

CEREBRO-SPINAL FEVER IN GLASGOW, 1929.

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(With 1 Chart.)

INTRODUCTION.

IN 1929, for the third time in the present century, cerebro-spinal fever occurred in Glasgow in epidemic form. The first epidemic, which was by far the most severe, was in 1906-8, the total number of cases recorded being 1363. Descriptions of the events of these years were given by Dr A. K. Chalmers (1906) in the *Annual Reports of the Medical Officer of Health of Glasgow for 1906 and 1907*, and also in a paper read before the Epidemiological Society. In this outbreak the fatality rate of cases treated in hospital was given as 74·8 per cent. by Currie and Macgregor (1908). The total number of cases admitted to hospital was 910. The incidence of the disease was highest during the months of January to May of 1907, and there was a slight recrudescence in the same months of the following year. The characteristics of the epidemic form of cerebro-spinal fever were present in so far as there occurred several instances of multiple infection in the same house, and a number of cases showed the exanthem peculiar to the disease.

From 1908 to 1915 the disease only occurred in the sporadic form. In 1915 and 1916 there was a considerable increase in prevalence. This was the local manifestation of what was being experienced in most of the populous parts of Britain, and was clearly associated with the outbreaks in military centres. It was definitely established that crowding together of soldiers in barracks and hutments which were unsatisfactorily ventilated, together with fatigue and exposure, were the prime factors in the spread of cerebro-spinal fever at this time. Many outbreaks amongst bodies of troops and sailors were reported in the journals and a large amount of work was published on the subject of the part played by carriers in the spread of the disease. It was only to be expected that the general population should also be to some extent affected.

After these outbreaks of the War years, cerebro-spinal fever in Glasgow kept to its purely sporadic form. The following shows the number of cases registered per annum from 1914 to 1929:

1914	47	1922	67
1915	179	1923	64
1916	143	1924	66
1917	83	1925	62
1918	75	1926	66
1919	79	1927	79
1920	85	1928	102
1921	63	1929	203

The case mortality was 60 to 70 per cent. In 1928 there was a slight increase in the notifications, due to a slightly increased prevalence in the first four months of the year, but it was not till the early months of 1929 that there was any indication that the disease was acquiring an epidemic tendency.

THE EPIDEMIC OF 1929.

The first signs that the disease was assuming an epidemic prevalence was the occurrence of a series of cases, mostly acute, some being of the fulminating type. This group occurred amongst boys, aged 14 to 18 years, who were in the habit of attending a recreation hall in the eastern division of the city. Two of the cases showed the petechial rash of "spotted fever." A fuller description of this series is given later.

There is no record of the occurrence of the specific petechial rash of cerebro-spinal fever in Glasgow since the epidemic of 1906-8, although such rashes were observed elsewhere. When it was noted that an unusual movement was taking place, the Public Health Department issued a circular letter to medical practitioners warning them of the possibility of an outbreak, and emphasising some of the salient features of the more acute forms of the disease. There is ample ground for belief that notification was fairly complete in consequence.

All cases were personally investigated by the medical staff of the Department during the months of January to June, 1929, and special enquiry was made into the relevant epidemiological features of each case. Practically every case was hospitalised.

Bacteriological examination, apart from that undertaken in actual cases, was confined almost entirely to the examination of naso-pharyngeal swabs from school contacts prior to their return to school. There was no routine examination of swabs from all contacts, nor was any attempt made to trace and isolate carriers. Sir Arthur Newsholme, quoted by Hamar (1928) in his description of the disease in London in 1916, estimates that practically every individual in the whole population at one time or another harboured the meningococcus for varying periods during the outbreak of that year. The nature of meningococcal infection, which even in a widespread epidemic seldom gives rise to actual case to case infection, is sufficient proof of the hopelessness of dealing with it by determining and isolating carriers. Of far greater administrative importance is attention to conditions regarding hygiene generally, and to overcrowding and bad ventilation in particular.

AGE AND SEX INCIDENCE—MORTALITY.

The total number of cases occurring between January and the end of June was 134. Table I shows the age and sex distribution, and case mortality.

All the cases dealt with in this report were either bacteriologically confirmed or there was convincing evidence from a clinical standpoint as to the correctness of the diagnosis. The number of cases in which the meningococcus was recovered from the cerebro-spinal fluid was 124, or 92 per cent. of the

Cerebro-spinal Fever

Table I.

Under 1 year: Male cases													30	
Female cases													12	
Total...													42	
Age in months	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	Total	
Male deaths	—	1	1	4	2	3	4	1	4	3	1	3	27	
Female deaths	1	1	—	1	—	1	1	—	5	1	1	—	12	
Male recoveries	—	—	—	—	—	—	—	—	—	1	1	1	3	
Female recoveries	—	—	—	—	—	—	—	—	—	—	—	—	—	
1-5 years: Male cases													22	
Female cases													17	
Total...													39	
Age in years	-2		-3		-4		-5		Total					
Male deaths	10		4		4		2		20					
Female deaths	9		2		3		1		15					
Male recoveries	1		1		—		—		2					
Female recoveries	1		—		1		—		2					
Over 5 years: Male cases													34	
Female cases													19	
Total...													53	
Age in years	-10	-15	-20	-25	-35	-45	-55	-65	Total					
Male deaths	2	5	9	3	4	1	1	—	25					
Female deaths	2	4	3	1	1	1	1	—	13					
Male recoveries	2	2	3	1	—	—	—	1	9					
Female recoveries	3	1	—	2	—	—	—	—	6					
Deaths													Recoveries	
Males													72	14
Females													40	8
Total...													112	22
Case mortality														
Males													83.7	
Females													83.3	

total. It should be observed that the mortality rate among cases in the present outbreak which were treated in hospital is rather higher than that of the epidemic of 1906-8 by about 10 per cent. This seems to point to the absence of any degree of success attributable to improved methods of preparing and administering the specific anti-serum. Experience in Glasgow does not confirm that of Flexner (1928) and others in America where the case mortality is said to be halved by the use of serum. It is not, however, our intention to go into details on this point here.

The case mortality rates of 40 to 50 per cent. quoted in the army reports¹ dealing with the War period are much lower owing mainly to the ages of the patients being more favourable to recovery.

From Table I it will be observed that the incidence in males is almost double that in females, and that this discrepancy is particularly marked in the first year of life and in the age periods over 5 years.

¹ *History of the Great War (1923). Medical Services, Hygiene of the War, 2, 239.* London: H.M. Stationery Office.

The disease was equally fatal in both sexes. The ages most favourable to recovery were 5-25, in which groups the case mortality was 67 per cent.

SOCIAL DISTRIBUTION.

Table II gives the distribution of cases according to the size of house and the number of inmates per room.

Table II. *Housing conditions of patients.*

	Cases	Inmates per room
Houses of 1 room	1	1
	7	2
	6	3
	12	4
	4	5
	3	7
	2	8
	1	9
	36	
Houses of 2 rooms	2	1
	9	1.5
	16	2
	19	2.5
	9	3
	2	3.5
	5	4
	3	4.5
	2	5
	1	5.5
68		
Houses of 3 rooms	2	1
	4	1.3
	3	1.7
	5	2
	3	2.3
	3	2.7
	1	3
	2	3.3
	2	3.7
	25	
Houses of 4 rooms	1	1.5
	2	1.75
	3	
House of 7 rooms (a house let-in-lodgings)	1	
Institution	1	
	<hr/> 134	

In one-apartment houses 36 cases, or 26.8 per cent., occurred. Of the total population of the city, according to the census of 1921, 16.5 per cent. lived in houses of one apartment. 50.7 per cent. of the cases occurred in two-roomed houses, and of the total population 45.5 per cent. occupied two-roomed houses. In houses of more than two apartments the proportion of cases to population rapidly diminishes. Cerebro-spinal fever is, therefore, essentially a disease of small, overcrowded and consequently badly ventilated houses. In the case of the T. family, *q.v.*, in which there were three fatal cases, the housing conditions were particularly bad, the rooms being extremely small and without

thorough ventilation. The same was true of the McC. family of four persons, who lived in a particularly unhealthy, ground floor, one-apartment house, and in this instance two fatal cases occurred. These were the only examples of family outbreaks, and they occurred under the conditions which are well known to favour the spread of cerebro-spinal fever.

TIME DISTRIBUTION OF CASES.

The attached histogram shows the time distribution of the cases in two-weekly periods. The largest number of cases occurred during the fortnights ending January 28th and February 25th, when there were 17 cases confirmed.

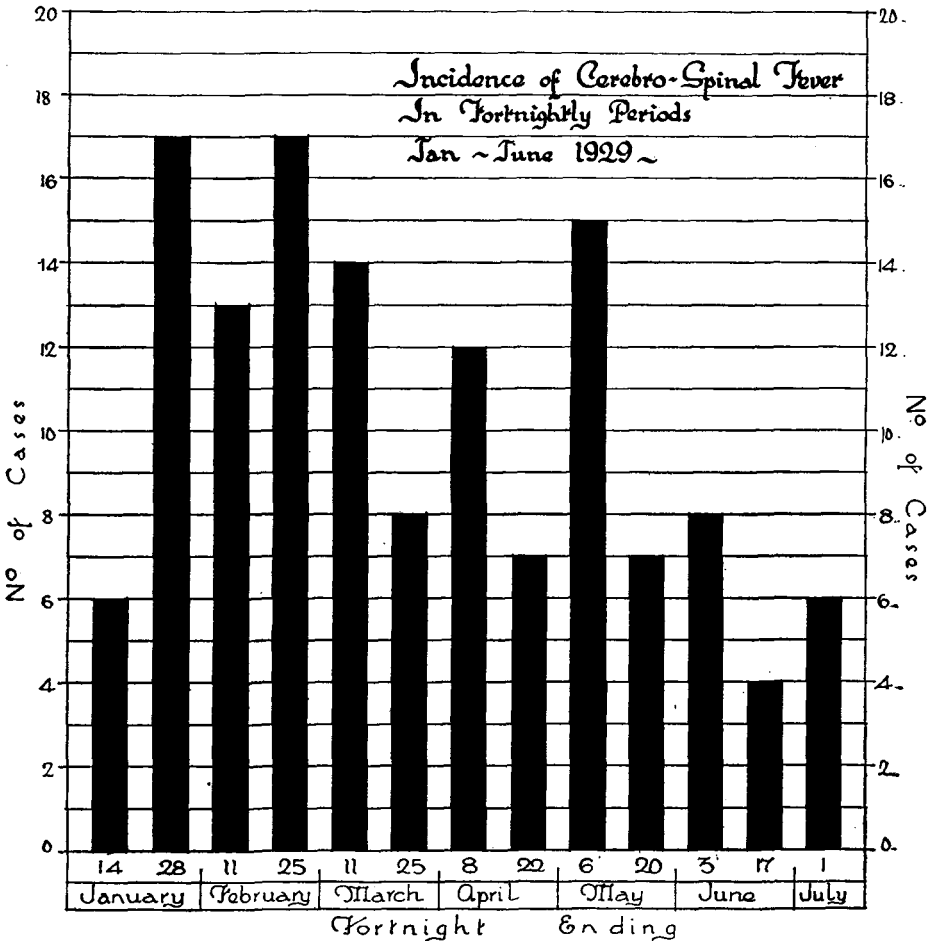


Chart 1.

After that the number of cases dropped, but there was a recrudescence during the fortnight ending May 6th, when the figure rose to 15; thereafter the number of cases gradually fell to a more uniform incidence, although still remaining rather higher than normal during the succeeding months of the year.

ASSOCIATION AND GROUPING OF CASES.

One of the indications of an epidemic tendency in certain diseases is the occurrence of definite case to case infection, or, as it might be better expressed with reference to cerebro-spinal fever, the occurrence of the disease in successive or almost successive hosts.

In the first six months of this year there were three definite groupings of cases, and in nearly all of these the disease was of a virulent character. The most important group centred round a recreation hall in the eastern division of the city. This hall was used as a sort of club room for youths, mostly between 14 and 18 years of age, where they foregathered of an evening to play cards, dominoes, billiards, etc. It was often rather crowded in the evening, and the atmosphere decidedly "fuggy." When the first cases were reported, careful search was made in the district for possible missed cases, and the local medical practitioners were warned of the existence of cerebro-spinal fever in an unusually acute and infectious form.

In all there were ten cases associated with this recreation hall. The first five sickened between January 28th and February 1st, 1929. One case, J.H., aged 15, was admitted to the Royal Infirmary with a diagnosis of acute appendicitis. He died on February 1st, and at the autopsy was found to have been suffering from cerebro-spinal fever. On investigation it was found that another boy, F.G., aged 14, a chum of the former, had been admitted to Belvidere Hospital as a case of pneumonia on February 2nd, and he also was subsequently diagnosed as cerebro-spinal fever. The third case, J.M., aged 15, died at home after a very brief illness commencing on January 31st and lasting less than 24 hours. The body was removed by the police to the Central Police Mortuary, where a post-mortem examination was carried out at the instance of the Fiscal. The cause of death was made out to have been "an acute infection." No bacteriological examination was made in this case, the Fiscal being satisfied that death was due to natural causes. There is little doubt, in the light of subsequent events, that this was a case of fulminating cerebro-spinal fever.

The next case, D.P., died at home after an illness of less than one day, and a death certificate was given by the police surgeon showing the cause of death as "due to natural causes." This case was not notified, but was picked up during the investigations which were carried out in the district. Sir Thomas Horder (1915) observes that, as in two of the cases noted above, deaths due to cerebro-spinal fever in the fulminating form are occasionally brought to the notice of the police for investigation as sudden death.

The next two cases, D.R., aged 15, and A.C., aged 14, were both admitted to Belvidere Hospital, the first as pneumonia and the second as cerebro-spinal fever. The case which was admitted as pneumonia was interesting in that clinically it resembled cerebro-spinal fever very closely, and showed the characteristic rash of the disease, but the meningococcus was never recovered from the cerebro-spinal fluid, and the fluid itself never showed anything more than a haze

of cells. Nevertheless, this patient was extremely ill on admission to hospital, and it seemed difficult to put any other label to his illness than cerebro-spinal fever. He recovered and was dismissed from Belvidere Hospital on April 24th, 1929.

His subsequent history is also interesting. At present, December 12th, 1929, he is completely blind, the blindness being "due to a progressive metastatic infection of the uveal tract, probably of the choroid in the first place, by the organism which caused the cerebro-spinal fever. Both eyes are passing into a shrivelled condition" (Dr A. J. Ballantyne's report¹). This may have been one of those cases of meningococcic septicaemia where the disease failed to obtain a firm hold on the cerebral meninges (see Marlow, 1929, and Gardiner, 1928).

After the explosion of these six cases there was a lull for a fortnight until on February 14th another boy—an Italian, M.T., aged 15—sickened with cerebro-spinal fever and died after a brief illness on February 21st. His was the second of three deaths which occurred in the one family.

On March 18th there was an eighth case, R.B., aged 19, and on April 25th the ninth case, J.H., aged 16, sickened.

A still further case occurred at the end of June. This also was a very acute infection which terminated fatally, and the patient was the second of two cases in one house, the first having sickened on May 14th, 1929, an acute fulminating case with a rash, which ended fatally after 2 days' illness.

In connection with this group of cases the following is worthy of note. A boy, 13 years of age, who was in the habit of frequenting the hall, became ill on February 2nd. He came home after 7.30 p.m. on that date shivering, and sick and vomiting. He complained of aching of the limbs, and his ailment was diagnosed as rheumatism by his doctor. On February 7th, when seen by a member of the staff of the Public Health Department, his temperature was 102° F. and his pulse rate 117. He looked ill, but there were no physical signs of meningitis. Nevertheless, in view of his association with other cases, he was sent to hospital for observation. Naso-pharyngeal swabs were examined and the meningococcus found. He was dismissed from hospital on February 20th, and the diagnosis on dismissal was "influenza and constipation." On February 27th he was again visited at home by one of the staff of the Department, and found to be in much the same condition as on February 7th—febrile and ill. Further swabs from the naso-pharynx showed the meningococcus to be still present. He was again admitted to hospital, where he made an uninterrupted recovery and has remained well since. Current opinion on the method of spread of infection of cerebro-spinal fever would not favour the belief that this boy was the source of infection of the other cases, but exactly what part he played in the spread of the disease it is impossible to say.

At one period during the War great importance was placed on the necessity for segregating carriers, but it was ultimately realised that in the absence of other measures mainly directed towards ventilation and overcrowding, segre-

¹ Unpublished. Dr A. J. B., under whose care the patient now is, kindly furnished the report quoted.

gation was not of much use. At present there seems little evidence that any control over cerebro-spinal fever can be established by isolating carriers. The meningococcus seems to find it necessary to pass through many throats before it can produce cerebro-spinal fever.

The following is a list of the cases associated with the recreation hall:

Name	Age	Date of sickening	Admitted to hospital	Died	Duration of illness	Meningococcus found	Rash present
J. H.	15	30. i. 29	31. i. 29	1. ii. 29	2 days	Yes	No
F. G.	14	28. i. 29	2. ii. 29	26. iii. 29	60 "	"	"
J. M.	15	29. i. 29	—	30. i. 29	1 "	No	Yes
D. P.	15	3. ii. 29	—	4. ii. 29	1 "	"	No
D. R.	15	31. i. 29	1. ii. 29	—	21 "	"	Yes
A. C.	14	1. ii. 29	8. ii. 29	—	16 "	Yes	"
M. T.	15	14. ii. 29	16. ii. 29	21. ii. 29	6 "	"	No
R. B.	19	18. iii. 29	21. iii. 29	10. iv. 29	23 "	"	Yes
J. H.	16	25. iv. 29	28. iv. 29	—	9 weeks	"	No
C. McC.	15½	30. vi. 29	7. vii. 29	12. vii. 29	12 days	"	"

Connected with this group of cases there were two separate family outbreaks—both mentioned already (p. 423), one in which three members of one family sickened and died after very short illnesses, and the other where two fatal cases occurred. The first was that of the family T.—Italians who kept an ice-cream shop. They lived in a house of two apartments and were eight in number, the youngest being 13 years of age. Theresa, aged 19, was the first to sicken, and on February 12th she turned suddenly ill with what was considered to be influenza. Cerebro-spinal fever was diagnosed on February 14th, when she was admitted to the fever hospital. One of us (R. J. P.) visited the house on the following day, and found two other cases, who had sickened earlier on that day, lying together on a single bed, both in an extremely ill condition. These were obviously cases of cerebro-spinal fever and were immediately removed to hospital. Michael, mentioned above as having been a frequenter of the recreation hall, died on February 21st. Dominic, aged 19, developed the characteristic rash 14 to 18 hours after sickening and died in hospital on February 19th. This family lived under very overcrowded conditions. With regard to the shop it was used partly as a small restaurant where hot peas, ice-cream, etc., were consumed on the premises, but it was never overcrowded or congested with customers. There seems no reason to incriminate conditions pertaining to the shop as being in any way responsible for the infection of the family. One girl, Netta, aged 21, had suffered from a mild influenzal attack towards the end of January, and a boy, aged 13, had had sore throat some 6 weeks before. The naso-pharyngeal swabs taken from all the contacts were examined for the meningococcus with negative result. It is conceivable that although Michael was the second to become clinically affected he may have been the means by which the disease was introduced into the family.

The other family outbreak (McC.) involved the deaths of two male cases, aged 18 and 14. The elder sickened on May 14th with fulminating cerebro-spinal fever, and died after 2 days' illness. He showed the characteristic petechial rash. The other boy, aged 14, was a frequenter of the recreation hall.

He sickened on June 30th, and died after 12 days' illness. These two family outbreaks must be regarded seriously as denoting the awful potentialities of cerebro-spinal fever when with heightened virulence it attacks persons in overcrowded houses.

A most interesting association of two cases occurred in the western district of the city. An infant, 7 days old, died after an illness of 7 hours' duration, and the attention of the Public Health Department was drawn to the case by the practitioner in charge by reason of the presence of a petechial rash suggestive of cerebro-spinal fever. An autopsy was carried out, and the meningococcus was recovered both from cisternal puncture and from the base of the brain. A child, aged 10, who lived on the flat above had come down to assist in nursing the baby on the morning of its birth. This girl was on that morning complaining of a headache, and on the following day she was removed to hospital with cerebro-spinal fever which proved fatal a week later. The presumption is that the infant was infected shortly after birth, and 7 days later developed the disease in a fulminating form. This is probably the youngest case recorded. It is also interesting to note that, although the post-mortem did not take place till 30 hours after death, the meningococcus was recovered in culture. Living organisms were also obtained from fluid withdrawn by cisternal puncture 12 hours after death.

Two other associated cases occurred where the patients were brothers but did not live in the same house. One brother was in hospital—a general hospital—suffering from a disease which subsequently proved to be cerebro-spinal fever. Before his condition was diagnosed he was visited by his brother, who sickened at home some 10 days later. It is very unusual to be able to trace case to case infection after such a slight contact. We do not care to use the term “incubation period” in connection with cerebro-spinal fever, but these last two examples would point to a space of time up to 10 days as being the incubation period.

A further apparent association occurred in three persons who inhabited houses in the same street. Two of these cases were accustomed to visit each other, but the association was too indefinite to justify further description.

DISTRIBUTION IN SPACE.

The largest concentration of cases occurred in the Calton area. Smaller groupings were also noted in Partick and Kinning Park, but apart from these the disease seemed to attach itself to no particular locality, the great majority of the cases being widely separated. The better class residential districts were completely exempt, as would be expected.

ASSOCIATION WITH INFLUENZA.

A considerable amount of attention has of recent years been paid to the apparent epidemiological association of influenza with cerebro-spinal fever, poliomyelitis, and epidemic encephalitis. The writings of Hamar, Crookshank

and others are well known. The setting of the present outbreak of cerebro-spinal fever forms almost a classic localised example of their thesis. Glasgow suffered in January and February of 1929 from a particularly severe type of influenza, which raised the death-rate in the last week of January to 50·3, which is almost a record for the city during the present century. This rate is the highest since 1922.

Cerebro-spinal fever was intermingled with this outbreak of influenza, and lingered on for some months after it had passed. Another point is that, in 1928, there was in Glasgow a small but quite definite epidemic of acute anterior poliomyelitis which has been fully reported by Halliday (1929). This epidemic occurred during the months of July–October of that year. According to the descriptions given of influenza epidemics these other diseases usually occur as “trailers” following the influenza, but they sometimes precede it or are contemporaneous with it, and one is very much tempted to postulate some subtle relationship between the causes producing these diseases.

It is not possible to show that the incidence of influenza was any greater amongst the families where cerebro-spinal fever occurred than it was in the population generally. In the 131 houses visited by cerebro-spinal fever, influenza was noted to have been present in 33, and this is not different, to any significant degree, from the general incidence of influenza in the city.

At present, however, until a more scientific basis can be found for associating these four diseases, it is not wise to place too much reliance upon what may be merely coincidence, or the result of the interaction of causes which might be easily explainable apart from the “humid” theory.

SYMPTOMATOLOGY.

The ordinary signs and symptoms of cerebro-spinal fever are so well known as not to require any description here, but, when taking case histories of patients, the variety of the symptoms described as present in the earliest stages of the disease was very striking. It may be stated that the main symptoms were no definite guide to practitioners in attendance in arriving at an early diagnosis. In the majority of cases the diagnosis of cerebro-spinal fever from tubercular meningitis, and even from such diseases as pneumonia, had to be assumed, and the final verdict left to the results of further observations made in the hospitals.

Lumbar puncture, as a means of diagnosis, is very rarely performed at the homes of the patients, and, in fact, it is very seldom practicable and would not be without its dangers.

Altogether during the six months' period under review there were 210 notifications of cerebro-spinal meningitis, of which only 134 were regarded as confirmed; of the remainder, cases of tubercular meningitis formed a considerable part.

The primary symptoms of onset varied very considerably and with the following frequency according to the histories obtained. Vomiting occurred in

94 cases; headache in 62; pain and hyperaesthesia generally in 48; convulsions in 29; and coma as an early symptom in 24. Rigidity of the neck and limbs was present in 13 cases, and delirium in 12. Among other early symptoms less frequently observed were screaming, sore throat, catarrh, and squint. Herpes labialis, which is so frequently associated with cerebro-spinal meningitis, was only observed in three cases at the onset.

The petechial rash, which could be described as characteristic of cerebro-spinal fever, was observed altogether in 17 cases. In some of the most acute the rash appeared within 12 hours of sickening, but on the whole it cannot be counted upon as being of great help in the early diagnosis of the disease.

THE RASH.

The rash of cerebro-spinal fever is a petechial eruption commencing as reddish spots which rapidly deepen in colour, and ultimately become purple. The elements appear particularly on the forehead, the arms and legs, and the abdomen. In some instances the rash was profuse, but the spots could never be described as resembling flea-bites. They were more blotchy, and varied in size from pinhead to 1 inch or more in diameter. The margins were fairly sharply defined, and the outline irregular. For example, in some instances it was triangular, and in others crenated, like the map of Scotland. The individual elements showed some variation in colour one from another. Some were raised and a little indurated, offering some resistance to palpation. Of the 17 cases which showed the rash four recovered.

POST-MORTEM APPEARANCES.

The following are notes from the post-mortem examination in the case of a boy of 13 years of age who died after a brief illness, and give some indication of what is to be expected in a fulminating case.

The body was well nourished, and showed extreme lividity over the whole surface, with the exception of the abdomen. There were numerous purpuric spots and blotches on forehead, face, right side of chest and groins.

The principal and most characteristic changes on the part of the internal organs were those noted in the brain and suprarenal bodies.

The brain surface was markedly congested, but there was no evidence of exudate in the meninges beyond a slight opacity in the deeper sulci of the cerebral hemispheres, and some pinkish fluid in the pia-arachnoid, between the lobes of the cerebellum. The vessels of the white matter were congested.

The suprarenals were enlarged, soft, and resembled blood clot both in colour and consistence. These appearances of the suprarenals were characteristic and were noted in all of the autopsies which were performed in similar cases of fulminating cerebro-spinal fever. A case of the same type showing this feature is described by Burton and Chalmers (1930), and their case was one of the epidemic with which we are at present dealing. MacLagan and Cooke (1916) also emphasise this point.

Haemorrhagic spots were visible in the stomach wall and in the wall of the small intestine; the mesenteric glands were enlarged and some were haemorrhagic.

In the chest there was excess of straw-coloured fluid in both pleurae, and some ecchymosis in the surfaces of the lungs.

The spleen was enlarged, dark in colour, and rather diffuent.

In the case of the baby, aged 7 days, already mentioned, who died on 2. iii. 30, the post-mortem examination showed the same appearances of the suprarenal bodies but slightly less marked. There were petechial spots in the skin, and small sharply defined pin-head petechial spots in the visceral pleurae.

The spleen was enlarged and very engorged, and the stomach and intestine showed petechial haemorrhages.

In the brain there was a trace of pus formation in some of the sulci, and congestion of the superficial vessels.

The bacteriological examination in this case was carried out by cisternal puncture 12 hours after death, and by examination of the exudate from the brain surface at the autopsy, 30 hours after death. By both of these procedures living organisms were obtained in culture.

A feature of importance in this case is the very early age at which the child contracted the infection, and the very acute progress of the disease to a fatal issue. She was infected by direct contact with a case of cerebro-spinal fever on the day of birth.

A NOTE ON CASES RECOVERED.

The 22 cases which recovered were all followed up in the early months of 1930, when it was found that 18 were showing no sequelae. Of the remaining four, one was blind (D.R.—already described), one was completely deaf, and two suffered from headache and nervousness, and were temperamentally slightly unstable.

As an apology for this somewhat lengthy paper it may be stated that outbreaks of this kind are rather rare at the present time. Also, the fulminant type of the disease is a condition which will not come under the personal notice of many practitioners, and it is perhaps well that its possibilities be kept in mind. In studying an incident such as the invasion of the T. family, where three deaths occurred in rapid succession, the devastating potentialities of the disease can be realised. Further, it is almost certain that, as the disease exists at present, such an occurrence would be impossible under good housing conditions.

Our thanks are due to the staffs of the hospitals for various particulars regarding the cases, and to Dr Buchanan for his post-mortem reports. We also gratefully acknowledge the assistance given by our colleagues in the Public Health Department.

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(*MS. received for publication* 26. v. 1930.—Ed.)