind of occurrence was noted in New York; Dr. Holt collected records of 350 cases which had recovered before the use of the serum, and the average period of illness of those cases was a long one; in 50 per cent. the cases had shown acute symptoms for five weeks, but such cases were not seen later in New York.

The disease had been referred to that night as one with a very high case mortality rate; but he thought it was scarcely correct to say that it had a high mortality now. In the case of soldiers, they were at the best age and in the best condition for recovery. In all the epidemics before the use of serum was begun the recovery-rate improved as the young adult age was reached; in young children the recovery-rate was not so good. In an adult the diagnosis could be reached much earlier than in the case of children. Infants, aged 1 year, he found were often left for two or three days before being sent into hospital.

In Flexner’s first 400 cases, which included seventy Belfast cases, that authority found that if the serum were used between the first and third days of the illness the death-rate was only 16 per cent.; if given between the fourth and seventh days it was 23 per cent.; but if its administration were delayed until later than the seventh day it was 35 per cent.

In the case of young and vigorous troops, in whom diagnosis could

be made early, he was satisfied the death-rate could be kept low—i.e., in the neighbourhood of 10 per cent. But there would *always* be a considerable number of cases in which nothing would do any good. There had been, within the past fortnight, two or three cases in a camp 25 miles from Belfast. In one of these the men had been on a route march, and came in at 5 o'clock. He went to his supper as usual, and then suddenly felt very ill, so went off to his hut. He awoke his companions at 4 a.m., moaning. He was seen by the medical officer, placed in a motor ambulance, and sent to the hospital, but he died on the way. There were instances in the large Belfast outbreak in which death ensued within nine hours of attack. In such acute cases the difficulty was to get at the men soon enough, and even if that were possible, the result would probably be the same.

He had had no experience of any serum but Flexner's, which was now supplied to Belfast by the Public Health Department, New York. That of Dopter, of Paris, prepared on Flexner's lines, had also given excellent results. Many other places were supplying anti-meningitis sera, and they might be good, but he thought it a pity to experiment with other varieties when there were sera available of such proved worth as Flexner's and Dopter's, and especially as they seemed to meet the case of a variety of strains.

Captain ELLIS said that during the past few months he had been associated with an epidemic of low incidence but high virulence. It was of low incidence, in that in a body of troops of 30,000 there had been only some 40 cases in six months. Its high virulence was shown in the fact that despite treatment by serum the mortality was between 60 and 70 per cent. The low incidence was especially striking, in that the men were in crowded quarters, and were living under very arduous conditions of work and weather. The virulence of the epidemic was evidenced by the number of fulminant cases, which during the last three months had been as high as 30 per cent.; by fulminant, he meant those in which death supervened from thirty-six to forty-eight hours after the onset of the illness. Such figures, in spite of early diagnosis and persistent serum treatment, were impressive.

From Dr. Robb's and Flexner's figures one knew how low the mortality could be in cases well treated with a serum which was active against the strain of organism prevalent in the epidemic. Such good results had also been achieved by many men in many places and in different countries, the mortality varying between 25 and 35 per cent.