AN ANALYSIS OF FOUR HUNDRED CASES OF EPIDEMIC MENINGITIS TREATED WITH THE ANTI-MENINGITIS SERUM.*

By SIMON FLEXNER and JAMES W. JOBLING.

(*From the Rockefeller Institute for Medical Research, New York.*)

INTRODUCTION.

We have already reported concerning the effects of the employment of an antimeningitis serum, prepared in the horse by the inoculation of *Diplococcus intracellularis* and its products, upon the course and termination of a small number of cases of epidemic meningitis.[1] The results first reported were, on the whole, so satisfactory that we believed the employment of the serum on a wider scale not only justified but clearly called for; and we are now in position to present a second series of figures which are based upon an analysis of something more than 400 cases of epidemic meningitis in which the serum has been used.

The cases of meningitis upon which this analysis rests have arisen in different and widely separated parts of the United States and Canada, and in Great Britain. They have occurred sometimes as small epidemics, as in Castalia and Akron, Ohio, in Porterville, California, and possibly in other places in the United States, and in Belfast, Ireland, and Edinburgh, Scotland; and sometimes as sporadic outbreaks of considerable extent, as in Cleveland, Boston, Baltimore, Cincinnati, Philadelphia and New York. Moreover, it is now evident that so-called epidemic meningitis is widely prevalent throughout the United States, and it would appear to be question-

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[1] *Journal of Experimental Medicine,* 1908, x, 141. Independent publications on the use of the serum have been made by Robb, *British Medical Journal,* 1908, i, 382; by Dunn, *Boston Medical and Surgical Journal,* 1908, clviii, 370; and *Journal of the American Medical Association,* 1908, li, 15; by Chase and Hunt, *Archives of Internal Medicine,* 1908, i, 294; by Churchill, *Journal of the American Medical Association,* 1908, li, 21; and by Miller and Barber, *idem,* 1908, l, 1957.

able whether any parts are really free from the disease. In view of the fact that we have demanded that the bacteriological diagnosis be made in every case of meningitis for which we have supplied the serum, and which we have accepted for our analysis, and that in doubtful instances we have ourselves examined stained slides and sometimes cultures prepared from the spinal exudates, we can speak with positiveness upon this important subject. Whether the wide distribution of the epidemic type of meningitis in the United States is the outcome and residue of the epidemic that raged in New York and vicinity from 1905 to 1907, or whether the disease tends to exist and has long existed in a sporadic state in this country, from which the severe epidemic outbreaks have occasionally taken their origin, has not been satisfactorily determined.

The mortality of the disease reached during the height of epidemics in the United States and in Great Britain has been about the same, that is, 75 per cent. The mortality of the sporadic form of the disease so far as it has prevailed in the United States on a scale sufficiently large to allow of a conclusion upon this point, has not been considerably lower than that figure, and it has sometimes been higher. Dunn[2] gives a chart in which the mortality of the disease is shown for the cases treated in the Boston Children's Hospital from 1899 to 1907, before the antiserum was employed, and it ranges from 69 to 80 per cent. This chart also shows the striking fall in the curve which has been produced by the employment of the serum, for since the spring of 1907, when the use of the serum was first introduced, the mortality has fallen below 20 per cent. Meningitis has not been epidemic in Boston since 1897. The epidemic, properly speaking, of meningitis ceased in New York with the appearance of warm weather in the spring of 1907, and the cases of the epidemic type of the disease which have appeared since that time have arisen sporadically. We have procured from Dr. S. J. Baker, of the department of health, the case mortality statistics for this period. During 1906 when the epidemic was at its height 1032 cases with 812 deaths were reported in Greater New York; the mortality was 78.7 per cent. During 1907 when the epidemic was declining 828 cases with 642 deaths were reported; the mor-

[2] *Journal of the American Medical Association,* 1908, li, 16.

tality was 77.5 per cent. During the first six months of 1908 when the disease prevailed sporadically 253 cases with 182 deaths were reported; the mortality was 71.9 per cent. Dr. Baker informed us that the case mortality records of the department are less perfect than the gross mortality records; but as the average error of each period may be assumed to be the same, the figures may be accepted as generally correct. No striking diminution in the fatality of the disease has therefore taken place in Greater New York during 1908 as compared with the period corresponding to the height of the epidemic. The small epidemic which prevailed at Akron, Ohio, in 1907, consisted of 22 cases.[3] Among the first ten cases which occurred there were nine deaths: a mortality of 90 per cent. Then the use of the serum was begun, and it was employed in the next 12 cases, of which nine recovered: a mortality of 25 per cent. Of the three cases which were fatal one was moribund when first injected with the serum, and another suffered a fulminant attack. The epidemic at Porterville, California, began in December, 1907, and embraced 16 cases.[4] Among the first twelve cases there was one recovery: a mortality of 91.6 per cent. The serum was employed in the last four cases, of which three recovered: a mortality of 25 per cent. There was no difference observed in the manner of onset of the last four as compared with the earlier cases, although their course was milder and the termination more favorable. The epidemics in Ireland and Scotland have been of great severity, and the mortality, before our serum was employed, was above 70 per cent. During the first period of the use of the serum the mortality of cases observed outside and inside hospitals, but treated *without serum,* ranged from 80 to 90 per cent. The figures contained in Dr. Robb's report of 71 serum-treated cases give, after deducting the fulminant and moribund cases, 20 per cent., or including them, 26.7 per cent, mortality; Dr. Ker's figures, based on 27 cases, are higher, from 40 to 44.5 per cent., under the same conditions of calculation as the former.

The analysis which is to be presented is based upon histories of cases of epidemic meningitis in which the diagnosis has been estab-

[3] Chase and Hunt, *op. cit.*

[4] Miller and Barber, *op. cit.*

lished by bacteriological examinations as well as by the usual clinical tests. The histories have been supplied by physicians in hospital and in private practice, who have employed the serum. We are under many obligations to these physicians, who so generously gave their time to the study of the effects of the serum. It will not be possible for us to mention by name all who participated in the study. But our special thanks are due Dr. A. Gardner Robb, of Belfast, Ireland; Dr. C. B. Ker, of Edinburgh, Scotland; Dr. L. W. Ladd, of Lakeside Hospital, Cleveland; Drs. W. T. Longcope and Morris J. Lewis, of the Pennsylvania Hospital, and Dr. Franklin Royer, of the Municipal Hospital, Philadelphia; Drs. Charles H. Dunn, John Lovett Morse, J. L. Ames and Frederic Shattuck, Boston; Dr. Frank Fulton, of the Rhode Island Hospital, Providence; Drs. L. F. Barker, Frank J. Sladen and Harvey Cushing, of the Johns Hopkins Hospital, Baltimore; Drs. James D. Morgan and W. W. Wilkinson, of the Garfield Hospital, and Dr. S. S. Adams, Washington; Drs. Henry Koplik, Henry Heiman, Morris Manges and Alfred Meyer, of the Mt. Sinai Hospital, Dr. L. Emmett Holt, of the Babies' Hospital, Dr. C. H. Lewis, of St. Vincent's Hospital, Dr. G. M. Swift, of St. Mary's Hospital, Dr. George L. Peabody, of the New York Hospital, Drs. Walter James, John A. Thacher and W. T. Northrup, of the Presbyterian Hospital, New York; Dr. Charles W. Duval, of the Montreal General Hospital, Montreal; Drs. Frank S. Churchill and Maximilian Herzog, of Chicago; Dr. Alfred I. Cole, of the City Hospital, Cincinnati; Dr. Philip King Brown, of San Francisco, and Drs. Austin Miller and S. A. Barber, of Porterville; and the other physicians whose names are given in the table, attached to the isolated cases treated by them, and to the hospital internes who contributed such valuable service to the carrying out of the serum injections and the making of bacteriological and hæmatological examinations.

In making up the tabulations upon which the results are based, account has been taken of the ages and sex of the patients, the type of the disease, the period of the disease at which the serum was first injected, the days of the disease on which subsequent injections were made, the total amount of serum employed, the effects produced on the temperature and the subjective and objective symptoms of the

disease, upon the duration of the symptoms, the number of the diplococcus in the spinal exudate, and its viability in cultures, the general leucocytosis, and the manner of recovery—that is, whether by gradual improvement of the symptoms, or lysis, or by their abrupt termination, or crisis—and some other details of the disease.

We wish to state that Table I (see page 711 *et seq.*) contains a record of all the histories of cases of epidemic meningitis treated with the serum which were received by us up to the time of the completion of this report, and that in making up the various statistical tabulations no selection of cases has been made further than to exclude first, those cases which survived the first dose of the serum less than twenty-four hours. It may, we think, be accepted as probable that any marked benefit which the serum may be assumed to exert, could hardly be effectively manifested before the first twenty-four hour period following its administration had elapsed. It has chanced that of the histories here analyzed the eliminations include chiefly cases which were moribund at the time of their admission to hospital and the first serum injections, and in which the survival was often only a few hours. A second elimination, embracing a smaller number of cases, includes the rapidly fatal fulminant cases. As a rule it is possible to separate by means of the patients' histories and the clinical appearances, the fulminant cases which terminate fatally, from the moribund ones which have only a few hours to live. Indeed the propriety of eliminating the fulminant cases from the statistical calculations may possibly be a questionable procedure, since, rarely, a case with fulminant onset has recovered under the employment of the serum. However, in adhering to our rule not to take into account in calculating the percentage any case which survived a first serum injection less than twenty-four hours, the fulminant cases are practically eliminated. A third small elimination includes several cases of secondary and mixed infection of the meninges, of intercurrent infection (erysipelas, peritonitis) which were the immediate causes of death, and hopelessly chronic examples of the disease in children who were moribund after two to three months illness, but who survived a first serum injection longer than twenty-four hours. There were 21 cases eliminated as moribund, 12

cases as fulminant, and 10 as secondary and intercurrent fatal infections, or chronically moribund.

RESULTS ACCORDING TO THE AGES OF THE PATIENTS.

In Table I all the cases subjected to analysis are briefly described; they number 421. Of these, 43 cases were eliminated for the reasons already stated. Hence the total number of cases which will be subjected to analysis is 393, of which 295 or 75 per cent. recovered, and 98, or 25 per cent. died. Tabulated according to the ages of the patients the following results are obtained:

TABLE II.

	Total Number of Cases.	Recovered.	Died.	Mortality Percentage.
Under 1 year.	22	11	11	50
Between 1 and 2 years.	19	11	8	42.1
" 2 " 5 "	68	52	16	23.5
" 5 " 10 "	79	70	9	11.4
" 10 " 20 "	105	80	25	23.8
Over 20 years.	87	64	23	26.4
Age not given.	13	7	6	46.1

It will be desirable to consider these figures somewhat in detail. Perhaps the most striking figures are those relating to children under one year of age. Epidemic meningitis is commonly regarded as being uniformly fatal among infants under one year. Holt[5] states that " of twenty cases under one year (in his hospital wards) not one recovered "; and Koplik[6] states that of 27 cases below one year of age observed by him 23 either died, or were discharged unimproved. We have, therefore, made a special table of the cases of infants under one year of age, so that they may be more closely scrutinized.

The results shown in Table III are, indeed, not only instructive but of hopeful augury. Of the eleven cases which terminated in death, ten were already in the third week of the disease, or in a later stage, even, six or more presented well-marked symptoms of hydrocephalus, and one case only was in the first week of illness, when the serum injections were begun. Of the eleven

[5] Holt, Diseases of Infancy and Childhood, 1906, p. 763.

[6] Osler's Modern Medicine, 1907, ii, p. 575.

cases which recovered, one infant was four weeks old when first injected, all but three were in the first week of the disease, and none showed symptoms of hydrocephalus when the injec-

TABLE III.

Number.	Age in Months.	Sex.	Day of First Injection of Serum.	Total Quantity in c.c. of Serum Injected.	Result.	Reported by	Remarks.
1	2	?	120	60	Death 137th day.	Cushing.	Chronic hydrocephalus intraventricular injection.
2	5	M.	22	72	Death 29th day.	Mt. Sinai, N. Y.	Semi-chronic.
3	10	F.	15	35	Recovered.	" "	Rapid recovery.
4	3½	M.	20 (?)	102	Death in 5th week.	" "	History imperfect; possibly later injection.
5[7]	5	M.	49	30	Death.	Garfield, Hosp.	Hydrocephalus and mixed infection on admission.
6[7]	11	M.	21	135	"	New York Hosp.	Hydrocephalus; erysipelas.
7	11	F.	49 (?)	47	Death 117th day.	Babies' Hosp.	Chronic case.
8	6	M.	23	60	Recovered.	" "	Prompt recovery.
9	6	M.	(?) late	29	Death.	Lakeside Hosp.	Hydrocephalus on admission.
10	7	M.	6	60	Recovered.	" "	Slow recovery.
11	3	M.	14 (?)	90 (?)	Death.	" "	Complicated by general œdema on admission.
12	11	M.	2	30	Recovered.	Cincinnati Hosp.	Prompt recovery.
13	1	F.	2	16	"	" "	" "
14	3½	F.	7	75	"	Dunn, Boston.	" "
15	11	F.	21	60	"	" "	" "
16	5	M.	4	45	"	" "	" "
17	8	M.	23	45	Death.	Robb, Belfast.	Semi-chronic.
18	3	M.	5	150	Recovered.	" "	Slow recovery.
19	9	F.	3	90	"	" "	Prompt recovery.
20	4	F.	42	184	Death.	Morse, Boston.	Hydrocephalus. No fluid by lumbar puncture.
21	6	M.	60	60	"	Newark Hosp.	Chronic case.
22	7	M.	7	30	Recovered.	Adams, Washington.	Prompt recovery.
23[7]	5	M.	7	108	Death.	Bellevue, N. Y.	Secondary streptococcus infection.
24	4	F.	21	134	"	Jennings, N. Y.	Hydrocephalus.
25	10	M.	5	75	"	Ker, Edinburgh.	Severe case.

tions were begun. Hence the outlook for favorable effects from the serum injections in infants under one year of age may be considered hopeful, provided the injections are begun at an early period of the infection and before anatomical changes leading to

[7] Cases eliminated from the tabulation.

hydrocephalus, and the consequent locking up of infected exudate in the cerebral ventricles, are established.[8]

The mortality among somewhat older children—those ranging from one to two years of age—has been in the past as high or almost as high as among the younger infants. Of the nineteen children in our series between the ages of one and two years, eleven recovered and eight died. An analysis of these shows that only one case injected in the first week of illness died, while six cases injected in the first week, and five cases injected from the second to the fourth week, recovered. It is probable therefore that the same conditions determine for this series as for the preceding series what the outcome shall be, and the chief obstacle to successful treatment by the serum injections is to be found in the greater tendency exhibited by young children affected with epidemic meningitis to develop early basilar lesions leading to chronic hydrocephalus.

The rise in recoveries and fall in deaths in the next several series of cases, until the twentieth year is reached, call for no special comment, but show conclusively that the mortality from epidemic meningitis can be greatly reduced by the proper injection of an antiserum. We are, indeed, encouraged by the figures presented even beyond what they actually exhibit, since we believe that the cases have not been treated uniformly as well as they might have been. As will be shown presently when we come to speak of the influence of the period of injection upon the mode of termination of the disease, one of the important factors determining good results is early injection, and yet in many cases where the outcome was a good one, the injections were made late in its course. Aside from this fact, however, are the additional facts of the skill with which the serum is injected, and its proper dosage and spacing, regarding which there have been unavoidable discrepancies. In two instances at least a fatal termination was insured and recovery de-

[8] Possibly even this condition of retained infected exudate in the cerebral ventricles may not be hopeless now that Cushing and Sladen have shown the feasibility of direct drainage of the ventricles and serum injection. See *Jour. of Exp. Med.*, 1908, x, 548. Since the completion of this report we have received from Dr. Robb the histories of three cases in children under one year of age and one case in a child fifteen months old, in all which the serum was injected in the first week of illness and recovery took place.

feated, apparently, through the induction from without of secondary pyogenic infection of the meninges. In one case a convalescent succumbed to a *Staphylococcus aureus* infection arising from an infected needle track, and in another a patient who had shown rapid improvement succumbed to a streptococcus infection also of external origin.

The possibility of this danger of secondary infection of the meninges from without should always be kept in mind by those entrusted with the injection of the serum, and no pains should be spared in disinfecting the field of operation and all objects coming into contact with the serum. Every precaution should be taken from the beginning, since prediction seems, at present, impossible, whether one or many injections of the serum may be required. Cases of marked severity have improved so rapidly after one injection as not to demand another, and cases apparently mild have called for successive injections before responding to the treatment. The general statement may be hazarded that the milder the case and the earlier the injection of serum is made, the more certain and more rapid the improvement; but to this statement there have already occurred not a few exceptions in which severe and semichronic cases have responded more quickly and surely than earlier mild ones. The individual factors of patients and of micro-organisms play a part here as in all other infective diseases with which we are familiar.

In our first publication we pointed out the dangers and difficulties that are connected with the intradural mode of administration of the serum which we then regarded as essential; and, as may now be added, the wider our experience with the serum has become, the more have we been convinced that the successful substitution of subcutaneous or intravenous for intraspinal injection cannot be accomplished.

We wish to draw especial attention to the number of deaths among the cases embraced in the series over twenty years of age, since we believe that the somewhat higher mortality among them can be explained, probably, by the fact that a larger number than in other series was treated by widely scattered physicians who had had little or no previous experience with the serum. If this is not

the reason, and adults of twenty years and over are less subject to the beneficial action of the serum than younger persons, the fact will of course come out finally; but with one exception (Cincinnati City Hospital series) wherever a considerable number of cases of these ages has been treated by one person the proportion of recoveries to deaths has been high. In justice to Dr. Cole, of Cincinnati, whose general results obtained with the serum have been excellent, it should be stated that many of the failures occurred in the early period of his employment of the serum and among negro patients, the circumstances surrounding which made the most favorable administration of the serum difficult. In all Dr. Cole treated with the serum eleven cases over twenty years of age. Of these two were moribund and died soon after the first injection. The other six fatal cases were injected between the third and twentieth days of illness. The three cases which recovered were injected in the first week of illness. These figures are to be contrasted with those obtained at the Johns Hopkins Hospital, where of seven patients over twenty years of age five recovered and two died, and especially with those given by Dr. Robb, of Belfast, who treated twenty-one cases of these ages, eighteen recovering; and of the three fatal cases two died within twenty-four hours of the first injection of serum. Dr. Robb's cases are especially significant, since they were treated during the prevalence of an epidemic of meningitis.

RESULTS ACCORDING TO THE PERIOD OF INJECTION.

We have also analyzed the histories according to the earliest periods of the disease at which the injection of the serum was begun. Not all the histories are perfectly definite on this point and hence we have used in the analysis only those that are definite. In not a few cases the onset of the disease was insidious and the prodromata appear to have been indefinite, and more or less overlooked. At other times, and this seems to have been the more frequent experience, the onset was abrupt, so that no special doubt surrounded the beginning of the disease. Under the circumstances, therefore, the danger is that the period elapsing between the onset of the symptoms of the disease, their recognition, and the first

serum injection, will be calculated too short rather than too long. It is very rare, except in the fulminant cases, that one can assure himself that he is dealing with the disease on the first day of its existence.

The histories of 361 cases were sufficiently explicit to enable us to approximate the period in which the first serum injection was made. We have arbitrarily chosen the three periods which follow, in which to group the cases:

Period of Injection of Serum.	Number of Cases.	Number Recovered.	Number Died.	Per Cent. Mortality.
1st to 3d day.	123	107	16	16.5
4th "7th "	126	96	30	23.8
Later than 7th day.	112	73	39	35

In spite of the uncertainties surrounding the period of onset of the symptoms, which affect the accuracy of the calculation of the period, the beneficial influence of early injection is rendered sufficiently obvious by the table. The period embraced in the last group is, of course, highly irregular, since not a few cases came under treatment when they were in a semi-chronic or chronic state after many weeks of illness. On the whole, therefore, the outlook even for the latter class of patients is not wholly discouraging; and, indeed, we are of the opinion that so long as the diplococcus is still present in the meningeal exudate, and the mechanical damage to the anatomic structure is not irreparable, the employment of the serum holds out hope of considerable benefit. In one respect cases coming under any treatment at the end of a week or even a longer interval since the appearance of the symptoms of meningitis, present the advantages which accrue from the spontaneous elimination by death of the severer and rapidly-fatal examples of the disease, and the circumstance that some of them will already be progressing towards recovery. The offset to these advantages is to be found in the larger number of cases of the common and severer types, which, in the past, having survived the early acute stage of the disease, developed semi-chronic and chronic lesions to which they succumb. Hence in any considerable number of cases of the class under consideration the fatalities have up to the present tended

greatly to exceed the recoveries. We should, therefore, expect less benefit to be manifested by the serum injections which are carried out during the later, as compared with the earlier periods of the infection. In the next table (IV) the results of the periods of injection in the different age groups are shown.

TABLE IV.

Age.	1st to 3d Day.				4th to 7th Day.				Later Than 7th Day.			
	No. Cases.	Rec.	Died.	Per Cent of Deaths.	No Cases.	Rec.	Died.	Per Cent of Deaths.	No. Cases.	Rec.	Died.	Per Cent of Deaths.
Under 1 yr.	3	3		0	6	5	1	16.7	12	4	8	66.7
1 to 2 yrs.	3	3		0	4	3	1	25	12	6	6	50
2 to 5 yrs.	17	15	2	11.7	34	24	10	29.5	17	13	4	23.5
5 to 10 yrs.	38	35	3	8.6	25	21	4	16	12	10	2	17
10 to 20 yrs.	42	37	5	12	32	26	6	23	27	17	10	37
Over 20 yrs.	20	14	6	30	25	17	8	32	32	23	9	28.1
Total	123	107	16	16.5	126	96	30	23.8	112	73	39	35

MANNER OF TERMINATION OF THE SYMPTOMS.

We described in our first publication[9] on the antimeningitis serum the different manner in which the symptoms terminated in a number of the serum-treated cases, and we drew attention to the not uncommon abrupt manner of termination to which we applied the term crisis. We have examined the larger collection of histories now in our possession from the point of view of the manner of the recovery; that is, whether by gradual subsidence of the symptoms, or lysis, or by the abrupt cessation, or crisis. In considering the figures which we will present as bearing on this point, account should be taken of the fact that in rare instances only have the histories contained the specific statement that the symptoms terminated in one or the other of these ways. In almost all instances we have had ourselves to make the decision, which we have done by studying carefully the facts given in the histories. Hence we do not believe that our decisions have been uniformly correct, and the figures are presented, therefore, merely as an approximation of what may be found later to be the true figures. There can be little doubt that these figures will have to be modified later, in accord-

[9] *Op. cit.*, p. 197.

ance with the wider observation and more exact and uniform judgment which will come to be exercised. We believe, however, that by the employment of the serum a new and very desirable mode of recovery, to secure which in the future every effort should be made, has been effected.

In order that recovery by crisis should be intentionally promoted it will be necessary, as a preliminary step, to study closely the conditions under which it has come about spontaneously in the serum-treated cases, so that they may be designedly imitated. We do not ourselves feel able to undertake this study, which should, we think, be made by the clinicians themselves, but we think it desirable, imperfect as the present figures may be, to classify them in a way that may serve to bring out their suggestive values. We have, therefore, brought them together in the form of a table (V), and arranged them according to the ages of the patients and the three periods of the first injection of the serum.

TABLE V.

	First to Third Day.	Fourth to Seventh Day.	Later than Seventh Day.	Total.
Under 1 yr.				
By lysis.	3	5	1	9
By crisis.	0	0	1	1
1 to 2 yrs.				
By lysis.	3	3	4	10
By crisis.	0	0	1	1
2 to 5 yrs.				
By lysis.	10	19	10	39
By crisis.	5	5	3	13
5 to 10 yrs.				
By lysis.	24	15	7	46
By crisis.	11	6	3	20
10 to 20 yrs.				
By lysis.	24	19	13	56
By crisis.	13	7	4	24
Over 20 yrs.				
By lysis.	10	11	19	40
By crisis.	4	6	4	14

The above table (V) shows that of 273 cases of epidemic meningitis treated with the serum which recovered, the termination of the symptoms in approximately 200 was a gradual one and in 73 more or less sudden in nature. And, hence, allowing for unavoid-

able errors of judgment in interpreting the histories, we think that it is probable that this abrupt or critical cessation of the symptoms may take place in about 25 per cent. of the patients who recover under the influence of the serum treatment. Subjecting the figures in the table to a still closer scrutiny, it is found that the number of instances of lysis and crisis occurring in cases treated within the first three days of illness is in the proportion of 74 to 33, on the fourth to seventh day, of 72 to 24, and later than the seventh day, of 54 to 16. In other words the ratio according to these periods is 2.3, 3 and 3.4 to one respectively. It will not be profitable to carry this analysis further, since the table exhibits clearly other relationships and the whole number of cases is not large enough to warrant the making of any far-reaching deductions.

FREQUENCY OF RELAPSES.

It was evident to us, from the study of the first series of cases treated with the serum, that a certain number of cases, apparently recovering, would suffer recrudescences of the disease. At that time no further statement could be ventured than that the resumption of the serum injections promised to control this condition of relapse as they had the original attack.[10] The present larger number of histories has afforded some additional data bearing on the subject of the relapses, but they are, as affecting this subject, of very unequal value. We have been able to collect from the histories 19 examples of undoubted relapse, of which 14 terminated in recovery and 5 in death. We are, therefore, encouraged to believe that the early recognition of the relapses, and a prompt and vigorous resumption of the injections, will often arrest their progress and bring about a favorable termination of the disease.

DURATION OF ACTIVE SYMPTOMS.

Closely connected with the question of the manner of termination of the symptoms is the question of the duration of the active symptoms of the disease in serum-treated as compared with non-serum-treated cases. In view of the relatively large number of the former cases in which the symptoms cease abruptly, the fact is open to

[10] *Op. cit.*, p. 199.

prediction that the average duration in days, of the active symptoms of any considerable number of the cases, will be smaller than of a similar number of cases which had not the benefit of the serum. We have analyzed 228 histories, in which the data covering this point are pretty complete, with reference to the duration of the fever and the usual subjective and special objective symptoms among patients who recovered, and found the period to be about eleven days.

This period, it should be stated, embraces not the entire time during which the patients were under observation in hospitals and private practice before their discharge, but it covers the interval during which they presented *active* symptoms of illness. Hence it has happened that the interval has not infrequently been estimated as only a few days in length, although the recovery of lost strength and the ability to resume the ordinary vocations took a much greater number of days.

INFLUENCE ON DIPLOCOCCI.

In our first publication on the serum treatment of epidemic meningitis we drew attention to a fact, which impressed us as remarkable and significant, namely, that very soon after the serum injections were begun the diplococci tended to be greatly reduced in numbers, to disappear from the fluid part of the exudate, to become wholly intracellular (unless they were already entirely absent), to present certain changes in appearance, as swelling and fragmentation, and to stain diffusely and indistinctly, and coincidentally to lose viability in cultures. The later and far wider experience has tended to confirm the views we first expressed, based on the effects observed; and while exceptions occur in which the diplococci disappear or become engulfed and change in morphology or lose viability more slowly, yet the general fact of the profound and rapid injury exerted upon the diplococci by the serum seems securely established. There seems little doubt that part of the beneficial effect of the serum injections must arise from the restriction of multiplication and from the greater phagocytosis of the diplococci.

We have indicated in our main table (I), under the heading "Influence on Diplococci," what the fate of the diplococci in the

spinal exudate was in cases in which the serum was injected, and in which adequate observations were made on the number, appearance, location, and viability of the diplococci. By the phrase "rapid" or "prompt disappearance and loss of viability" of the diplococci, we mean that after the first, second or third serum injection they were greatly reduced in numbers and lost power to grow on favorable culture media, and by the term "slow loss of viability" or "gradual" or "slow disappearance," we mean that the diplococci showed themselves more resistant to the serum. Perhaps the strongest impression of the rapidly injurious action of the serum upon the diplococci will be brought out by a simple statement of the number of instances in which, recovery having taken place, the diplococci were affected in this "rapid," or "prompt," and in this "slow" manner. The records in the histories of 110 cases are sufficiently complete to admit of a decision upon the fate of the diplicocci; and we have therefore ascertained that in 100 cases the diplococci disappeared and lost viability quickly, and in 10 cases slowly.

Perhaps a word should be added on the question of the value as evidence of the observed loss of power of the diplococci to grow in the cultures, on their capacity to multiply in a restricted manner in the meningeal exudate. We believe that there is no absolute agreement between the facts regarding cultivation outside the nervous system and capacity for growth in the meninges. Instances have been observed (Presbyt. Hosp. Case 2, etc.) in which relapse of symptoms was ushered in, or attended by, increase in the number and resumption of normal appearance of the diplococci, which yet did not grow in cultures, although the medium was otherwise favorable to the diplococcus. It is of course in no degree surprising, but quite what should, in view of the anatomical conditions present, be expected, that after complete disappearance of the diplococci from the spinal exudate they should sometimes reappear. The resolution of the fibrino-purulent exudate must often proceed slowly, and until it is complete the diplococci must often find favorable niches in which to survive and even to multiply. From such active foci the reinfections, with which the relapses are associated, probably take place. In the fatal cases the diplococci are often more resistant, and fail wholly to be influenced by the serum injections, or are

little influenced by them. The viability under these circumstances is likely also to be retained.

The opportunities for such cryptic survival of the diplococci probably explain the exceptional instances in which the symptoms and the character of the spinal exudate leave no doubt of the existence of acute (epidemic?) meningitis, but in which there is failure to demonstrate the diplococci at the first lumbar puncture, or even at all in cases which recover rapidly.

INFLUENCE ON SPINAL EXUDATE AND LEUCOCYTOSIS.

Attention was previously directed by us to the rapidity with which the exudate in the meninges loses turbidity under the influence of the serum injections.[11] This fact has been noted again and again in the subsequent cases treated with the serum. Indeed, it would now appear as if the fear we expressed that the cases with strictly purulent exudates might be less amenable to the action of the serum was premature. A fair number of cases (see Table I) in which the notes state the spinal exudate to have been purulent, have recovered, and the rapid clearing of the exudate was observed even in them. Whether there is complete anatomical restitution of the meninges in these cases can only be determined by post-mortem examinations; but that complete functional restoration can take place may be regarded as established.

Closely connected with the rapidity with which the cerebro-spinal exudate loses pus cells and returns to a limpid condition is the state of the general leucocytes of the blood. If the inflammatory emigration is arrested by the serum injections, then the number of circulating leucocytes should tend rapidly to return to the normal. The facts at hand, based upon many counts of the circulating leucocytes, only a few representative ones of which can be reproduced here, made before the injections of the serum were begun, and afterwards at regular intervals, show, as was to be expected, in favorable cases going on to recovery, a fall, often very rapid and even critical, in the number of leucocytes in the general blood stream with which the disappearance of the diplococci and the clearing of the spinal exudate are correlated.

[11] *Op. cit.*, p. 200.

Case.	Age.	Before Injection.	After First Injection.	After Second Injection.	After Third Injection.	Result.
Johns Hopkins Hospital No. 1.	6 yr.	21,000 (Dec. 24). 37,600 (Dec. 28).	Serum, Dec. 30. 15,600 (Dec. 31).	Serum, Dec. 31. 20,400 (Jan. 2).	Serum, Jan. 2. 8,000 (Jan. 23).	Recovered.
Idem No. 14.	11 yr.	40,600 (Apr. 2).	Serum, Apr. 2. 31,200 (Apr. 3).	Serum, Apr. 3. 13,400 (Apr. 5).		Recovered by crisis.
Idem No. 19.	15 yr.	44,000 (May 20).	Serum, May 20. 26,400 (May 21).	Serum, May 21. 6,400 (May 24).		Recovered by crisis.
Mt. Sinai No. 11.	14 yr.	32,600 (Mar. 10).	Serum, Mar. 11. 28,000 (Mar. 12). 25,000 (Mar. 13).	Serum, Mar. 13. 16,000 (Mar. 14). 15,000 (Mar. 16).		Recovered.
St. Mary's Hospital No. 2.	12 yr.	47,500 (Mar. 21).	Serum, Mar. 21. No count.	Serum, Mar. 22. 12,500 (Mar. 23).		Recovered by crisis.
Pennsylvania Hospital No. 9.	23 yr.	23,350 (May 14). 20,650 (May 16).	Serum, May 16. 10,550 (May 17). 12,050 (May 19). 10,600 (May 20). 12,500 (May 21).	Serum, May 21. 24,950 (May 22).	Serum, May 22. 12,450 (May 23). 10,900 (May 24). 9,600 (May 25). 13,400 (May 26). 10,750 (May 27). 10,850 (June 9).	Recovered

It has been stated already that during the relapses, and possibly as ushering them in, the spinal exudate becomes more turbid, with which condition there is correlated an increase in the systemic leucocytosis, as is shown by the following example (p. 708).

The reverse of the phenomena here mentioned is encountered in those cases not responding to the serum, or responding imperfectly, in which death is the result. Although the data bearing on this topic at our command are less numerous and perfect than the other, yet the general statement can be made that the diplococci, the spinal exudate, and the circulating leucocytes are less influenced in the

Case.	Age.	Before Injection.	After First Injection.	After Second Injection.	After Third Injection.	After Later Injections.	Result.
Presbyterian Hospital, N. Y. No. 2.	4 yrs.	No count.	Serum Jan. 25. 39,700 (Jan. 26) 34,800 (Jan. 27)	Serum Jan. 27. 22,500 (Jan. 29)	Serum Jan. 29. 16,400 Jan. 30.	Serum Jan. 30. 22,500 (Feb. 1) Serum Feb. 2. 17,300 (Feb. 3) 25,200[12] (Feb. 4) Serum Feb. 4. 28,200[12] (Feb. 6) Serum Feb. 6. 24,200 (Feb. 7) Serum Feb. 7. 19,100 (Feb. 8) Serum Feb. 8. 14,000 (Feb. 9) Serum Feb. 10. 13,500 (Feb. 11) 9,900 (Feb. 15)	Relapse with recovery.

resistant cases, and that progressive increase in turbidity of the exudate, and rise in leucocytosis, and greater persistance of the diplococci, with retention of viability, are unfavorable indications. The relation of a persistently high or increasing systemic leucocytosis, and an unfavorable termination of the disease is shown by the next examples (p. 709).

FREQUENCY OF PERMANENT SEQUELÆ.

The indications which were given by the first series of serum-treated cases were to the effect that the recoveries, as the rule to which the exceptions would not be numerous, would be complete. The facts brought out by the far larger series of cases on which this article is based confirm the earlier view which we expressed. The

[12] Appearance of relapse.

Case.	Age.	Before Injection.	After 1st Injection.	After 2d Injection.	After 3d Injection.	After Later Injections.	Result.
New York Hospital, No. 1.	18 mo.	30,000 (Dec. 2).	Serum, Dec. 2. 20,400 (Dec. 3).	Serum, Dec. 3. 22,000 (Dec. 4).	Serum, Dec. 4. 21,800 (Dec. 6).		Died.
Cincinnati Hospital, No. 26.	17 yr.	25,000 (Mar. 31).	Serum, Mar. 31. 21,000 (Apr. 1). 16,200 (Apr. 2).	Serum, Apr. 2. 16,460 (Apr. 4).	Serum, Apr. 4. 10,730 (Apr. 6). 26,000 (Apr. 7).	Serum, Apr. 7. 28,666 (Apr. 8). 26,200 (Apr. 9). 25,400 (Apr. 10). 31,460 (Apr. 11).	Died.
Adams, Washington, No. 1.	5 yr.	No count.	Serum, Feb. 11.	28,200 (Feb. 13). Serum, Feb. 13.	Serum, Feb. 14. 26,400 (Feb. 15).	29,800 (Feb. 16). Serum, Feb. 16. 42,400 (Feb. 18). 59,200 (Feb. 20). Serum, Feb. 20. Serum, Feb. 22. Serum, Feb. 24. 57,400 (Feb. 26).	Died.

complications of a serious character, arising during and as a result of the meningeal inflammation, which remained permanently after the infection and inflammation subsided, have been few. There are noted in the histories deafness seven times, blindness and deafness once (in an infant in whom they were already present on the twenty-second day, when first injected), mental impairment once, and choroiditis once. The condition of deafness was, almost invariably, noted early in the disease, and several times before the serum injections were begun.

CONCLUSION.

It is our belief that the analyses of histories of cases of epidemic meningitis which have been presented in this article furnish convincing proof that the antimeningitis serum when used by the sub-

dural method of injection, in suitable doses and at proper intervals, is capable of reducing the period of illness; of preventing, in large measure, the chronic lesions and types of the infection; of bringing about complete restoration to health, in all but a very small number of the recovered, thus lessening the serious, deforming, and permanent consequences of meningitis; and of greatly diminishing the fatalities due to the disease.

TABLE I.

R. L. = recovery by lysis.
R. C. = recovery by crisis.
R. R. = recovery by relapse.
D. = died.
D. F. = died in fulminant attack.
D. M. = moribund at time of injection.
D. R. = died in relapse.
D* = eliminated from tabulation for special reason.

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Johns Hopkins Hospital, Baltimore	1	H. N.	M.	6 yr.	47, 48, 50	65	Gradual reduction	Prompt improvement	Rapid disappearance. No growth after first injection.	10 d.	Ordinarily severe, and protracted. Symptoms subsided quickly after serum injection.	R. L.
Idem	2	I. H.	M.	15 yr.	4, 6, 7, 13, 17	134	Gradual reduction	Gradual improvement	Prompt disappearance and loss of viability.	17 d.	Severe. Fluctuating improvement.	R. L.
Idem	3	G. F.	M.	29 mo.	13, 14	45	Prompt reduction	Prompt improvement	None.	.....	Ordinarily severe. Respiratory failure 12 hours after serum injection. Artificial respiration. Death 36 hours later.	D.
Idem	4	A. R.	M.	13 mo.	21, 22, 23, 31	105	Gradual reduction	Gradual improvement	Rapid reduction in number and loss of viability	10 d.	Insidious onset. Protracted course: rapid improvement after injection of serum.	R. L.
Idem	5	J. G. P.	M.	23 yr.	5, 6	30	Gradual reduction	Prompt improvement	Diplococci difficult to demonstrate.	12 d.	Insidious onset. Ordinarily severe.	R. L.
Idem	6	C. S.	M.	5 yr.	5, 6, 7	60	Gradual reduction	Rapid improvement	Rapid disappearance and loss of viability	6 d.	Ordinarily severe.	R. L.
Idem	7	G. H.	M.	26 yr.	2, 3 (two) 4 (two)	120	None	None	Reduction in number and loss of viability	.....	Very severe. Onset with convulsions. Died in convulsion 4th day.	D.
Idem	8	I. S. H.	M.	5 yr.	3, 4, 5, 7, 8, 10	138	Fall by crisis after 6th injection	Critical improvement after 6th injection	Great reduction after 3d injection.	7 d.	Ordinarily severe.	R. C.
Idem	9	M. G.	M.	7 yr.	5	30	Rapid reduction	Rapid improvement	Second puncture not made.	2 d.	Sudden and severe onset.	R. C.

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Johns Hopkins Hospital,	10	J. D.	M.	7 yr.	14, 16	45	Rapid reduction	Rapid improvement	Rapid loss of viability	2 d.	Ordinarily severe.	R. C.
Idem	11	H. L. B.	M.	7 yr.	2, 3	60	Rapid reduction	Rapid improvement	Rapid loss of viability	4 d.	Severe onset.	R. C.
Idem	12	N. S.	F.	25 yr.	4, 5 (two)	90	None	None	Rapid loss of viability	.....	Insidious onset. Very severe. Death 5 days after severe symptoms appeared.	D.
Idem	13	B. N.	F.	9 yr.	4, 5, 6, 7	105	Gradual reduction	Gradual improvement	Rapid loss of viability	10 d.	Severe. Complicated with iridocyclitis.	R. L.
Idem	14	F. N.	M.	11 yr.	2, 3	60	Prompt reduction	Rapid improvement	Rapid loss of viability	5 d.	Ordinarily severe.	R. C.
Idem	15	P. J.	M.	27 yr.	7, 8, 9, 19	105	Gradual reduction	Gradual improvement	Rapid disappearance	14 d.	Insidious onset. Ordinarily severe.	R. L.
Idem	16	L. A.	F.	25 mo.	6, 7	40	Rapid reduction	Rapid improvement	Difficult to demonstrate	4 d.	Ordinarily severe.	R. L.
Idem	17	P. H.	M.	30 yr.	3 (two)	45	Rapid reduction	Rapid improvement	Rapid disappearance	3 d.	Ordinarily severe.	R. C.
Idem	18	T. W. B.	M.	6 yr.	2, 3	45	Prompt reduction	Prompt improvement	Rapid disappearance	5 d.	Severe onset.	R. L.
Idem	19	G. G.	M.	15 yr.	2, 3	45	Prompt reduction	Prompt improvement	Difficult to demonstrate	6 d.	Severe onset.	R. C.
Idem	20	?	F.	36 yr.	60 (?), 62, 64	45	Prompt reduction	Prompt improvement	Rapid disappearance	6 d.	Severe. Chronic state	R. L.
Idem	21	?	?	2 mo.	120 (?), 126, 129, 132	60	.....	Temporary improvement	Reduction after 3d injection	.....	Chronic case. Hydrocephalus. Diplococci absent from spinal fluid. Intraventricular injection of serum. Death on 137th day. (Reported by Cushing and Sladen.)	D.
Idem	22	H. D.	M.	28 yr.	6, 7	40	Rapid reduction	Rapid improvement	.....	4 d.	Ordinarily severe.	R. C.
Municipal Hospital, Philadelphia	1	B. F.	M.	3 yr.	7, 8, 12, 14, 31, 33, 35, 37	180	None	Temporary improvement	Rapid disappearance	.....	Ordinarily severe. Death on 53d day.	D.
Idem	2	C. F.	F.	18 yr.	4, 5	60	None	None	None	.....	Severe. Death on 6th day	D.

Idem	3	S. D.	F.	7 yr.	5, 6, 7, 8, 10	140	Rapid reduction	Gradual improvement	Rapid loss of viability	6 d.	Ordinarily severe.	R. L.
Idem	4	S. S.	M.	3 yr.	4 (two), 6, 8, 18, 20, 22, 24	200	None	None	None	.....	Severe. Death on 25th day	D.
Idem	5	P. D.	M.	10 yr.	2, 4, 6	90	Gradual reduction	Gradual improvement	Rapid loss of viability	2 w.	Ordinarily severe. Deafness.	R. L.
Idem	6	A. M.	F.	8 yr.	6	30	Rapid reduction	Rapid improvement	.....	2 d.	Ordinarily severe.	R. C.
Idem	7	H. B.	F.	4 yr.	9, 11, 13	90	Prompt reduction	Rapid improvement	Rapid loss of viability	7 d.	Ordinarily severe.	R. L.
Idem	8	J. C.	M.	22 yr.	13 (?), 14, 15, 16	95	Gradual reduction	Gradual improvement	.....	10 d.	Mild. History inadequate.	R. L.
Idem	9	R. R.	M.	13 yr.	3, 4, 5, 8, 11	150	Gradual reduction	Prompt improvement	Rapid disappearance	10 d.	Ordinarily severe.	R. L.
Idem	10	H. B.	M.	10 yr.	8, 9, 11	90	None	None	None	.....	Ordinarily severe. Death on 12th day.	D.
Idem	11	G. C. B.	F.	10 yr.	5, 6, 8, 10, 18	150	Rapid reduction	Gradual improvement	Rapid disappearance	23 d.	Ordinarily severe. Deafness.	R. L.
Idem	12	J. B.	M.	13 yr.	3, 4, 5, 7	120	Rapid reduction	Rapid improvement	Rapid disappearance	5 d.	Ordinarily severe.	R. C.
Idem	13	H. S.	F.	9 yr.	3, 4, 5, 8, 31, 32, 34	210	Rapid reduction	Gradual improvement	Reduction after 1st injection	.....	Severe with relapse. First attack lasted 7 days. Relapse occurred after interval of 3 weeks and lasted 5 days.	R. R.
Idem	14	E. F.	M.	8 yr.	5, 6, 7, 8, 10	150	None	None	Rapid disappearance	.....	Ordinarily severe. On 10th day an abscess developed in puncture wound and followed needle track into spinal canal. Death from S. Aureus infection.	D.*
Idem	15	M. W.	M.	1 yr.	10, 12	30	None	None	.....	.....	Severe onset. The 1st injection only entered canal. Death in 5th week.	D.*
Idem	16	T. C.	M.	4 yr.	5, 6, 7, 8, 9, 10	165	Gradual reduction	Gradual improvement	Slow disappearance	2 w.	Ordinarily severe.	R. L.
Idem	17	A. W.	M.	44 yr.	4 (two), 5, 6	120	None	None	Prompt reduction	.....	Very severe. One injection only certainly entered canal. Died 6th day.	D.*
Idem	18	E. M.	M.	adult	4 injections on successive days	90	Gradual reduction	Gradual improvement	Rapid disappearance	6 d.	Ordinarily severe.	R. L.
Idem	19	J. V.	M.	adult	1	30	.....	.....	.....	.....	Small amount of pus obtained on puncture. Death occurred within one hour of injection.	D. M.

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Municipal Hospital, Philadelphia	20	F. D.	M.	child	3 (two)	60	.....	.....	.....	.....	Severe. Death occurred 10 hours after 2d injection.	D. M.
Idem	21	M. D.	F.	child	3, 4, 5, 6, 7, 8, 9	185	Gradual reduction	Gradual improvement	Rapid disappearance	10 d.	Severe. Sister of previous child.	R. L.
Mt. Sinai Hospital, N. Y.	1	M. L.	M.	5 mo.	22, 23, 25, 26	72	.....	None	Rapid loss of viability	.....	Severe. Death on 29th day.	D.
Idem	2	K. S.	F.	10 mo.	15	35	Rapid reduction	Rapid improvement	.....	6 d.	Severe.	R. C.
Idem	3	A. K.	M.	2 yr.	7	23	Rapid reduction	Rapid improvement	.....	7 d.	Ordinarily severe.	R. C.
Idem	4	S. M.	F.	5.5 yr.	21, 31	59	Gradual reduction	Gradual improvement	Slow disappearance	4 w.	Severe. Protracted course.	R. L.
Idem	5	L. S.	F.	24 yr.	19, 21, 23, 25, 28, 30	140	Gradual reduction	Prompt improvement	Prompt disappearance	12 d.	Severe.	R. L.
Idem	6	M. S.	M.	4 yr.	5	30	Prompt reduction	Prompt improvement	.....	10 d.	Ordinarily severe.	R. L.
Idem	7	H. B.	M.	15 mo.	23	30	Gradual reduction	Slow improvement	.....	3 w.	Severe.	R. L.
Idem	8	H. L.	M.	3.5 mo.	20, 22, 26, 29, 32, 36	102	None	None	None	.....	Ordinarily severe. Death in 5th week.	D.
Idem	9	H. I.	M.	3 yr.	6, 13, 18, 27	75	Gradual reduction	Slow improvement	Rapid loss of viability	2 w.	Ordinarily severe.	R. L.
Idem	10	M. G.	M.	15 mo.	8	30	Rapid reduction	Rapid improvement	.....	5 d.	Severe.	R. C.
Idem	11	F. F.	M.	2.5 yr.	6, 7	88	Gradual reduction	Slow improvement	Rapid loss of viability	16 d.	Severe. 1st puncture yielded thick, greenish pus; 2d thin straw-colored fluid	R. L.
Idem	12	E. W.	F.	14 yr.	5, 7	55	Prompt reduction	Prompt improvement	Rapid loss of viability	6 d.	Ordinarily severe.	R. L.
Idem	13	E. G.	F.	4.5 yr.	6, 8, 12	105	Prompt reduction	Gradual improvement	Prompt disappearance	14 d.	Severe.	R. L.
Idem	14	S. M.	M.	11 yr.	8, 14, 15	90	Gradual reduction	Gradual improvement	.....	10 d.	Ordinarily severe.	R. L.
Idem	15	E. G.	F.	10 yr.	5, 6	50	Gradual reduction	Gradual improvement	.....	7 d.	Ordinarily severe. Deafness.	R. L.
Rhode Island Hospital, Providence	1	F. V.	M.	8 yr.	7, 8, 10, 32, 33, 35, 36, 37, 48, 49, 51, 52, 54, 56, 58, 60, 61, 63, 65, 67, 72, 75	655	.....	.....	.....	3-4 mo.	Severe. Two relapses with which reapparance of diplococci was associated. Very protracted course.	R. R.
Idem	2	T. D.	M.	9 yr.	6, 7, 8, 9	120	Gradual reduction	Gradual improvement	Rapid loss of viability	7 d.	Ordinarily severe.	R. L.

Idem	3	V. B.	M.	14 yr.	3, 5, 6, 7 8, 9, 10, 11, 12, 13, 15, 17, 20	390	Slow reduction	Slow improvement	Rapid loss of viability	24 d.	Severe.	R. L.
Idem	4	M. D.	F.	10 yr.	4, 5, 6, 8, 9	150	Prompt reduction	Prompt improvement	Rapid loss of viability	8 d.	Ordinarily severe. Deafness apparent on 2d day; persisted.	R. L.
Idem	5	R. E. B.	M.	15 yr.	10, 13	60	None	None	.....	.....	Severe. Death in 5th week.	D.
Idem	6	M. C.	F.	13 yr.	3, 4, 5	90	Gradual reduction	Gradual improvement	Rapid loss of viability	14 d.	Ordinarily severe.	R. L.
Idem	7	M. H.	M.	32 yr.	6, 7, 8	90	Gradual reduction	Gradual improvement	Rapid loss of viability	12 d.	Ordinarily severe.	R. L.
Idem	8	M. A. T.	F.	32 yr.	3, 4, 5, 6, 8	150	Gradual reduction	Gradual improvement	Rapid loss of viability	14 d.	Ordinarily severe.	R. L.
Idem	9	F. V.	M.	30 yr.	4, 5, 6, 7, 8, 9, 11	210	None	None	Rapid loss of viability	.....	Onset doubtful. Patient chronic alcoholic. Death on 15th day.	D.
Idem	10	C. L.	F.	6 yr.	4, 5, 6, 7, 9, 11	170	Gradual reduction	Gradual improvement	Rapid disappearance	10 d.	Ordinarily severe.	R. L.
Idem	11	L. S.	M.	16 yr.	5, 6, 7, 8, 10	150	Gradual reduction	Gradual improvement	Rapid disappearance	11 d.	Ordinarily severe.	R. L.
Idem	12	V. D.	F.	9 yr.	4, 5, 6, 7	120	Gradual reduction	Gradual improvement	.....	14 d.	Ordinarily severe.	R. L.
Idem	13	A. M.	M.	2 yr.	3 (?)	30	.....	.....	.....	.....	Moribund on admission. Died immediately after injection.	D. M.
Idem	14	F. A. A.	F.	51 yr.	6 (?)	30	.....	.....	.....	.....	Moribund on admissions. Died 12 hours after injection.	D. M.
Idem	15	R. S.	F.	14 yr.	4, 5, 6, 7	120	Rapid reduction	Rapid improvement	.....	4 d.	Mild.	R. C.
Idem	16	M. H.	F.	2 yr.	4	25	.....	.....	.....	.....	Comatose on injection. Death within 24 hours.	D. M.
Idem	17	L. G.	M.	16 yr.	10, 12, 13	75	.....	.....	.....	.....	History inadequate. Bacteriological diagnosis doubtful.	D.
Pennsylvania Hospital, Philadelphia	1	J. J.	M.	23 yr.	4	15	Rapid reduction	Rapid improvement	.....	4 d.	Ordinarily severe.	R. C.
Idem	2	R. B.	M.	17 yr.	3, 5	25	Gradual reduction	Gradual improvement	.....	5 d.	Ordinarily severe.	R. L.
Idem	3	A. G.	F.	15 yr.	4, 6, 9	45	Rapid reduction	Rapid improvement	Rapid disappearance	7 d.	Ordinarily severe.	R. C.
Idem	4	C. B.	M.	11 yr.	11, 12	25	None	None	.....	.....	Severe. Purulent exudate. Death on 13th day.	D.

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Pennsylvania Hospital	5	P. C.	M.	18 yr.	10	15	Rapid reduction	Rapid improvement	.....	3 d.	Mild.	R. L.
Idem	6	A. L.	F.	8 yr.	6, 7	20	.....	None	.....	.....	Severe. Condition desperate at first injection. Death 48 hours later.	D.
Idem	7	W. H.	M.	19 yr.	5, 6	60	None	None	.....	.....	Ordinarily severe. Death on 8th day.	D.
Idem	8	M. E.	F.	4 yr.	4, 5	60	Rapid reduction	Gradual improvement	Rapid disappearance	9 d.	Severe.	R. L.
Idem	9	M. F.	F.	21 yr.	10, 11, 17, 18	120	Gradual reduction	Gradual improvement	Rapid disappearance	8 d.	Ordinarily severe.	R. L.
Idem	10	E. D.	M.	19 yr.	12 (?), 13	60	Rapid reduction	Rapid improvement	Rapid disappearance	4 d.	Mild.	R. C.
Garfield Hospital, Washington	1	M. S.	F.	18 yr.	10, 11, 12, 15, 17, 19, 21, 22	165	None	None	Rapid disappearance, reappearance and subsequent disappearance	48 d.	Ordinarily severe; protracted. Complicated by arthritis and choroiditis.	R. R.
Idem	2	F. L.	M.	5 mo.	49, ?	30	.....	.....	.....	.....	On admission chronic hydrocephalus and mixed diplococcus and bacillary infection.	D.* D.*
Idem	3	H. G.	M.	4 yr.	7, 13	30	Prompt reduction	Prompt improvement	Prompt disappearance	16 d.	Ordinarily severe.	R. L.
Idem	4	M. H.	F.	4 yr.	4	15	Gradual reduction	Gradual improvement	.....	11 d.	Severe. Deafness.	R. L.
Idem	5	I. O.	M.	25 yr.	8, 14	20	None	Gradual improvement	Rapid disappearance	23 d.	Ordinarily severe. Complicated by pneumonia. Mental impairment.	R. L.
Idem	6	J. J.	M.	16 yr.	34	15	Rapid reduction	Rapid improvement	.....	3 d.	Imperfect history of onset. Subacute. Abrupt termination after injection.	R. C.
Idem	7	W. B.	M.	39 yr.	4, 10, 12, 13, 20	105	None	None	None	.....	Ordinarily severe. Death on 25th day.	D.
Idem	8	E. N.	M.	3 yr.	8	15	.....	.....	Rapid disappearance	.....	Mild.	R. L.

Idem	9	T. L.	M.	17 yr.	14, 15, 17, 20, 21, 25	142.5	Gradual	Gradual	Prompt disappearance	20 d.	Ordinarily severe.	R. L.
Idem	10	W. W.	M.	23 yr.	4, 5 21, 25	45	Reduction	Prompt improvement	Rapid disappearance	.....	Severe. Complicated by pneumonia and paralysis of intestine. Death from peritonitis.	D.*
New York Hospital	1	S. D.	F.	18 mo.	15, 16, 17, 18, 19, 20, 21, 24, 25, 26	150	None	None	.....	.....	Insidious onset. Ordinarily severe. Death on 26th day.	D.
Idem	2	P. F.	F.	2.5 yr.	22, 23, 24, 25, 26, 27	90	Gradual reduction	Gradual improvement	.....	12 d.	Ordinarily severe.	R. L.
Idem	3	M. A. C.	F.	23 yr.	3, 4, 6, 14	135	Gradual reduction	Gradual improvement	.....	12 d.	Mild. Complicated with diphtheria.	R. L.
Idem	4	J. C.	M.	13 mo.	8, 9	50	.....	.....	.....	.....	Severe. Died within 24 hours of 1st injection.	D. M.
St. Luke's Hospital, N. Y.	1	J. B.	M.	29 yr.	20, 21	45	Slow reduction	Gradual improvement	.....	10 d.	Mild.	R. L.
Idem	2	M. S.	F.	14 yr.	4 (two)	45	None	None	.....	.....	Severe.	D.
S. Vincent's Hospital, N. Y.	1	A. C.	M.	22 yr.	?	30	None	None	.....	.....	Inadequate history. Condition desperate on admission. Death 3d day after injection.	D.
Idem	2	C. L.	M.	22 yr.	4	30	Prompt reduction	Prompt improvement	.....	8 d.	Severe.	R. L.
Idem	3	G. P.	M.	18 yr.	18 (?), 24	60	Prompt reduction	Prompt improvement	.....	27 d.	Ordinarily severe.	R. L.
Idem	4	A. L.	M.	11 yr.	34, 35	29.5	Rapid reduction	Rapid improvement	.....	2 d.	Mild. Protracted course.	R. C.
Presbyterian Hospital, N. Y.	1	D. O.	M.	2 yr.	6, 7, 8, 9, 12, 16, 23, 25, 26	155	None	None	Rapid reduction with subsequent increase.	.....	Ordinarily severe. Death on 26th day.	D.
Idem	2	G. R.	F.	4 yr.	3, 5, 6, 7, 8, 11, 15, 16, 17, 18, 19	295	Gradual reduction	Gradual improvement	Rapid loss of viability. Increase during relapse.	11 d.	Severe.	R. R.
Idem	3	F. D.	M.	2.5 yr.	16	30	Rapid reduction	Rapid improvement	.....	2 d.	Ordinarily severe.	R. C.
Idem	4	M. A.	F.	34 yr.	3, 5, 6, 7, 9, 10, 14	225	None	None	Slow reduction	.....	Severe. Intercurrent pericarditis. Death on 16th day.	D.
Idem	5	I. A.	M.	11 mo.	21, 25, 26, 27, 32	135	None	None	Prompt disappearance	.....	Semichronic with hydrocephalus. Intercurrent erysipelas. Death on 80th day.	D.*

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Babies' Hospital, N. Y.	1	E. F.	F.	11 mo.	49 (?), 64, 75, 91, 112	47	None	None	Gradual disappearance	.....	Severe. Semichronic. Death on 119th day.	D.
Idem	2	S. H.	M.	6 mo.	23, 24, 25, 26, 27, 28, 29	60	Gradual reduction	Gradual improvement	Rapid disappearance	7 d.	Ordinarily severe.	R. L.
Idem	3	H. K.	M.	22 mo.	28, 29, 30, 31, 32, 33, 34, 35	117	Gradual reduction	Gradual improvement	.....	.....	Ordinarily severe.	R. L.
St. Mary's Hospital, N. Y.	1	H. F.	F.	4 yr.	20, 21	20	Rapid reduction	Rapid improvement	.....	3 d.	Mild.	R. C.
Idem	2	A. P.	M.	12 yr.	2, 3	40	Rapid reduction	Rapid improvement	Rapid disappearance	2 d.	Severe. Deaf on admission.	R. C.
Lakeside Hospital, Cleveland	1	B. K.	F.	16 yr.	3, 4, 19	25	Gradual reduction	Gradual improvement	.....	25 d.	Severe.	R. L.
Idem	2	F. W.	?	3 yr.	12	5	Rapid reduction	Rapid improvement	.....	?	Severe.	R. C.
Idem	3	J. B.	M.	23 yr.	4, 5, 6	30	Gradual reduction	Prompt improvement	.....	30 d.	Very severe.	R. L.
Idem	4	H.	M.	17 yr.	5	15	None	None	.....	.....	Severe with purulent exudate.	D. M.
Idem	5	W. F.	M.	3 yr.	2, 8, 23	35	Gradual reduction	Gradual improvement	.....	24 d.	Death within 24 hours of injection. Severe. Two relapses on 6th and 22d d. respectively.	R. R.
Idem	6	N.	F.	2 yr.	1	15	Rapid reduction	Rapid improvement	.....	6 d.	Severe.	R. C.
Idem	7	X.	F.	11 yr.	3, 9	20	Rapid reduction	Rapid improvement	.....	7 d.	Severe.	R. C.
Idem	8	W. H.	M.	21 yr.	3, 4, 7	40	Gradual reduction	Gradual improvement	.....	12 d.	Ordinarily severe.	R. L.
Idem	9	C. G.	F.	6 yr.	3, 4, 6	35	None	None	.....	.....	Severe. Death on 7th day.	D.
Idem	10	J. C.	M.	2 yr.	1	15	Rapid reduction	Rapid improvement	.....	6 d.	Severe.	R. C.
Idem	11	P. G.	M.	18 mo.	40 (?), 44	25	.....	.....	.....	.....	Semichronic. Hydrocephalus present. Death on 119th day.	D.
Idem	12	F. P.	M.	3 yr.	4, 5, 6	46	None	None	.....	.....	Severe. Death on 6th day.	D.
Idem	13	O. C.	F.	7 yr.	1, 2, 3	45	Rapid reduction	Rapid improvement	.....	4 d.	Severe.	R. C.

Idem	14	L. S.	M.	19 mo.	14, 17, 32, 45, 47	28	Gradual reduction	Slow improvement	.....	4 w.	Protracted course.	R. L.
Idem	15	C. D.	M.	8 yr.	3, 5, 8, 12, 14, 27	53	Slow reduction	Slow improvement	.....	4 w.	Ordinarily severe.	R. L.
Idem	16	I. L.	?	5 yr.	4, 5, 6, 7, 9, 19, 23	41	None	None	.....	.....	Ordinarily severe. Small serum injections. Hydrocephalus. Death on 45th day.	D.
Idem	17	P.	M.	10 yr.	90, 97	20	None	None	.....	.....	Hopelessly chronic. Death 5.5 mo. after onset.	D.*
Idem	18	A. C.	M.	6 mo.	? (5 injections given)	29	None	None	Rapid loss of viability	.....	Imperfect history. Purulent exudate. Subcutaneous injections. Hydrocephalus.	D.*
Idem	19	J. M.	M.	7 mo.	6, 7, 8, 16, 24, 26	60.5	Slow reduction	Slow improvement	Slow disappearance	4 w.	Ordinarily severe. Serum subcutaneous and subdural.	R. L.
Idem	20	H.	M.	7 yr.	4, 5, 12, 14	60	Gradual reduction	Gradual improvement	.....	15 d.	Ordinarily severe. Serum subcutaneous and subdural.	R. L.
Idem	21	R. H.	M.	15 yr.	4, 5, 6, 7, 8	73	Gradual reduction	Gradual improvement	Rapid loss of viability	11 d.	Ordinarily severe.	R. L.
Idem	22	C. L.	M.	8 yr.	2, 3	37	None	None	Culture negative after 1st injection	.....	Fulminant. Death on 3d day.	D. F.
Idem	23	R. R.	M.	21 yr.	21 (?), 24, 26, 27	36.5	.....	Gradual improvement	Rapid disappearance	10 d.	Ordinarily severe with normal temperature.	R. L.
Idem	24	E. S.	M.	6 yr.	5, 6, 7, 9	50	Gradual reduction	Gradual improvement	Rapid disappearance	10 d.	Ordinarily severe.	R. L.
Idem	25	A. H.	M.	15 mo.	5, 9, 13, 19	55	Gradual reduction	Prompt improvement	Rapid disappearance	14 d.	Severe.	R. L.
Idem	26	L.	M.	3 mo.	2d week (?) (9 injections?)	90(?)	None	None	Rapid disappearance	.....	Late case complicated by general oedema.	D.
Idem	27	R.	F.	16 yr.	3	20	.....	.....	.....	.....	Moribund. Purulent exudate. Survived injection 3 hours.	D. M.
Idem	28	J. D.	M.	23 yr.	3 (?) (two), 4 (two)	37.5	None	None	.....	.....	Very severe. Death on 5th day.	D.
Idem	29	V. M.	F.	12 yr.	2, 3	35	Rapid reduction	Rapid improvement	.....	2 d.	Severe.	R. C.
Akron City Hospital	1	V. H.	F.	9 yr.	7, 12, 15, 28, 37, 49	82.5	Gradual reduction	Gradual improvement	Rapid disappearance	59 d.	Ordinarily severe. Relapse on 48th day.	R. R.
Idem	2	H. R.	M.	17 yr.	2	10	None	None	.....	.....	Fulminant. Death 12 hours after injection.	D. F.

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Akron City Hospital	3	B. S.	M.	19 yr.	15	20	Rapid reduction	Rapid improvement	.....	4 d.	Ordinarily severe.	R. C.
Idem	4	F. N.	M.	32 yr.	7	25	Rapid reduction	Rapid improvement	.....	3 d.	Ordinarily severe.	R. C.
Idem	5	B. K.	F.	15 yr.	2, 5, 7, 11	43.5	Slow reduction	Slow improvement	Prompt disappearance	23 d.	Ordinarily severe.	R. L.
Idem	6	Z. H.	F.	17 yr.	2, 4	22.5	Rapid reduction	Prompt improvement	.....	.....	Severe. Death occurred suddenly 2 hours after 2d injection on 4th day.	D.
Idem	7	H. S.	M.	14 yr.	1, 4	35	Rapid reduction	Rapid improvement	.....	10 d.	Severe.	R. C.
Idem	8	R. M.	M.	17 yr.	1	15	.....	.....	.....	.....	Fulminant. Death 30 hours after injection.	D. F.
Idem	9	G. G.	F.	17 yr.	1	22.5	Prompt reduction	Prompt improvement	.....	10 d.	Mild.	R. C.
Idem	10	J. A. S.	M.	24 yr.	2, 5, 11, 15	105	Slow reduction	Slow improvement	.....	17 d.	Ordinarily severe.	R. L.
Idem	11	E. R.	M.	20 yr.	1	25	Rapid reduction	Rapid improvement	.....	4 d.	Severe.	R. C.
Idem	12	H. B.	F.	6 yr.	6, 7, 8, 16, 29, 36	160	Slow reduction	Slow improvement	.....	49 d.	Severe.	R. L.
Montreal General Hospital	1	L. B.	F.	26 mo.	5, 6, 7, 17, 18	53	Gradual reduction	Gradual improvement	Gradual reduction, reappearance	.....	Ordinarily severe. First attack terminated on 7th day. Relapse and death on 46th day.	D. R.
Idem	2	M. F.	F.	6 yr.	2, 3, 4, 5, 6, 8	94	Prompt reduction	Prompt improvement	Rapid loss of viability	6 d.	Ordinarily severe.	R. L.
Idem	3	A. W.	F.	6 yr.	3, 5, 7, 8, 10, 12	170	Gradual reduction	Gradual improvement	.....	2 w.	Ordinarily severe.	R. L.
Idem	4	E. W.	F.	9 yr.	2, 3, 6, 7, 9, 10	153	Gradual reduction	Gradual improvement	Rapid loss of viability	2 w.	Ordinarily severe.	R. L.
Idem	5	J. L.	M.	9 yr.	2, 3, 8, 12, 13, 15	151	Gradual reduction	Gradual improvement	Rapid loss of viability	13 d.	Ordinarily severe.	R. L.
Idem	6	L. F.	M.	3 yr.	2	30	.....	.....	.....	.....	Severe. Death 6 hours after injection.	D. M.
Idem	7	F. L.	F.	10 yr.	3	30	.....	.....	.....	.....	Severe. Death one half hour after injection.	D. M.

Idem	8	S. C.	M.	39 yr.	2, 4	32.5	Prompt reduction	Prompt improvement	Diplococci not demonstrated	5 d.	Severe.	R. L.
Churchill, Chicago	1	R.	F.	2 yr.	16	30	.....	.....	.....	.....	Inadequate history. Death 2d day after injection.	D.
Idem	2	H. M.	M.	9 yr.	28 (?), 30, 33, 38, 39, 40, 43	120	Gradual reduction	Gradual improvement	Prompt disappearance	14 d.	Semichronic.	R. L.
Idem	3	M. B.	F.	4 yr.	2, 4	30	Rapid reduction	Rapid improvement	.....	6 d.	Severe.	R. C.
Idem	4	R. G.	M.	30 yr.	3d w. (1 injection)	30	Prompt reduction	Prompt improvement	Rapid disappearance	9 d.	Semichronic.	R. L.
Idem	5	F. J.	M.	14 yr.	3, 4, 6	90	Rapid reduction	Rapid improvement	Rapid disappearance	4 d.	Severe.	R. L.
Idem	6	J. B.	M.	16 yr.	7	30	Prompt reduction	Prompt improvement	Rapid disappearance	5 d.	Ordinarily severe.	R. L.
Idem	7	C. T.	M.	19 yr.	2, 4	55	Prompt reduction	Prompt improvement	Rapid disappearance	9 d.	Ordinarily severe.	R. L.
Idem	8	A. B.	F.	11 yr.	4, 5, 6	90	Prompt reduction	Prompt improvement	Rapid disappearance	9 d.	Ordinarily severe.	R. L.
Idem	9	R. S.	F.	14 yr.	12	15	.....	.....	.....	.....	Ordinarily severe. Moribund. Death 16 hours after injection.	D. M.
City Hospital, Cincinnati	1	A. M.	M.	19 yr.	16 (?), 17, 35, 42	120	.....	.....	.....	.....	Semichronic.	D.
Idem	2	G. D.	M.	18 yr.	25, 26	60	.....	.....	Rapid disappearance	.....	Semichronic. Emaciated and hopeless. Death on 28th day.	D.
Idem	3	C. T.	M.	18 yr.	2 (?), 3, 5, 6, 8, 9, 11, 12, 13, 15, 21, 24	315	.....	.....	Slow disappearance and loss of viability	.....	Severe.	R. L.
Idem	4	D. E.	M.	40 yr.	3	30	.....	.....	.....	.....	Very severe. Moribund.	D. M.
Idem	5	W. J.	M.	18 yr.	? (5 injections)	135	.....	.....	Prompt disappearance	.....	Inadequate history. Severe.	R. L.
Idem	6	T. R.	F.	4 yr.	3, 4, 7	45	Rapid reduction	Rapid improvement	.....	5 d.	Mild.	R. L.
Idem	7	K.	F.	2 yr.	3, 5	30	Rapid reduction	Rapid improvement	Rapid disappearance	5 d.	Ordinarily severe.	R. L.
Idem	8	V.	F.	10 yr.	3, 4, 7	90	Gradual reduction	Gradual improvement	Rapid disappearance	7 d.	Severe.	R. L.
Idem	9	K.	M.	11 mo.	2, 3	30	Gradual reduction	Gradual improvement	Rapid disappearance	6 d.	Ordinarily severe. Deafness.	R. L.
Idem	10	R. S.	M.	3 yr., 8 mo.	1	30	.....	.....	.....	.....	Fulminant. Death 4 hours after injection.	D. F.
Idem	11	A. K.	F.	7 yr.	1, 2	45	Rapid reduction	Rapid improvement	Rapid loss of viability	2 d.	Ordinarily severe.	R. C.

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
City Hospital, Cincinnati	12	T. K.	F.	4 wk.	2, 4	16	Gradual reduction	Gradual improvement	Rapid loss of viability	.....	Ordinarily severe.	R. L.
Idem	13	B. B.	M.	20 yr.	5, 6	60	.....	.....	.....	.....	Very severe.	D.
Idem	14	S.	F.	7 yr.	2, 3	60	Gradual reduction	Gradual improvement	Rapid loss of viability	5 d.	Ordinarily severe.	R. L.
Idem	15	G.	F.	10 yr.	3, 4	60	Prompt reduction	Prompt improvement	.....	5 d.	Ordinarily severe.	R. L.
Idem	16	C. O.	M.	15 yr.	1	30	.....	.....	.....	.....	Fulminant. Died within 24 hours of injection.	D. F.
Idem	17	A. J.	M.	20 yr.	20, 21	60	.....	.....	.....	.....	Semichronic. Purulent exudate.	D.
Idem	18	W. W.	F.	6 yr.	3, 4, 13, 19	60	Gradual reduction	Gradual improvement	.....	.....	Ordinarily severe.	R. R.
Idem	19	P. R.	M.	28 yr.	3, 4	60	.....	.....	.....	.....	Very severe. Purulent exudate. Death on 5th day.	D.
Idem	20	A. W.	M.	20 yr.	(?) (2 injections)	60	.....	.....	.....	.....	Inadequate history. Severe. Death soon after 2d injection.	D.
Idem	21	E. H.	M.	26 yr.	(?) (2 injections)	60	.....	.....	.....	.....	Severe. Death on the 12th day after second injection.	D.
Idem	22	H. R.	M.	4.5 yr.	2, 4, 7	45	None	None	.....	.....	Ordinarily severe.	D.
Idem	23	E. L.	M.	5 yr.	2, 4, 8, 11	105	Slow reduction	Slow improvement	.....	2 w.	Ordinarily severe.	R. L.
Idem	24	R.	M.	16 yr.	2, 4	60	Rapid reduction	Rapid improvement	.....	5 d.	Ordinarily severe.	R. L.
Idem	25	M. G.	F.	21 yr.	5, 7, 9	90	Gradual reduction	Gradual improvement	.....	.....	Ordinarily severe.	R. L.
Idem	26	A. E.	M.	17 yr.	3, 5, 7, 10	120	None	None	Rapid disappearance	.....	Ordinarily severe. Death on 14th day.	D.
Idem	27	A. H.	F.	25 yr.	3,4,6,10,13,15	180	None	.....	.....	.....	Ordinarily severe. Death on 22d day.	D.
Idem	28	E. G.	M.	16 yr.	6, 7, 9	90	.....	.....	.....	.....	Ordinarily severe.	R. L.
Idem	29	H. C.	F.	5 yr.	(?) (1 injection)	30	Rapid reduction	Rapid improvement	Diplococci not demonstrated	2 d.	Ordinarily severe.	R. C.
Idem	30	J. M.	M.	17 yr.	7, 10, 12, 14, 17	150	Slow reduction	Gradual improvement	Rapid disappearance	.....	Ordinarily severe.	R. L.
Idem	31	E. C.	M.	3 yr.	2, 3, 4	90	Prompt reduction	Prompt improvement	.....	8 d.	Ordinarily severe.	R. L.

Idem	32	K. B.	F.	12 yr.	2, 3, 4, 6, 9, 16, 17, 24	240	Slow reduction	Slow improvement	.....	.....	Ordinarily severe.	R. L.
Idem	33	M. B.	F.	8 yr.	1, 2, 4	75	Rapid reduction	Rapid improvement	Rapid disappearance	5 d.	Ordinarily severe. Early injection; clear exudate.	R. L.
Idem	34	C. B.	M.	2 yr.	1, 2, 3, 5	75	Rapid reduction	Rapid improvement	Prompt disappearance	5 d.	Ordinarily severe.	R. L.
Idem	35	M. B.	M.	2 yr.	5, 6, 8	60	Prompt reduction	Prompt improvement	.....	4 d.	Ordinarily severe.	R. L.
Idem	36	L. T.	M.	8 yr.	31 (?), 32, 33	90	Prompt reduction	Prompt improvement	.....	.....	Semichronic. Purulent exudate. Rapid clearing up of exudate.	R. L.
Idem	37	E. S.	M.	20 yr.	5	30	.....	.....	.....	.....	Moribund. Death 15 hours after injection.	D. M.
Idem	38	A. E.	M.	5 yr.	2, 4, 10, 11, 20	135	.....	.....	Prompt disappearance; reappearance during relapse	.....	Ordinarily severe. Two relapses.	R. R.
Idem	39	M. M.	F.	14 yr.	2, 3, 4	90	.....	.....	.....	.....	Ordinarily severe.	R. L.
Idem	40	C. G.	F.	14 yr.	2, 3, 4	90	.....	.....	.....	.....	Ordinarily severe.	R. L.
Idem	41	T. H.	M.	24 yr.	2, 3, 4, 5, 6, 8, 14	210	.....	.....	.....	.....	Ordinarily severe.	R. L.
Idem	42	J. H.	M.	18 yr.	5, 6, 7	90	.....	.....	.....	.....	Ordinarily severe.	R. L.
Idem	43	H. W.	M.	19 yr.	3, 13, 14, 17, 25	150	.....	.....	.....	.....	Ordinarily severe.	R. L.
Idem	44	A. D.	F.	5 yr.	3, 4, 5	90	.....	.....	.....	.....	Ordinarily severe.	R. L.
Idem	45	S.	F.	25 yr.	3, 4, 5, 7, 8, 13	150	.....	.....	.....	.....	Severe.	R. L.
Dunn, Boston	1	C. C.	M.	2 yr., 10 mo.	2, 3, 4, 5, 19, 20, 21, 22	181	Slow reduction	Slow improvement	Slow disappearance	23 d.	Ordinarily severe.	R. L.
Idem	2	B. K.	F.	3.5 yr.	8, 9, 10, 11, 19, 20, 21, 22	200	Slow reduction	Slow improvement	Rapid loss of viability	16 d.	Ordinarily severe.	R. L.
Idem	3	J. M.	M.	16 mo.	14, 15	60	None	None	.....	.....	Inadequate history. Death in 3d week.	D.
Idem	4	J. H.	M.	6.5 yr.	2, 3, 4, 5	120	Prompt reduction	Rapid improvement	Rapid loss of viability	6 d.	Severe.	R. C.
Idem	5	E. S.	F.	1 yr.	21, 22, 23, 24, 29, 30, 31, 32	295	Fall to normal after 1st injection	None	.....	.....	Death in 5th week.	D.
Idem	6	A. M.	M.	6 yr.	2, 3, 5	85	Rapid reduction	Rapid improvement	Rapid loss of viability	3 d.	Ordinarily severe.	R. C.
Idem	7	R. A.	M.	7 yr.	1	30	Rapid reduction	Rapid improvement	.....	4 d.	Mild.	R. C.
Idem	8	A. W.	F.	10 yr.	4, 5, 6	75	.....	Prompt improvement	Rapid loss of viability	5 d.	Ordinarily severe.	R. C.
Idem	9	W. W. W.	M.	6 yr.	1 (two)	60	Rapid reduction	Rapid improvement	.....	10 d.	Fulminant.	R. C.
Idem	10	A. R.	M.	4 yr.	2	30	Rapid reduction	Rapid improvement	.....	1 d.	Severe.	R. C.

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Dunn, Boston	11	B. S.	F.	27 yr.	21, 22, 26, 32	165	.....	.....	Prompt reduction	.....	Severe course. Death in 5th week.	D.
Idem	12	E. D.	F.	14 wk.	7, 8, 12	75	Prompt reduction	Prompt improvement	.....	7 d.	Ordinarily severe.	R. L.
Idem	13	F. W.	M.	29 yr.	8, 9	60	Prompt reduction	Prompt improvement	Diplococci not demonstrated	4 d.	Mild.	R. L.
Idem	14	M. E. C.	F.	9 yr.	5, 6, 7, 8	120	Rapid reduction	Rapid improvement	Prompt disappearance	6 d.	Ordinarily severe.	R. C.
Idem	15	J. M.	F.	8 yr.	5. 6, 7, 8, 15, 18, 19, 20	275	Prompt reduction and relapse	Prompt improvement and relapse	Prompt reduction followed by increase during relapse.	15 d.	Ordinarily severe. Relapse on 5th day which endured 10 days.	R. R.
Idem	16	M. R. R.	F.	2 yr. 3 mo.	3, 4, 5	80	Gradual reduction	Gradual improvement	Prompt disappearance	7 d.	Severe.	R. L.
Idem	17	P. S.	F.	11 mo.	21, 22	60	.....	.....	.....	.....	Imperfect history. Blind and deaf on admission.	R. L.
Idem	18	M. B.	F.	16 yr.	20, 21, 23, 31	120	Gradual reduction	None	Prompt reduction	.....	Ordinarily severe. Death on 32d day.	D.
Idem	19	D. J. D.	M.	3.5 yr.	11, 12, 13, 14	140	Prompt reduction	Prompt improvement	.....	8 d.	Ordinarily severe.	R. L.
Idem	20	J. J. D.	M.	5 mo.	4, 5, 10, 12	45	Slow reduction	Slow improvement	.....	10 d.	Ordinarily severe.	R. L.
Idem	21	?	M.	13 yr.	28	30	None	None	.....	.....	Condition desperate at first injection. Death on 31st day.	D.
Idem	22	S. B.	F.	10 yr.	5, 6, 7, 9, 19	140	Gradual reduction	Gradual improvement	Prompt disappearance	6 d.	Ordinarily severe.	R. L.
Idem	23	J. D.	M.	4 yr.	56, 58	60	Prompt reduction	Prompt improvement	.....	8 d.	Protracted course; prompt recovery after serum injection.	R. L.
Idem	24	C. R.	F.	2 yr.	8	30	.....	Prompt improvement	.....	8 d.	Mild.	R. L.
Idem	25	J. F.	M.	2 yr.	3, 4, 5, 6	120	Gradual reduction	Gradual improvement	Rapid disappearance	14 d.	Severe.	R. L.
Idem	26	R. C.	M.	4.5 yr.	4, 5, 6, 7	120	Gradual reduction	Gradual improvement	Prompt disappearance	7 d.	Ordinarily severe.	R. L.
Idem	27	B. L.	F.	21 yr.	3, 4, 6, 7, 8, 9, 10 (after about 20th day 4 more injections)	330	.....	.....	.....	.....	Severe. Death in 4th week.	D. R.
Idem	28	A. H.	F.	5 yr.	2, 3, 4, 5, 11, 14, 23, 24, 25	280	Slow reduction	Slow improvement	Slow disappearance	24 d.	Severe. Deafness.	R. L.

Idem	29	L. C.	F.	9 yr.	3, 4, 5, 6, 7	115	Gradual reduction	Gradual improvement	Gradual disappearance	13 d.	Ordinarily severe.	R. L.
Idem	30	J. J. K.	M.	29 yr.	3 (two)	60	.....	.....	.....	.....	Fulminant. Death 4th day.	D. F.
Idem	31	W. M.	M.	16 yr.	6, 7, 8, 9	120	Rapid reduction	Rapid improvement	Rapid disappearance	3 d.	Mild.	R. C.
Idem	32	V. H.	M.	5 yr.	2, 4	45	Rapid reduction	Rapid improvement	Rapid disappearance	1 d.	Fulminant.	R. C.
Idem	33	A. T.	F.	24 yr.	21, 23	60	Rapid reduction	Rapid improvement	.....	1 d.	Protracted course. Immediate improvement after injection.	R. C.
Idem	34	G. L.	F.	7 yr.	8, 10	45	Rapid reduction	Rapid improvement	.....	1 d.	Ordinarily severe.	R. C.
Idem	35	T. F.	F.	4 yr.	5, 6, 7, 11	105	Rapid reduction	Rapid improvement	.....	7 d.	Mild.	R. C.
Idem	36	J. F. M.	M.	21 mo.	3, 4	60	Prompt reduction	Prompt improvement	.....	4 d.	Ordinarily severe.	R. L.
Idem	37			14 yr.	(?) (6 injections)	180	Gradual reduction	Gradual improvement	.....	10 d.	Ordinarily severe.	R. L.
Idem	38	M. O.	M.	15 yr.	6, 7	75	.....	.....	.....	.....	Collapse following serum injection; revived; died 29 hours later.	D.
Idem	39	A. A.	F.	2 yr., 7 mo.	35, 36, 38	45	.....	.....	.....	.....	Imperfect history. Died 7th week.	D.
Idem	40	C. B.	F.	4 yr.	? (8 injections)	205	Gradual reduction	Gradual improvement	Prompt disappearance	15 d.	Ordinarily severe.	R. L.
Robb, Belfast* (Purdysburn)	1	J. P.	M.	22 yr.	3, 6, 9	90	.....	.....	.....	7 d.	Ordinarily severe.	R. C.
Idem	2	R. J. B.	M.	8 mo.	23, 29	45	.....	.....	.....	.....	Semichronic. Purulent exudate. Death on 30th day.	D.
Idem	3	E. S.	F.	12 yr.	2, 4	60	.....	.....	.....	5 d.	Ordinarily severe.	R. L.
Idem	4	C. W.	F.	31 yr.	16, 19, 23	90	.....	.....	.....	14 d.	Severe.	R. L.
Idem	5	M. Q.	M.	19 yr.	3	30	.....	.....	.....	.....	Fulminant. Death 9 hours after injection.	D. F.
Idem	6	M. McG.	M.	22 yr.	8, 11	60	.....	.....	.....	4 w.	Ordinarily severe.	R. L.
Idem	7	J. C.	M.	20 yr.	6, 11, 22, 29, 52	210	.....	.....	.....	.....	Severe.	R. L.
Idem	8	P. H.	M.	13 yr.	2	30	.....	.....	.....	.....	Fulminant. Death 30 hours after injection.	D. F.
Idem	9	D. McI.	M.	11 yr.	7, 15, 18	75	.....	.....	.....	33 d. (?)	Ordinarily severe.	R. L.
Idem	10	J. B.	M.	19 yr.	6, 8, 13	80	.....	.....	.....	.....	Ordinarily severe.	R. L.
Idem	11	E. N.	F.	8 yr.	6, 13, 17, 19, 22, 34, 43	210	.....	.....	.....	.....	Severe. Purulent exudate.	R. L.
Idem	12	E. K.	F.	4 yr.	14, 17	60	.....	.....	.....	.....	Ordinarily severe.	R. L.
Idem	13	G. S.	M.	4 yr.	3	30	.....	.....	.....	.....	Fulminant. Purulent exudate. Death 6 hours after injection.	D. F.
Idem	14	C. S.	M.	13 yr.	2, 3	65	.....	.....	.....	4 d.	Fulminant onset.	R. C.
Idem	15	M. H.	M.	27 yr.	6, 7	60	.....	.....	.....	5 d.	Ordinarily severe.	R. L.

* Dr. Robb employed the serum at the two fever hospitals—Purdysburn and Union—in Belfast.

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Robb, Belfast * (Purdysburn)	16	J. C.	F.	8 yr.	34, 36, 38, 44, 48, 52	180	.....	.....	.....	.....	Chronic. Death on 59th day.	D.
Idem	17	G. D.	F.	4 yr.	5, 6	60	.....	.....	.....	.....	Very severe. Purulent exudate.	D.
Idem	18	R. M.	F.	18 yr.	6, 7, 9, 11, 13, 15, 21, 26, 28, 32	315	.....	.....	.....	4 w.	Death 3 hours after 2d injection. Severe.	R. L.
Idem	19	S. S.	M.	11 yr.	2, 3, 5, 7, 9, 12, 15, 19, 24	290	.....	.....	.....	24 d.	Very severe. Purulent exudate.	R. L.
Idem	20	E. W.	F.	21 yr.	7, 13	60	.....	.....	.....	3 d.	Very severe.	R. C.
Idem	21	A. F.	F.	25 yr.	4 (two), 6, 7, 10, 13, 17, 21, 27	270	.....	.....	.....	33 d.	Very severe.	R. L.
Idem	22	H. G.	M.	17 yr.	1, 2, 4, 8	120	.....	.....	.....	11 d.	Very severe.	R. L.
Idem	23	S. J.	F.	4 yr.	5, 7	50	.....	.....	.....	.....	Ordinarily severe.	D.
Idem	24	J. A.	F.	14 yr.	3, 5, 7, 11,13, 19	180	.....	.....	.....	17 d.	Collapsed on admission. Severe.	R. L.
Idem	25	R. B.	M.	27 yr.	32, 34, 38	120	.....	.....	.....	7 d.	Chronic.	R. L.
Idem	26	J. D.	M.	3 yr.	5, 6, 8, 11,14, 16	180	.....	.....	.....	.....	Very severe. Collapsed for first four days after admission.	R. L.
Idem	27	A. McN.	F.	6 yr.	3, 4, 5, 6	100	.....	.....	.....	6 d.	Very severe.	R. L.
Idem	28	T. B.	M.	5 yr.	10, 11, 12,14, 16, 18	180	.....	.....	.....	.....	Very severe. Collapsed on admission; never rallied.	D.
Idem	29	D. T.	M.	20 mo.	3, 4, 6, 9, 12	130	.....	.....	.....	9 d.	Ordinarily severe.	R. L.
Idem	30	M. D.	F.	15 mo.	7, 9, 15	120	.....	.....	.....	.....	Ordinarily severe. Death on 19th day.	D.
Idem	31	L. C.	F.	2 yr.	6, 8, 11	120	.....	.....	.....	6 d.	Ordinarily severe.	R. L.
Idem	32	B. S.	F.	2.5 yr.	3, 5	60	.....	.....	.....	7 d.	Ordinarily severe.	R. L.
Idem	33	R. McD.	M.	1 yr.	7, 16	60	.....	.....	.....	4 d.	Ordinarily severe. Relapse on 14th day. First attack 2 days; second 2 days.	R. R.
Idem	34	M. McC.	F.	4 yr.	4, 5	60	.....	.....	.....	.....	Collapsed on admission. Death on 7th day.	D.

Idem	35	F. A.	M.	23 yr.	5	30	.....	.....	.....	.....	Moribund on admission. Death half hour after injection.	D.	M.
Idem	36	W. D.	M.	26 yr.	2 (two), 7	100	.....	.....	.....	7 d.	Ordinarily severe. Purulent exudate.	R.	L.
Idem	37	M. H.	F.	5 yr.	5, 7	60	.....	.....	.....	5 d.	Ordinarily severe. Purulent exudate.	R.	C.
Idem	38	W. R.	M.	9 yr.	15	30	.....	.....	.....	3 d.	Mild.	R.	C.
Idem	39	L. H.	F.	13 yr.	2, 7	60	.....	.....	.....	7 d.	Ordinarily severe.	R.	L.
Idem	40	R. D.	M.	8 yr.	3	30	.....	.....	.....	3 d.	Mild.	R.	C.
Idem	41	S. McG.	F.	4 yr.	5	30	.....	.....	.....	3 d.	Ordinarily severe.	R.	C.
Idem	42	T. S.	M.	3 mo.	5, 8, 17, 20, 25, 26	150	.....	.....	.....	3 w.	Ordinarily severe. Purulent exudate.	R.	L.
Idem	43	A. S.	F.	2 yr.	5, 8	60	.....	.....	.....	6 d.	Ordinarily severe. Purulent exudate.	R.	L.
Idem	44	J. B.	M.	43 yr.	2	45	.....	.....	.....	.....	Fulminant. Purulent exudate. Death 20 hours after injection.	D.	F.
Idem	45	J. F. M.	M.	8 yr.	2, 3, 4, 6,7,10	180	.....	.....	.....	18 d.	Very severe. Purulent exudate.	R.	L.
Idem	46	A. D.	M.	6 yr.	3, 4	45	.....	.....	.....	.....	Severe. Purulent exudate. Collapsed on admission. Death on 4th day.	D.	
Idem	47	F. R.	M.	21 yr.	2, 3, 4, 5, 7, 9	195	.....	.....	.....	16 d.	Severe.	R.	L.
Idem	48	L. McC.	F.	5 yr.	1, 3, 4, 9	120	.....	.....	.....	13 d.	Ordinarily severe. Purulent exudate.	R.	L.
Idem	49	A. I.	F.	2.5 yr.	4, 6, 7	67	.....	.....	.....	.....	Ordinarily severe. Cyanosed on admission. Death on 8th day.	D.	
Idem	50	H. F.	F.	2 yr., 9 mo.	75	30	.....	.....	.....	.....	Chronic.	R.	L.
Idem	51	J. L.	F.	4.5 yr.	4	30	.....	.....	.....	.....	Cyanosed on admission. Death 7 hours after injection.	D.	M.
Idem	52	S. F.	M.	20 yr.	10, 12, 16	90	.....	.....	.....	7 d.	Ordinarily severe.	R.	L.
Idem	53	A. A.	F.	9 mo.	3, 5, 9, 13	90	.....	.....	.....	15 d.	Ordinarily severe.	R.	L.
Idem	54	E. K.	F.	4 yr.	1, 3, 4	75	.....	.....	.....	.....	Ordinarily severe. Death on 4th day.	D.	
Idem	55	W. W.	M.	14 yr.	2, 4, 6, 8, 11	150	.....	.....	.....	.....	Ordinarily severe.	R.	L.
Robb, Belfast (Union)	56(1)	R. C.	M.	14 yr.	35	30	.....	.....	.....	.....	Semichronic.	R.	L.
Idem	57(2)	F. McC.	M.	17 yr.	25, 32	60	.....	.....	.....	.....	Semichronic.	R.	L.
Idem	58(3)	P. O'H.	M.	40 yr.	52	30	.....	.....	.....	.....	Semichronic.	R.	L.
Idem	59(4)	W. H. G.	M.	29 yr.	57	30	.....	.....	.....	.....	Semichronic.	R.	L.
Idem	60(5)	T. D.	M.	14 yr.	4, 10	60	.....	.....	.....	.....	Ordinarily severe. Death on 11th day.	D.	
Idem	61(6)	M. K.	F.	21 yr.	7	30	.....	.....	.....	3 d.	Ordinarily severe.	R.	C.

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Robb, Belfast (Union)	62(7)	S. K.	M.	20 yr.	3, 11	60	.....	.....	.....	.....	Very severe. Deafness.	R. L.
Idem	63(8)	H. J.	M.	24 yr.	16, 24	60	.....	.....	.....	.....	Ordinarily severe.	R. L.
Idem	64(9)	M. McC.	F.	3 yr.	6, 10, 15	75	.....	.....	.....	.....	Very severe. Death on 15th day.	D.
Idem	65(10)	D. S.	M.	7 yr.	8	30	.....	.....	.....	4 d.	Mild.	R. L.
Idem	66(11)	S. D.	F.	14 yr.	29, 40	60	.....	.....	.....	.....	Semichronic. Intermittent.	R. L.
Idem	67(12)	F. B.	M.	5 yr.	7	30	.....	.....	.....	2 d.	Mild.	R. C.
Idem	68(13)	S. G.	F.	22 yr.	13, 17	60	.....	.....	.....	6 d.	Severe.	R. C.
Idem	69(14)	H. W.	M.	10 yr.	2, 3, 6, 10	120	.....	.....	.....	13 d.	Very severe.	R. C.
Idem	70(15)	J. L.	M.	36 yr.	12	30	.....	.....	.....	.....	Very severe. Death 30 hours after injection.	D.
Idem	71(16)	R. G.	M.	21 yr.	11, 12	60	.....	.....	.....	5 d.	Severe.	R. C.
McCantrie, Woolwich, England	1	C. M. M.	M.	19 yr.	4	30	Rapid reduction	Rapid improvement	.....	2 d.	Severe.	R. C.
Hebrew Hospital, Baltimore	1	L. A.	M.	7 yr.	1,2,3,4,6,8,9, 11, 13, 15, 16	225	Slow reduction	Slow improvement	.....	3-4 w.	Severe. Protracted course.	R. L.
Idem	2	F. B.	F.	20 yr.	6, 7, 8, 11	120	Gradual reduction	Gradual improvement	Rapid disappearance	8 d.	Severe.	R. L.
Idem	3	J. C.	M.	5 yr.	28, 29, 30, 31, 32, 33	180	Slow reduction	Slow improvement	.....	26 d.	Ordinarily severe.	R. L.
Morse, Boston	1	R. B.	M.	2 yr.	(?) (3 injections)	40	.....	.....	.....	.....	Chronic. Uncertain duration.	D.
Idem	2	C.K.	F.	28 yr.	10	25	Rapid reduction	Rapid improvement	.....	2 d.	Ordinarily severe.	R. C.
Idem	3	I. R.	F.	1 yr.	14, 15, 16, 17	57	Prompt reduction	Prompt improvement	Rapid disappearance	5 d.	Semichronic.	R. L.
Idem	4	M. S.	F.	4 mo.	42, 43, 44, 45, 46, 47, 48, 50, 52, 53, 54, 56, 57, 58, 59	184	.....	.....	.....	.....	Chronic. Only 1st puncture yielded fluid.	D.
Boston City Hospital	1	G. W. M.	M	28 yr.	2, 3, 4	85	.....	.....	.....	.....	Fulminant. Death on 4th day.	D. F.
Idem	2	L. M.	F.	32 yr.	6, 7, 8	70	Prompt reduction	Prompt improvement	Rapid disappearance	10 d.	Ordinarily severe.	R. L.
Idem	3	J. M.	F.	48 yr.	13, 14, 19	85	None	None	.....	.....	Ordinarily severe. Complicated with pneumonia. Death on 25th day.	D.

Idem	4	N. E.	M.	14 yr.	4, 5, 6, 7, 10, 11, 13, 16	235	Gradual reduction	Gradual improvement	.....	15 d.	Ordinarily severe.	R. L.
Idem	5	O. H.	M.	28 yr.	6 injections	180	.....	.....	.....	.....	No history. Ordinarily severe.	R. L.
Idem	6	M. A.	F.	11 yr.	7, 19	30	Rapid reduction	Rapid improvement	.....	5 d.	Ordinarily severe. 1st injection doubtfully intraspinal.	R. C.
Idem	7	E. L.	F.	35 yr.	20 (?), 23	45	Prompt reduction	Prompt improvement	.....	7 d.	Mild.	R. L.
Idem	8	M. N.	F.	14 yr.	3, 5	40	Rapid reduction	Rapid improvement	Rapid disappearance	5 d.	Ordinarily severe.	R. C.
Idem	9	J. O'N.	M.	24 yr.	13, 14	60	.....	.....	.....	.....	Severe.	D.
Idem	10	M. M.	M.	4 yr.	(?) (2 injections)	45	Rapid reduction	Rapid improvement	Diplococci not demonstrated	.....	Ordinarily severe.	R. C.
Massachusetts Gen. Hospital	1	E. T.	M.	8 yr.	2, 3, 4, 5, 9, 10, 11	195	Gradual reduction	Gradual improvement	.....	21 d.	Severe. Deafness.	R. L.
Idem	2	L. D.	M.	8 yr.	3	30	.....	.....	.....	.....	Severe. Death within 24 hours of injection.	D. M.
Portersville, California	1	F. H.	M.	14 mo.	2, 3, 4, 5, 11, 12, 13	127.5	Gradual reduction	Gradual improvement	.....	12 d.	Ordinarily severe.	R. L.
Idem	2	L. E. R.	M.	8 yr.	1, 2	45	Rapid reduction	Rapid improvement	.....	3 d.	Ordinarily severe.	R. C.
Idem	3	F. G.	F.	19 yr.	2, 3, 4	75	Prompt reduction	Prompt improvement	.....	.....	Ordinarily severe. Sudden return of severe symptoms. Death on 5th day	D.
Idem	4	M. S.	F.	6 yr.	1, 2, 3, 4	120	Prompt reduction	Prompt improvement	Rapid disappearance	4 d.	Ordinarily severe.	R. L.
Clayton, California	1	G. B.	M.	22 yr.	21, 22, 23, 24	120	Prompt reduction	Prompt improvement	.....	5 d.	Semichronic.	R. L.
Newark City Hospital	1	G. S.	M.	7 yr.	21, 23, 24, 25, 28, 29, 30, 31	134.5	Slow reduction	Slow improvement	Slow disappearance	.....	Semichronic.	R. L.
Newark	2	M. S.	M.	6 mo.	60, 64, 82, 88	60	None	None	.....	.....	Chronic. Clear spinal fluid. Death on 93d day.	D.*
McCulloch, Seattle	1	R. L.	M.	15 yr.	2, 3, 4	90	Rapid reduction	Rapid improvement	.....	3 d.	Severe.	R. C.
Idem	2	H.	?	child	3 (two)	18	.....	.....	.....	.....	Severe. Death within 24 hours of injection.	D. M.
Idem	3	J. H.	M.	30 yr.	(?) (5 injections)	150	.....	.....	.....	.....	Patient found unconscious. No history.	D.
Idem	4	W. O.	M.	4 yr.	1, 2	23	.....	.....	.....	.....	Fulminant. Death 24 hours after injection.	D. F.
Herzog, Chicago	1	?	M.	17 yr.	21, 22, 23, 24, 25, 27, 31, 32	210	Gradual reduction	Gradual improvement	Rapid disappearance	.....	Semichronic.	R. L.
Idem	2	F. R.	M.	23 yr.	7, 8, 9, 13, 14	105	Prompt reduction	Prompt improvement	.....	.....	Ordinarily severe.	R. L.
Adams, Washington	1	F. T.	M.	5 yr.	2, 4, 5, 7, 11, 13, 15, 17, 20	150	None	None	Diminished but not removed	.....	Severe. Death on 20th day.	D.

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Adams, Washington	2	R. C.	M.	13 yr.	4, 5	45	Prompt reduction	Prompt improvement	.....	6 d.	Severe. 1st injection subcutaneous. No effect. 2d subdural.	R. L.
Idem	3	C. V. C.	M.	7 mo.	7, 14	30	Gradual reduction	Gradual improvement	.....	8 d.	Ordinarily severe.	R. L.
Raymond, Columbus, Ohio	1	C. F. G.	M.	adult	5, 6	60	Rapid reduction	Rapid improvement	.....	2 d.	Ordinarily severe.	R. C.
Idem	2	A. N. L.	M.	adult	10, 12	60	.....	.....	.....	.....	Very severe. Death on 13th day.	D.
Idem	3	G. B.	M.	23 yr.	1, 2	60	.....	.....	.....	.....	Fulminant. Death on 2d day.	D. F.
Idem	4	C. C. C.	M.	38 yr.	1, 2, 3	45	Rapid reduction	Rapid improvement	.....	3 d.	Ordinarily severe.	R. C.
Idem	5	C. W. C.	M.	adult	1, 2, 3, 4	60	None	None	.....	.....	Very severe.	D.
Naval Hospital, Newport	1	F. F. C.	M.	17 yr.	28,30,31,33,34	150	Slow reduction	Slow improvement	.....	.....	Chronic with apparent recovery. Sudden death from hydrocephalus, on 130th day.	D.
Idem	2	R. B. H.	M.	19 yr.	8, 9, 10, 13	115	Prompt reduction	Prompt improvement	Rapid disappearance	7 d.	Ordinarily severe.	R. L.
Idem	3	G. H. G.	M.	17 yr.	2,3,4,5,7,17, 19,20,21,22,24	330	None	Improvement with relapse	Slow reduction	.....	Severe. Autopsy showed no purulent exudate in meninges, but excessive quantity of clear fluid in lateral ventricles. Complicating pneumonia.	D.
Nichols, Washington	1	J. S.	M.	53 yr.	4	25	.....	.....	.....	.....	Severe. Death within 24 hours of injection.	D. M.
Idem	2	P. W.	M.	18 yr.	6, 8	60	.....	.....	.....	.....	Severe. Serum injected together with magnesium sulphate.	D.
Idem	3	C. H.	M.	22 yr.	14, 16, 18, 23	120	.....	.....	.....	.....	Ordinarily severe. Death on 25th day.	D.
Gouveneur Hospital, N. Y.	1	P. McG.	M.	23 yr.	3, 4, 5, 6	120	.....	.....	.....	.....	Severe. Only one injection certainly entered canal.	D.

Idem	2	M. F. I.	M.	18 yr.	3 (9 injections)	?	.....	.....	.....	.....	Ordinarily severe.	R. L.
Kingston Ave. Hospital, Brooklyn	1	W. O.	M.	3 yr.	16,17,20,23,25	65	None	None	.....	.....	Ordinarily severe.	D.
Idem	2	Y. C.	F.	7 yr.	12, 13, 20	63	Gradual reduction	Gradual improvement	.....	10 d.	Ordinarily severe.	R. L.
Roosevelt Hospital, N.Y.	1	J. M.	M.	adult	8, 10	50	Prompt reduction	Prompt improvement	Rapid disappearance	10 d.	Ordinarily severe.	R. L.
Bellevue Hospital, N.Y.	1	M. S.	M.	5 mo.	11, 12, 13, 14, 15, 16	108	.....	.....	.....	.....	Ordinarily severe. Improvement until 4th day, after 3d injection; then secondary streptococcus infection. Death on 17th day.	D.*
Hartford Hospital, Connecticut	1	J. J. B.	M.	42 yr.	22, 23, 25, 27	105	Prompt reduction	Prompt improvement	.....	.....	Semichronic. Death on 37th day from cardiac disease.	D.
Royal Victoria, Montreal	1	R. C.	M.	8 yr.	5, 6, 7, 8,10, 12,14,16,19,24	260	None	None	At first reduction, then increase	.....	Severe. Death on 25th day.	D.
University Hospital, Baltimore	1	L. D.	F.	21 yr.	12,13,14,15,16	67	.....	.....	.....	.....	Ordinarily severe. Death on 17th day.	D.
Mt. Sinai Hospital, Philadelphia	1	S. S.	M.	28 yr.	28, 36	60	.....	Prompt improvement	.....	.....	Ordinarily severe.	R. L.
Jewish Hospital, Brooklyn	1	J. S.	F.	6 yr.	4, 5, 6, 7, 8, 9, 11, 13, 14	270	Gradual reduction	Gradual improvement	Rapid disappearance	12 d.	Mild.	R. L.
German Hospital, N.Y.	1	R. K.	F.	11 yr.	5, 6	25	Rapid reduction	Rapid improvement	Rapid disappearance	5 d.	Ordinarily severe.	R. C.
Yorkville Hospital, N.Y.	1	E. H.	F.	16 mo.	21 (?)	15	.....	.....	.....	.....	Moribund. Death within 24 hours of injection.	D. M.
Sydenham Hospital, N.Y.	1	J. P.	F.	1 yr.	56, 57, 58, 59	60	None	None	.....	.....	Chronic.	D.
Hunt, Worcester	1	J. C.	M.	3.5 yr.	6, 7	30	Rapid reduction	Rapid improvement	.....	3 d.	Mild.	R. L.
Jennings, New York	1	E. B.	F.	4 mo.	21, 22, 23, 24, 26,27,28,30,32	134	.....	.....	.....	.....	Ordinarily severe. After 6th injection no fluid by puncture. Death from hydrocephalus on 54th day.	D.
Read, Brooklyn	1	?	M.	8 yr.	3, 4	60	.....	Prompt improvement	.....	5 d.	Ordinarily severe.	R. L.
Snowden, Peekskill, N.Y.	1	M.	M.	38 yr.	11, 12, 13	88	.....	.....	Rapid disappearance	.....	Severe. Death on 15th day.	D.

TABLE I.—*Continued.*

Reported by	Case No.	Name	Sex	Age	Days of disease when serum injected	Total amount serum injected	Influence on temperature	Influence on special sympt.	Influence on Diplococci	Period of fever and sympt.	Type of disease and remarks	Result
Williams, Rochester	1	?	M.	adult	2	15	.....	.....	.....	.....	Severe. Death 12 hours after injection.	D. M.
Teeter, Newark	1	C. J.	M.	12 yr.	8, 10, 11, 12, 13, 14, 15	165	Gradual reduction	Gradual improvement	Gradual disappearance	.....	Severe. Purulent exudate with improvement and sudden death in 5th week from hydrocephalus.	D.
Harris, St. Louis	1	A. E.	F.	23 yr.	4, 5, 6, 10, 13, 15, 20	144	None	None	.....	.....	Severe. Complicated with pregnancy and abortion. Purulent exudate. Death on 23d day.	D.
Diefendorf, New Haven	1	A.	M.	12 yr.	8, 10, 13, 18	135	Gradual reduction	Gradual improvement	.....	12 d.	Ordinarily severe.	R. L.
Flexner, Louisville	1	Z.	F.	16 yr.	6, 7, 14, 15, 16	150	Slow reduction	Slow improvement	.....	.....	Ordinarily severe.	R. L.
Idem	2	R.	M.	14 mo.	16, 17, 18	60	.....	.....	.....	.....	Ordinarily severe.	D.
Mohr, Ottawa, Canada	1	M. McD.	F.	15 yr.	15, 17, 19, 20, 34, 36	150	Gradual reduction	Gradual improvement	Prompt disappearance	.....	Ordinarily severe. Purulent exudate.	R. L.
Ker, Edinburgh	1	C. S.	M.	4 yr.	5, 6, 7	90	Gradual reduction	Gradual improvement	.....	10 d.	Ordinarily severe. Deafness.	R. L.
Idem	2	A. M.	F.	3 yr.	4, 5, 6, 8	120	Gradual reduction	Gradual improvement	.....	.....	Ordinarily severe.	R. L.
Idem	3	M. Q.	M.	18 yr.	9,10,11,12,17	150	Gradual reduction	Gradual improvement	.....	10 d.	Ordinarily severe.	R. L.
Idem	4	C. D.	F.	7 yr.	2	30	.....	.....	.....	.....	Fulminant. Death within 24 hours of injection.	D. F.
Idem	5	E. M.	F.	21 yr.	6	30	.....	.....	.....	.....	Severe. Complicated by mitral disease. Death 9 hours after injection.	D. M.
Idem	6	T. S.	M.	7 yr.	4, 5	60	None	None	.....	.....	Severe. Purulent exudate. Death on on 12th day.	D.
Idem	7	E. F.	F.	19 yr.	2, 3, 4	85	None	None	.....	.....	Very severe. Death on 6th day.	D.
Idem	8	P. W.	M.	30 yr.	5, 6, 7	85	None	None	.....	.....	Very severe. Purulent exudate. Death on 8th day.	D.

Idem	9	W. B.	M.	13 yr.	2, 3, 4, 6, 8, 12, 17	210	.....	.....	.....	.....	Ordinarily severe. Relapses. First attack 7 days. Second attack 3 days. Death on 19th day.	D. R.
Idem	10	C. G.	F.	4 yr.	2, 3, 4	45	Rapid reduction	Rapid improvement	Rapid disappearance	.....	Ordinarily severe.	R. C.
Idem	11	D. C.	M.	10 mo.	5, 6, 7, 8, 9	75	None	None	.....	.....	Very severe. Death on 12th day.	D.
Idem	12	A. M.	M.	12 yr.	12, 13, 14, 15	120	Rapid reduction followed by relapse	Gradual improvement followed by relapse	.....	.....	Ordinarily severe. Relapse on 7th day. Death on 18th day.	D. R.
Idem	13	M. P.	F.	48 yr.	4, 5	60	Prompt reduction	Prompt improvement followed by relapse	.....	.....	Ordinarily severe. Death on 20th day.	D. R.
Idem	14	J. G.	M.	14 yr.	8, 9, 11, 12, 14, 15, 25, 27, 37, 38, 58, 59, 60, 62	360	None	None	.....	.....	Severe.	D. R.
Idem	15	P. B.	F.	4 yr.	6, 7, 8, 9, 12	105	Gradual reduction	Gradual improvement	.....	.....	Severe.	R. C.
Idem	16	J. S.	F.	5 yr.	2, 3, 5, 6, 8, 10	150	Gradual reduction	Gradual improvement	Prompt reduction	.....	Very severe.	R. L.
Idem	17	R. S.	M.	5 yr.	5, 6, 8, 10, 13	145	Prompt reduction	Prompt improvement	Prompt reduction	.....	Severe.	R. R.
Idem	18	A. S.	F.	6 yr.	6, 7	60	.....	Rapid improvement	.....	.....	Ordinarily severe. Normal temperature.	R. C.
Idem	19	H. S. N.	F.	2 yr.	4, 5	60	Rapid reduction	Rapid improvement	.....	.....	Mild.	R. C.
Idem	20	J. R.	M.	17 yr.	2 (two), 4, 5	120	Rapid reduction	Rapid improvement	Rapid reduction	.....	Severe. Purulent exudate.	R. L.
Idem	21	P. P.	M.	22 yr.	7, 8, 9, 12, 14, 16	210	None	None	.....	.....	Very severe.	D.
Idem	22	R. B.	M.	2 yr.	5, 6, 7, 13, 14	120	Prompt reduction	Prompt improvement	Rapid disappearance	.....	Ordinarily severe.	R. R.
Idem	23	G. D.	M.	26 yr.	5, 6, 7	120	Prompt reduction	Prompt improvement	.....	.....	Severe.	R. C.
Idem	24	E. M.	F.	17 yr.	5	15	.....	.....	.....	.....	Severe. Moribund. Death 3 hours after 1st injection.	D. M.
Idem	25	S. McG.	F.	12 yr.	4, 5, 6	90	Prompt reduction	Prompt improvement	.....	.....	Ordinarily severe.	R. L.
Idem	26	J.W.McC.	M.	2 yr.	4, 5, 8, 9	120	.....	Prompt improvement	.....	.....	Ordinarily severe. Normal temperature.	R. R.
Idem	27	J. McD.	F.	1 yr.	7, 8, 9, 11, 13, 16, 17	195	Gradual reduction	Gradual improvement	.....	.....	Mild.	R. L.
McQueen, Ayrshire	1	?	M.	6 yr.	? (two injections)	60	Rapid reduction	Rapid improvement	.....	.....	Ordinarily severe.	R. C.