War Medicine Series

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TRENCH FEVER

BY

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It is generally stated that trench fever appeared for the first time during the war of 1914-18 and that it then disappeared, never to be seen again. But there is good reason to believe that the disease had long been endemic in parts of Poland and that it has persisted there until the present day, although it was regarded as a form of malaria or influenza by the country doctors, who alone were familiar with it. References to a *febris quintana* appeared in the Russian literature a century ago, and the Moldavia fever described by Dehio as occurring during the Russo-Turkish War in 1877 was almost certainly trench fever. Franke stated that he was familiar with the disease at Lemberg, in Galicia, before the last war, but that it was thought to be a form of influenza. The first German reference to trench fever was made by His in February, 1916; he described it as *febris wolhynica*, having observed it among German soldiers in the Volhynia province of Poland, just to the north of Moldavia and Galicia. The short form was subsequently known in Germany as "gaiter fever" and the long form as "five-day fever," corresponding with the earlier *febris quintana* in Poland. Trench fever was probably conveyed by lice-infested German soldiers from the eastern to the western front early in 1915, quickly spreading to the British and French Armies in France and Flanders, where its specific nature was recognized by Graham, and subsequently by Hunt and Rankin and by McNee, Renshaw, and Brunt, a year earlier than the first observations recorded by the Germans and the French and two years earlier than those of the Italians.

The clean clothes provided for all soldiers admitted into British hospitals prevented the conveyance of the infection to their homes when they went on leave, so that it never reached the civilian population in England. After the armistice the small army still remaining on the Continent lived under such good hygienic conditions that lice infestation, and with it trench fever, quickly disappeared, and no further cases developed after the first few weeks of 1919. Since that time it has never reappeared in the British Army. The low incidence of lice infestation in the Army in France in 1939 and 1940 would have prevented its development even if the disease had become endemic there; but it died out after the last war as quickly in all parts of Western Europe as in the British Army. Since it had never occurred in England, the herding of lice-infested people in air-raid shelters did not result in the appearance of the disease, as it certainly would have done in epidemic form had it been endemic in this country. There is, however, some evidence to show that trench fever remained endemic in Poland, though it was still not recognized as a distinct infection. In 1922 the extracellular rickettsia, *R. quintana*, which is believed to be the causal organism, appeared among the stock of 350,000 lice maintained for experimental work on typhus fever in Weigl's Pathological Institute in Lemberg, where it caused an outbreak of fever among the 50 people employed as feeders for the lice. The infection was named Weigl's disease, but it was clinically indistinguishable from the short form of trench fever. A similar event occurred in the same Polish laboratory again in 1939 (Herzl). It seems likely that the laboratory stock of lice became contaminated by the blood of feeders who had contracted the infection in Lemberg, where Herzl during the second epidemic actually isolated the organism in two patients unconnected with the Institute who were thought to be suffering from influenza.

If Weigl's disease is actually trench fever and if it has really continued to be endemic in Poland in the period between the two wars, there can be little doubt that it must have reappeared in the lice-infested Polish, Russian, and German armies. An epidemic of typhus fever is said to be raging in the German Army in Poland, the Ukraine, and the Baltic States, particularly Lithuania. A German announcement in December, 1941, explained that typhus-bearing lice had become more numerous and dangerous since winter began because of the difficulty of keeping clean and because the thicker clothing then worn harboured more lice, and official Russian reports describe the almost universal lousiness of German prisoners. A newspaper published in Cracow has recently stated that all schools in Volhynia, where trench fever was first recognized among German soldiers in the last war, have been closed because of the danger of a typhus epidemic among the children. As trench fever, like typhus, is conveyed by a lice-borne rickettsia, it seems likely that a trench fever epidemic would appear simultaneously; but the comparatively trivial symptoms might well not be recognized as those of a distinct disease by medical officers working in hospitals crowded with men seriously wounded or suffering from typhus. As I have been unable to discover whether trench fever was recognized by the Russian Army doctors during the last war, although it is certain it must have been at least as common among Russian soldiers as among the soldiers of the other European armies, it is natural that nothing should be known here as to whether it has reappeared in epidemic form during the present war. The fact remains that it will be of the utmost importance to keep British soldiers free from lice infestation if at a later period they come into close contact with the Russian Army in the Caucasus or elsewhere, not only in order to prevent typhus but also to prevent the much less serious but none the less incapacitating trench fever.

Trench fever first appeared in the British Army in France in the early summer of 1915. Its incidence rapidly increased until it accounted for about 15% of admissions into the clearing stations for all forms of sickness. It was estimated that about 45,000 per million men were lost each year by evacuation to the base on account of trench fever, and that 90% of them were off duty for at least 3 months. It did not occur in Gallipoli, but was brought to Salonica in December, 1915, and to Mesopotamia in May, 1916, by divisions which had previously served in France.

Pathology

It was soon recognized that the infection of trench fever was lice-borne, and later investigations showed that it was caused by a rickettsia, *R. quintana*, which develops in the lumen of the louse's gut, in contrast with the rickettsia of typhus, *R. prowazeki*, which invades the epithelial cells of its wall. Rickettsia is a well-defined group of minute living organisms, the position of which in relation to bacteria and viruses is still uncertain. *R. quintana* multiplies in the louse's gut and is then excreted in the faeces. It is transmitted to man when an area of skin on which the infected lice have been crushed is scratched. The conditions of life in the trenches naturally resulted in its incidence being much higher there than at the base, but cases occurred among hospital orderlies and occasionally in areas some distance from the front line.

Symptoms

The incubation period is between 15 and 25 days. Trench fever generally begins suddenly without premonitory symptoms, but it is occasionally preceded by a feeling of malaise for a day or two. The earliest symptom is a severe headache, especially frontal and behind the eyes; this is rapidly followed by pain in the lower part of the back and, on the second or third day, in the legs. The onset is sometimes extremely abrupt: the patient suddenly feels giddy and his legs give way under him. He may be very short of breath. He has to fall out if marching, and often has great difficulty in returning to camp without assistance. Pain in the neck may occur; it is occasionally accompanied by stiffness and may be severe enough to suggest the presence of meningitis, which cannot be excluded without lumbar puncture. The patient generally shivers at the onset, but there is never a definite rigor. He is sometimes flushed and often sweats profusely. The bowels are regular

or constipated, and there is no nasal or bronchial catarrh. The appetite is lost, the tongue is moist and often slightly furred, and occasionally mild pharyngitis is present. Herpes labialis sometimes occurs. There is usually no rash. The shins are always tender, even if the patient complains of no pain in the legs, but there is no muscular tenderness. The pressure of puttees may be enough to cause pain, and the patient often removes them in order to relieve his discomfort. In the first attack of pyrexia the spleen is sometimes palpable. Leucocytosis is often, but not always, present during each febrile period.

FIG. 1.—Temperature chart of the short form of trench fever.

In the short form of trench fever the temperature rises rapidly to between 102° and 104°, but the pulse rate is only slightly increased (Fig. 1). On the third or fourth day the temperature suddenly falls, generally to normal or subnormal, but there is no corresponding improvement in the symptoms. After an interval of a few hours it rises again, and then after another 2 to 5 days it falls to normal. On this occasion there is immediate relief from all of the symptoms. Sometimes the remission on the third or fourth day does not occur, the

In the long or periodic type of trench fever the temperature rises to between 101° and 104° on the first evening (Fig. 2). The initial attack is variable in duration: the temperature may be normal the first morning, high in the evening, normal the second morning, and rather less high the second evening than the first, after which it remains down. In other cases the first attack may last as long as 4 or 5 days, the temperature always being lower in the morning than the preceding and following evening, and reaching its maximum on the second or third day. With the fall in temperature at the end of the initial attack all the symptoms disappear. After being well for from 2 to 10 days the patient complains of a return of headache and pain in the legs which culminate at night; the temperature rises in the evening to a point that is generally a little lower than the highest temperature in the first attack. The temperature falls to normal or nearly normal the next morning, and either remains down or rises to a less extent the second evening, thereafter to remain normal. The general symptoms are much less severe than in the first attack, but the pain in the legs and the tenderness of the shins are usually greater, and they may not disappear completely in the interval between the second and third attacks, though the headache, which generally remains the most prominent symptom during the attack, is never present in the apyrexial periods. The pain in the legs is sometimes extreme and may prevent sleep. In other cases it is comparatively slight, and the patient looks and feels remarkably well considering that he has a temperature of 101° or more.

Recurrences follow periodically, the maximum temperature always being reached in the evening. The intervals between the attacks are fairly constant in each case, but vary in different cases between 4 and 8 days, 5 being the most common. As a rule each succeeding attack is milder than its predecessor and the temperature is rather lower, but in severe cases the patient feels weaker in the later intervals and the pain and tenderness of the legs are more persistent. The later attacks may be of such short duration that the rise in temperature is not recorded at all if it is taken only twice a day. On the afternoon and

FIG. 2.—Temperature chart of the periodic form of trench fever.

temperature remaining raised for about a week. There is often a single relapse after an interval varying from a few hours to 10 days, but generally less than 4 days; the temperature rises to 100° or 101° for 24 to 48 hours, during which the symptoms return with diminished severity. The patient is usually fit for duty almost immediately after the temperature falls again.

the evening of the day on which the attack is expected the temperature should therefore be taken every 2 hours, especially if there is any pain in the head or the legs, as in most instances the patient knows from his sensations that there is going to be a relapse even before the temperature rises. The temperature is sometimes raised for only 3 or 4 hours.

Diagnosis

The diagnosis can be made with certainty from a study of the temperature chart, but the association of pyrexia with tender shins is already very suggestive of trench fever in the first attack. The majority of cases were at first diagnosed as influenza, though it was generally recognized that they were not identical with the familiar forms of that disease. Thus there was never any nasal or bronchial catarrh, the patient rarely appeared or felt seriously ill, except sometimes during the first two days of the first attack, and respiratory complications never occurred. The periodic return of pain and pyrexia, and the pain and tenderness of the shins, are quite characteristic and prevent confusion with influenza except at the onset.

The diagnosis from dengue fever may be very difficult, especially in tropical and subtropical coastal and inland river areas, where the vector of the latter—a mosquito, *Aedes aegypti*—abounds. The onset of dengue is sudden; the temperature rises rapidly to 102° to 103°, dropping by crisis 3 or 4 days later, but often rising again for 2 or 3 days after a short interval. Severe backache and joint pains occur, and a rash, described as half-way between that of measles and scarlet fever, develops during the second pyrexial period.

The possibility of malaria must always be considered, and in cases of doubt a blood film should be examined for the malarial parasite before making a definite diagnosis, especially if the patient has previously had malaria and in countries where it is prevalent. The longer intervals between the attacks, their invariable occurrence in the evening instead of at various times of the day, the absence of true rigors, and the failure of quinine to modify the course of the illness are distinguishing features of trench fever.

A few cases of true spirochaetal relapsing fever occurred in British troops in Gallipoli, Egypt, and Salonica. The initial pyrexial period was usually longer than in trench fever, varying between 5 and 7 days, and the maximum temperature was often over 104°. In most cases only a single relapse, lasting between 3 and 5 days, occurred after an interval of from 8 to 10 days. Headache was severe, and pain was present in the muscles and the joints of the legs, but not especially in the shins. Slight jaundice, slight enlargement of the liver, and albuminuria were often present. The spirochaete was found without difficulty in the blood during the pyrexial stage.

Prognosis

There were no fatal cases of trench fever, and the patient never appeared seriously ill, except occasionally for a very short time in the first pyrexial period. The total duration of the periodic type from the onset to the end of the last attack was generally between 4 and 6 weeks; but some cases appeared to abort, and in a few others attacks recurred for several months, the patient remaining quite well in the intervals. In most cases the patient rapidly recovered his strength after an attack, and was usually fit for duty after the second period of pyrexia, though he might have to rest for a few hours when the later attacks occurred.

Patients with trench fever who were kept in base hospitals too long, especially if they were transferred to hospitals in England, showed a great tendency to become chronic invalids, and large numbers were eventually discharged from the Army as cases of "neurasthenia" and "D.A.H." The former complained chiefly of exhaustion, irritability, headache, and pains in the legs and back, the latter of breathlessness on exertion, palpitation, precordial pain, giddiness, and fainting. I am convinced that the neurasthenia and D.A.H. were only to a minor degree a direct result of the toxæmia of trench fever and were mainly functional and preventable conditions. They developed most frequently in hospitals where over-conscientious medical officers were too much impressed with what they took to be a slight enlargement of the heart or an apical systolic murmur, and where an over-sympathetic nursing staff in English V.A.D. hospitals was too much impressed with complaints of fatigue and general unfitness. There was a remarkable difference in different hospitals in both France and England in the average stay of patients with trench fever coming from the same units, and my impression was that a long stay in hospital was the cause and not the result of a case becoming chronic. I do not think that there was ever any justification for invaliding a man

from the Service for trench fever, and no cases need be allowed to develop either neurasthenia or effort syndrome.

Prophylaxis

As trench fever is conveyed by lice, which become infected by biting a patient during an attack, it should be possible to prevent the disease by keeping troops free from infestation. All cases should either be sent to hospital or be isolated, and the patient's clothes and bedding should be specially disinfected as well as that of all men who have recently slept near him. After the initial or the second attack a man is often able to return to duty. It is very important that he should be kept under observation, and if he again becomes lice-infested his clothes and bedding should again be disinfected.

A determined attempt to prevent the reappearance of trench fever in the present war is being made by the provision of sufficient baths, laundries, and vermin destroyers, and this has so far proved completely successful (August, 1942). Between 1914 and 1918 men were often crowded in dug-outs and cellars and could change their clothes or bathe only at rare intervals, with the result that lice-borne trench fever spread. Although measures to exterminate lice were energetically pursued from an early stage of the last war, it was not until the middle of 1917 that equipment and facilities were sufficient to have any obvious effect in reducing the incidence of trench fever.

Treatment

No treatment was found which prevented the periodic return of attacks. Aspirin was the most effective drug for the pains. It is of great importance not to keep the patient in hospital longer than is absolutely necessary. He should be sent as soon as possible to a convalescent depot, where fresh air, good food, and progressive exercise quickly restore him to full capacity, so that he is able to return to duty. If possible he should not be sent to hospital in England, as the longer he is in hospital the less likely is he to recover rapidly and completely.

The accompanying charts are reproduced from Sir Arthur Hurst's *Medical Diseases of War*, 2nd edition (Edward Arnold and Co.).

MEDICAL RESEARCH COUNCIL OF IRELAND

It is complained, in the annual report of the Medical Research Council of Ireland that the income placed at the disposal of the Council—namely, £5,000 from the Hospitals Trust Board, guaranteed by the Minister of Local Government and Public Health of Eire—is not adequate for the efficient discharge of its functions. The absence of any assurance that the endowment will be continued for a long period makes it impossible to plan for more than a year in advance or to invite at frequent intervals the services of new workers. It is hoped that when it approaches the Minister for renewed support he will find himself justified in making arrangements of a more liberal and stable character. Among the investigations carried out during the year by means of grants from the Council was a survey of the distribution of vitamin C in the Irish natural food products and emergency sources, together with a study of vitamin supplies and requirements under present conditions. This is being done in the Department of Biochemistry, Trinity College, Dublin. In the School of Pathology at Trinity, grant-holders of the Council have shown that the addition of talc or any one of some twenty insoluble inorganic substances renders distilled water capable of supporting the growth of coliform and similar bacteria. These substances also render tap water growth-supporting. It is suggested that talc makes available for the growth of these organisms carbon dioxide and ammonia derived from the atmosphere, and work is being continued to investigate this theory. In the Department of Chemistry, University College, Cork, an investigation is proceeding into the prevalence of goitre in Tipperary, especially the distribution of goitre among school-children and the influence of iodine treatment upon the prevalence of the condition. Balance experiments have been undertaken to ascertain the influence of certain foods on the excretion of iodine, and suitable methods for the estimation of calcium and phosphorus excretion, with a particular study of their possible relation in goitrous conditions, have been worked out.