

## CHAPTER I

### HISTORICAL

*Nomenclature—First recorded appearance at Geneva, Hirsch's four periods. First period: Geneva, America, France. Second period: Gascony, Italy, America. Third period: Sweden, Germany, Russia, Greece, Ireland, America. Fourth period: England, Cape Town, Poland, France, Italy. Fifth period: Identity of Posterior Basic Meningitis and Cerebro-spinal Fever established; France, America, Portugal, Silesia, Ireland, Scotland. The English epidemic of 1915. Outbreaks in tropical countries. Geographical distribution. Influence of carriers and suitable conditions.*

Cerebro-spinal fever may be defined as an infection of the meninges caused by a definite organism, the diplococcus meningitidis of Weichselbaum. The disease occurs in epidemics, which appear at varying intervals, and whose spread appears to follow no definite path. Sporadic cases of this disease are generally present, though in small number, and their identity with the epidemic form has been established by the most rigorous bacteriological proof. This disease has received many names, in whose elaboration practical convenience has been sacrificed to attempts at scientific accuracy. Epidemic cerebro-spinal meningitis accurately defines the main features of the disease, but is cumbersome. Moreover, since every infection of the brain by a pus-forming organism is cerebro-spinal in character, owing to the anatomical relations of its membranes, the term cerebro-spinal meningitis appears unnecessarily prolix. Meningococcal meningitis has been suggested by Heiman and Feldstein. This name has the merit of accuracy, but is clumsy in use, and has the further drawback that its general adoption would prevent any attempt to fix upon an adequately descriptive English name. The traditional names of common diseases remain the same through all the chances and changes of pathological fashion. The terms typhus, typhoid and cholera appear to be immutably fixed in medical literature. The name cerebro-spinal fever would seem to

combine the advantage of pathological accuracy with popular convenience. It has the further merit that it indicates on the one hand the kinship of this disease with the acute specific fevers, and on the other defines the essential pathological lesion upon which the symptoms depend. If it is desired to draw attention to the epidemic nature of the disease, the term epidemic meningitis is both accurate and descriptive, since, as has been mentioned above, the term cerebro-spinal meningitis is redundant. Various other names have from time to time been given to the disease: of these the one which has attained the greatest measure of popularity is Spotted Fever. This name, which was given to the disease on its first appearance in America, has the drawback that it draws attention to a far from constant symptom. In Italy the disease is called Tifo Apoplettico. In Germany the popular name Epidemische Genickstarre is derived from another marked symptom. Whether the disease is an entirely new one or has always existed, is a matter largely for antiquarian speculation. Some authors think that it can be identified in Hippocrates or Celsus. It would seem improbable that until the last century the disease was ever common in these islands, if indeed it ever reached them. Search has therefore revealed no description which can be identified with the disease in the works of Sydenham or Huxham. It has been conjectured that the petechial fevers, references to which lingered in text-books until well into the last century, may have been of this nature, but this is a matter of mere speculation.

The first authentic account of an epidemic is that which occurred in Geneva in 1805. This epidemic presents the singular feature that both the clinical symptoms and morbid lesions were so well described as to establish once and for all the identity of the disease. The outbreak occurred in March 1805; the first cases appeared in Eaux-Vives, a suburb on the left bank of Lac Lemman; others subsequently occurred at Pâquis on the other bank of the lake. The epidemic does not appear to have been particularly widespread, since only thirty-three persons died of the disease. The interest lies in the contemporary records. Vieusseux writes: "The initial symptom was a sudden failure of strength, the expression was anxious, the pulse feeble, sometimes threadlike, in a few cases hard and bounding. There was violent headache, in the main frontal. The headache was followed by vomiting of green matter, by stiffness of the spine, and in infants by convulsions. The body shewed livid patches after death, occasionally during life." Matthey has left behind a description of the morbid appearances, to which the pathologist of to-day could have little to add. "The vessels of the meninges," he

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says, “ were notably congested. A gelatinous humour covering the brain was markedly tinged with blood. There was fluid in the ventricles. The choroid plexus was of a deep red colour. The base of the brain was covered by yellow puriform matter, with no obvious change in the underlying cerebral tissue. This exudation covered the optic chiasma and extended backwards towards the cerebellum, reaching for the space of an inch down the vertebral canal.”

From the date of this, its first appearance, the disease was epidemic at various places both in Europe and America for the next ten years. Throughout the last century and up to the present day it has been epidemic for a few consecutive years, and quiescent periods of varying length have then followed. Hirsch has summarized these epidemics in an exhaustive and masterly article in his *Treatise on Geographical and Historical Pathology*. This author regards the epidemic prevalence of the disease as grouping itself into four periods. The recent epidemics both in the Old and New World constitute a fifth period. The periods in Hirsch’s classification may be chronologically arranged as follows. The first period from 1805 to 1815. The second period from 1837 to 1850. The third period from 1854 to 1875. The fourth period from 1876 to 1886. The fifth period may be regarded as beginning in 1896 and stretching to the present day. In reviewing the past history of the centres from which outbreaks spread, and the lines of march along which the disease travelled, its propagation appears at first sight to follow no appreciable law. Read in the light of our present knowledge, the part played by the carrier in the propagation of the disease affords a clear explanation of the records of these long past epidemics. Assuming the presence of a few permanent carriers, it only requires outside conditions which facilitate the spread of the organism, to create a large number of temporary carriers. As Arkwright has remarked, “The number of the carriers constitutes the epidemic.” The persons who fall sick of the disease are thus but the concrete evidences of the wide diffusion of temporary carriers. The apparently enigmatical march of the disease in the old epidemics acquires a fresh interest and meaning, when an attempt is made to trace the path of these long past carriers. In reviewing the first epidemic wave, its place of origin may be taken to be at Geneva in March 1805. Its next appearance was in the New World in March 1806 at Medfield in the Commonwealth of Massachusetts. As to whether any emigration from Switzerland took place there is no evidence, but there has always been interchange between Geneva and North America. From Medfield the disease spread through the

New England States of Connecticut, Vermont and Maine, where it recurred in isolated epidemics until 1816. The disease spread to Canada in 1807, to Virginia, Kentucky and Ohio in 1808, appearing in the State of New York and in Pennsylvania in 1809. This American epidemic was remarkable for the coining of the popular name of spotted fever, by which name it is described in a book entitled *Treatise on a Malignant Epidemic called Spotted Fever*, written by North in 1811.

In Europe the disease appeared amongst the Spanish prisoners at Briançon in 1807. In 1811 it occurred at Dantzic, then in French occupation. An outbreak occurred in the garrison at Grenoble in February, March and April 1814. The garrison of Paris was attacked during the same months. In the spring of 1815 it occurred at Metz and Pont à Mousson. In the same months an epidemic occurred in Albenga and some of the surrounding villages. This epidemic was of importance, since it was described by Sassi in 1815 under the title *Saggio sulla spinite epidemica che ha regnato in Albenga*, and was also described by Mela and Airaldi. It is a matter for surprise that a remote city on the sea-board of the Ligurian Alps should be the seat of an epidemic confined apparently to the valley in which it stands. When viewed from the point of view of the possible importation by carriers, the problem appears simpler. From Albenga the road leads up to the main pass into Piedmont, which is the only practicable one along a stretch of mountain ranges 70 miles in length. At the mouth of the river, on which Albenga stands, is the safest roadstead between Nice and Genoa, where to-day brigantine and felucca can be seen sheltering from any sudden gale. The sea-borne traffic was in those days considerable, the coast road having been a mule path less than twenty years before the epidemic. Infection could thus reach Albenga both by land and sea. Once established the infection might well be limited, as every one of the valleys bordering the shores of the gulf of Genoa is a country apart from its neighbours, each of them to this day presenting marked individual differences in dialect.

From the year 1815, with the exception of two small and purely local outbreaks in America, the disease remained quiescent until the second period, which Hirsch dates from 1837 to 1850. The first appearance of the malady was in the Landes and the valley of the Adour in 1836. Ferron, who has made an exhaustive study of the beginnings of this epidemic with most interesting results, regards the place of origin as Sengresse in the Landes. It was brought thither by a Spanish family who had left their native country on account of an epidemic, the nature of which is not recorded. The first person attacked was a maid-servant, thirty

years of age, who died on the 15th of February 1832. The Carlist war then raging in Spain had led to the concentration of a large body of troops in this district. Such a concentration of troops, for the most part in billets, involves a considerable amount of overcrowding. Further, their mere presence and their changes of station involve a relatively larger shifting population than is met with in ordinary civil life. The conditions were therefore similar to those which obtained in England in the winter 1914–15. The introduction of carriers in such circumstances enabled the disease to establish itself. From the Landes the contagion spread to the garrisons of Bayonne and Dax. Amongst the troops quartered in the Landes at the time of the first outbreak were the 18th Light Infantry, who were early attacked. They changed quarters to Bordeaux, where the disease continued. From Bordeaux the regiment marched to Rochefort, where fresh cases occurred in January and February 1838. In the latter part of this year the 18th moved from Rochefort to Versailles. At the latter station six men living in the same room were attacked in February 1839. The disease then spread through the regiment, and finally attacked the whole garrison. The further wanderings of this regiment next brought it to Chartres, where the disease again broke out. From Chartres the 18th moved successively to Metz, Nancy and Strasbourg, carrying with it the infection, which soon manifested itself in the garrison of each station. What Netter aptly terms the Odyssey of the 18th regiment presents a remarkable record of the human agencies which conveyed the disease from the Pyrenees to the Rhine. At the same time that the disease broke out in the Landes, it also appeared at Narbonne and Foix. In the following year it spread to Toulouse, Nîmes and Toulon. In the winter of 1839 it appeared at Avignon, and in the following winter it spread from the military to the civil population. In 1840 it appeared in Algiers, a considerable number of cases occurring amongst the garrison. Marseilles was attacked in the winter of 1841–2, and an outbreak of a malignant character occurred at Aigues Mortes. The latter town, with its houses crowded together within the circuit of its high surrounding walls, forms possibly one of the worst ventilated towns in the world, so that the gravity of the epidemic can hardly be a matter of surprise.

At the same time as the disease prevailed in France, it appeared also in Italy. The first outbreak occurred at Ancona in 1839; as Netter points out, French troops consisting of regiments of infantry and artillery had been maintained in this city since 1832. These regiments were constantly receiving recruits from France, whence it

may be inferred that the disease was brought by carriers. The brunt of the epidemic fell upon Naples and Calabria. The disease was present in Sicily in 1844. Corfu had already been visited by the disease in 1840, the infection having apparently been brought from the port of Sinigaglia near Ancona. In 1844 an epidemic occurred at Gibraltar, where the usual course of events was reversed, the civil population being the ones to suffer, while the garrison went largely unscathed. The strict regulations separating the military and civil population, which have always been in force in this station, probably account for the escape of the soldiers. In the spring of 1845 epidemic meningitis appeared in Denmark, Copenhagen in particular suffering. In the following winter it reappeared, Iceland also being affected. The United Kingdom had hitherto escaped the visitation of the disease, with the exception of two small epidemics which are cited by Ormerod. The first occurred in a Dartmoor village in 1807, but the recorded description by Gervis leaves the nature of the disease extremely doubtful. The second occurred at Sunderland in 1830; its description, however, was not published by Scott until thirty-five years later; so that the nature of the outbreak is without adequate confirmation. In the winter of 1845-6 the disease first appeared in an epidemic form in the workhouses at Dublin, Bray and Belfast. A few cases occurred also in Liverpool, and a small epidemic, as to whose nature some doubt exists, is recorded by Brown at Rochester in 1850. One case occurred at Haslar Hospital. In America a second visitation of epidemic meningitis occurred in 1841. The disease first appeared in Tennessee and Alabama. In 1845 and the following years outbreaks occurred in Illinois, Arkansas, Missouri and New Orleans. In 1848 it spread eastwards to Pennsylvania, and appeared in Massachusetts, but was limited to two small townships. A somewhat striking feature in this second visitation is the immunity enjoyed by the New England states, which suffered so severely in the first epidemic. It may be remarked, however, that the shifting character of the population in the States of the Middle West at this date may have had some influence on the propagation of the epidemic.

Hirsch's third period begins with the year 1854, when the disease appeared for the first time in Sweden. The method of spread of this epidemic differed in a marked manner from that observed in previous ones. In place of widely scattered isolated centres, the disease advanced in a systematic manner from the south-west in a northerly direction. With each succeeding annual recrudescence, fresh outbreaks occurred

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near the northern limit of the previous manifestation. The localities stricken by the epidemic of the year before escaped, while with each recurrence of the disease fresh districts were invaded. The disease also spread to a limited extent to Norway. In Germany a few small and unimportant epidemics had occurred in the earlier periods, in 1827 in Rhenish Prussia and in 1843 and 1851 at Leipzig. In the year 1863 the first serious outbreak took place in Silesia. In the following year East and West Prussia, Posen and Brandenburg were attacked. A year later Hanover and Brunswick were in turn invaded. In Southern Germany the epidemic first broke out at Nuremberg, and appeared coincidentally at other points until the greater part of Bavaria was attacked. Austria-Hungary seems to have been largely spared, with the exception of an outbreak in an orphanage at Vienna and small epidemics at Pola and Trieste. In Russia there were minor epidemics in Moscow and Warsaw, and a general epidemic in the Crimea. In Greece the disease first appeared in 1863–4 and was generally epidemic in 1868–9. Ireland was visited for the second time in 1866–7, an epidemic occurring in Dublin which affected both the troops and the civil population. The severity of this epidemic may be gauged by the frequency of haemorrhagic rashes, and the coincident high mortality. The disease also appeared at Bardney in Lincolnshire in 1867. In connection with this apparently isolated outbreak, it must be remembered that farmers near the recently reclaimed fenland were in the habit of employing gangs of reapers from Ireland, and that this may have been the method by which the infection was imported. In this epidemic wave, which was both more concentrated in point of time and more universal in distribution than any of the preceding outbreaks, America did not escape. The main site of the epidemic was not, as on its first appearance, in the New England States, nor, as in the second, in those of what is now styled the Middle West, but mainly in the Southern States. Two outbreaks anticipated the European epidemic, one in North Carolina, the other in the State of New York. The Civil War brought in its train all the attendant circumstances necessary to engender an epidemic—overcrowding of troops and, with their movements, a rapid shifting of the population. The disease broke out in the army of the Potomac during the winter of 1861–2, and was followed by a severe epidemic which ultimately involved the greater part of Pennsylvania; Indiana and Virginia were next attacked in 1866–7, and Kentucky also suffered. Finally, in 1873 the disease appeared in Massachusetts, and at Boston in 1874. The American epidemic began

earlier and lingered longer than the corresponding wave in Europe, which may be regarded as ending in 1869. After this date the appearance of the disease was for many years limited to slight and widely separated outbreaks.

Hirsch's fourth period begins in 1876, in which year there was a minor epidemic at Birmingham, nineteen cases being treated at the Queen's Hospital and several others occurring outside. In 1877 a small but relatively fatal epidemic occurred at Cape Town. In the succeeding years epidemics occurred in Silesia, Poland, Galicia and Hungary. There were also small epidemics in France, Sicily and Greece in the early eighties. In 1885–6 there were slight epidemics of the disease in Paris, Milan and Turin. The appearance of the disease in Vienna at this date has an historical interest in that it led to the isolation of the meningococcus. In 1885 the disease appeared in the Fijian Islands. In 1884 an epidemic occurred near Kilmarnock: of seven persons attacked, five died. In 1887 a series of cases in infants occurred in the north of London. These cases, which occurred in children, were distinguished clinically by marked retractions of the head, and pathologically by the presence of purulent meningitis. They were treated in University College Hospital, and during the same period two cases of purulent meningitis in adults were admitted with marked head retraction. Several other such cases occurred in the north of London. The cases at University College Hospital were observed by one of us, and were regarded by the late Sir William Gowers as probable examples of cerebro-spinal meningitis. Regarded in the light of subsequent experience, no doubt would occur as to the true nature of these cases. The outbreak in the eighties would appear to have been of a very minor character, and was followed by a period during which the disease remained largely quiescent.

Before the appearance of the next epidemic wave, which Osler regards as the fifth, the whole aspect of the disease as regards diagnosis had been entirely changed, by the isolation of the causative organism on the one hand, and the demonstration of the facility and safety of the operation of lumbar puncture on the other. From this time statistics, whether of the frequency of occurrence of the disease, or of its distribution, or of the results of treatment, acquire a new and more accurate significance. Another discovery was made in 1898, which has also proved to be of great importance from the epidemiological point of view. The identification of the meningococcus as the cause of posterior basic meningitis by Still put an entirely new aspect on the relation of one epidemic to another. Posterior basic meningitis was first

differentiated clinically as a form distinct from other varieties of meningitis by Gee and Barlow in 1878, but its relationship to epidemic meningitis was not then realized. Since its identification, posterior basic meningitis has been recognized every year in most of the large towns of England, and is to be looked upon as a sporadic form of epidemic meningitis which is always present. It is not necessary, therefore, to attempt to trace a direct spread for any particular epidemic, since the matter is more a question of the occurrence of the appropriate conditions than of the introduction of an extraneous infective agent. In the year 1898 there was a recrudescence of cerebro-spinal fever in France. America again suffered a visitation in this year, which has acquired significance from the researches then conducted by Councilman, Mallory and Wright. In 1901–3 a severe epidemic occurred in Portugal in which there were no less than 3000 cases, a heavy toll in proportion to the population. This epidemic has further interest in that lumbar puncture as a therapeutic method was then first employed by França. In 1904–5 a severe epidemic broke out in New York and the New England States. In New York alone in 1905 the cases amounted to 2755. This epidemic lasted with diminishing intensity through 1906 and 1907; its close is remarkable in that serum treatment was then first introduced by Flexner. Silesia was once more attacked, 3317 cases occurring there during the year 1907. In the year 1911 an outbreak occurred in the South-Western States of America. The succeeding year 1912 witnessed an extensive epidemic in the State of Texas, the disease originating in the larger towns, notably Dallas, and thence spreading to the country districts. In this epidemic Sophian had great opportunities of studying the clinical and bacteriological features of the disease and utilized them admirably.

In the four preceding periods of Hirsch's classification the United Kingdom had enjoyed a marked relative immunity. The Irish epidemics, and a comparatively unimportant one at Birmingham in the seventies, constitute the only outbreaks to which the term epidemic can fitly be applied. It was not until the earlier years of this century that extensive epidemics of the disease have occurred within these islands. In 1902 a small epidemic of forty or fifty cases occurred in Dublin, but no extension followed. In the end of the year 1906 cases began to appear in Belfast, a month later five members of one family were attacked within thirty hours of each other. The epidemic however did not begin in earnest until the end of February 1907. By the end of August, Robb had treated 275 cases in the Belfast hospitals.

During the next year ninety cases passed through the Belfast fever hospitals. Up to the end of 1914 only twenty-seven additional cases had come under Robb's care. From this it would appear that the epidemic was at its maximum in the first year, and had practically disappeared at the end of eighteen months. The total epidemic in 1907–8 consisted of 725 cases, about half of which therefore passed through Robb's hands. Almost simultaneously with the outbreak in Belfast cases began to appear in Glasgow. Currie and MacGregor state that the first cases were admitted into the Glasgow Fever Hospital in May 1906. For the rest of the year cases averaged about seven per month, but early in 1907 the disease became epidemic, and in April of that year forty-two cases were admitted. In the two years 1906–7 and 1907–8, 330 cases were admitted into the Belvedere Fever Hospital. The total number of cases in Glasgow was 1238; according to Chalmers more than a thousand of these occurred in the period 1906–7. This epidemic thus presents a marked similarity to that in Belfast as regards the abrupt decline noticeable in the second year. Edinburgh was also attacked during the same period but to a lesser degree, 138 cases occurring. During and after this main outbreak a few small and scattered epidemics have occurred up and down the country. The continuance of the disease led the authorities to make it notifiable in 1912. In the years 1912, 1913, 1914 about 300 cases were notified annually.

The early months of the year 1915 witnessed an epidemic, the first of its kind really to affect England as a whole; previous epidemics had been confined to the industrial towns of Scotland and Ireland. But conditions had entirely changed, the whole face of the country was covered by soldiers in training, by force of circumstances overcrowded in billets and exposed to changes of weather without any adequate means of drying themselves. Conditions such as these tended to a lowering of individual resistance, the changes being greater than would ever occur in any community of men during peace time. Owing to the system of billeting, soldiers and civilians were brought into close contact, consequently the disease was almost equally distributed amongst the military and civil population. The main distribution was in places where troops were most closely concentrated, namely on Salisbury Plain, at Aldershot, in the London area and the Eastern Counties of England. The statistics of the epidemic of 1914–15 are still in a condition too incomplete for any final study. Col. Reece has however published full statistics of the cases which occurred amongst the troops.

In the years 1906–7–8 extensive outbreaks occurred in West Africa