

# Trench fever in Belfast, and the nature of the 'relapsing fevers' in the United Kingdom in the nineteenth century

J S Logan

---

## SUMMARY

*Some evidence is assembled to suggest that trench fever, an infection with a strain of Rochalimaea, if not quintana, then vinsonii, was present in Belfast in the first half of the nineteenth century in endemic and epidemic form. It may have amounted at times to one half or more of 'fever'. This may account for the comparatively low mortality in some years from 'fever'.*

*The phrase 'relapsing fever' in the nineteenth and twentieth century medical literature of the United Kingdom should not be taken necessarily to mean infection with Borrelia recurrentis. Much or most may have been infection with Rochalimaea, quintana or vinsonii. The newly discovered Irish vole should be examined to see if it carries a Rickettsia or Rochalimaea infection.*

Trench fever, a louse-borne disease due to infection with *Rochalimaea quintana*,<sup>1</sup> came to the notice of the modern medical profession in 1914–1918, when huge epidemics occurred in the Allied and German Armies in Europe.<sup>2, 3, 4, 5</sup> It was a major cause of loss of manpower. At one time in 1917 the rate of loss in the British Army was calculated to be 45,000 in a million men in a year.<sup>4</sup> In spite of the sharpness of the fever and some prolonged invalidism, it had no mortality. It had long existed in Europe and elsewhere and still has a world-wide distribution where lousiness persists.<sup>6</sup> In the early decades of the nineteenth century it was not distinguished from the mass of 'fever', and, when 'relapsing fever' was distinguished from 'continued fever', predominantly typhus, trench fever then was not distinguished from the relapsing fever caused by *Borrelia recurrentis* infection. Diagnosis was difficult because of the varying clinical pattern of trench fever.<sup>5</sup> The most common was a relapsing fever, but it also could be a five-day fever and occasionally a prolonged irregular fever. Only recently have cultural<sup>7</sup> and serological<sup>8</sup> methods of diagnosis been developed, and they are probably not available routinely where cases are still found. Moreover, when louse-borne diseases were epidemic, mixed or successive infections of typhus, Borrelian relapsing fever and trench fever must have been frequent. Reid observed such.<sup>9</sup> During the Great War, trench fever had a period of intense attention and research. When peace came it was forgotten in the United Kingdom. Complete recovery was usual and no case died. A few ex-soldiers had war pensions for disability attributed to trench fever. Byam remarks that 'many patients continue in ill-health for months after the acute febrile stage is past, some of them relapse with marked fever from time to time, whilst others pass into a condition which is

---

Royal Victoria Hospital, Belfast, BT12 6BA.

J S Logan, MD, FRCP, Honorary Consultant Physician.

variously called myalgia, neurasthenia or disorderly action of the heart'.<sup>2</sup> This opinion remained a matter of debate. Hurst disagreed.<sup>10</sup>

This note examines the possibility that trench fever or a trench fever-like illness was common in Belfast in the last century. Recent reports suggest that a strain of *Rochalimaea* other than *quintana* could have been responsible.<sup>11</sup>

Undifferentiated 'fever', endemic and epidemic, was the main health problem of the early nineteenth century. It was to meet this danger that the Belfast Fever Hospital was founded, and for years it was only reluctantly and infrequently that 'ordinary' medical and surgical cases were admitted. The Hospital Report of 1818–19 says 'Fever still is, and ought to be, the great and predominant subject of solicitude with the public'. In 1820–21 it calls fever 'our dreadful enemy'. In 1821–22 fever is 'this fearful assailant'. In 1819–20 estimates of those stricken with fever, in Belfast's population of 30,000, range from 4,000 to 10,000, and 7,000 was thought most near the truth. It is in this mass of 'fever' that one must look for trench fever.

One must remember what 'fever' meant for the physicians of the time, especially in the early decades. The term did not include the pyrexial illness of smallpox, measles, scarlatina, dysentery, tuberculosis, tonsillitis, abscess or wounds. In fever the patient was generally ill, affected with rigors, languor, stupor, headache, pains in the back and loins, giddiness, anorexia, thirst, burning heat over the body, a quick pulse and incapacity for exertion.<sup>12</sup> This was before the clinical thermometer came into regular use.<sup>13</sup> Neither clinically nor post mortem could a focal lesion be found.<sup>14</sup> One cannot doubt from the clinical descriptions of the time that typhus, with its severe illness, its complications of vasculitis and gangrene, and its heavy mortality was the cause of many cases of 'fever'. Equally one does not doubt that many were cases of Borrelian relapsing fever, also with a heavy mortality and often complicated by hepatitis and jaundice. This was the 'yellow fever of Ireland', a term which has given rise to confusion with viral yellow fever of the Caribbean.<sup>15</sup> Brucellosis and Q fever must have been present but it is not in their nature to produce numerically large epidemics. It is impossible to identify typhoid fever in the Fever Hospital reports up to 1850, though that is not to say that it did not exist. 'Typhoid' is sometimes used as an adjective from typhus. The fever now known as typhoid had been described by Louis in 1829 (in the first edition of his book) together with the local pathology in the small intestine.<sup>16</sup> That is why Little looked so carefully at the small intestine when making his post-mortem examinations.<sup>14</sup> By 1860 J S Reid was satisfied that typhoid fever existed in Belfast and was certain that he had previously classified many cases of it as synochus.<sup>17</sup>

One begins to doubt, however, that typhus and Borrelian relapsing fever were the only or main causes of 'fever' when one notes the mortalities. The mortality of true, untreated typhus according to Osler varied from 10% to 20% and after middle age was as high as 50%.<sup>18</sup> Because much of the argument turns on death rates, it is right to quote Megaw at length on the mortality of untreated typhus.<sup>19</sup> The case fatality, he says, depends greatly on age. It is almost negligible in children. It is seldom more than 5% below age 20. At age 40 it is 10% to 15%; at age 50, 50%. Over 60, few recover. Persons debilitated by starvation bear the disease badly. Deaths are far more numerous in severe epidemics occurring in half-starved and crowded communities composed chiefly of adults. In such conditions the death rate may be as high as 40% or even 50%. In outbreaks in endemic areas the average rate may be as low as 5% to 10% if all the mild cases

are taken into account. Malcolm<sup>20</sup> tells us that in the early decades of the last century in Belfast 'the masses' lived 'in penury, in sickness, in wretchedness and woe, unpitied — nay unknown'. McCormac, the Belfast physician, said 'the physical condition of man, in these regions at least, so far as my own observation and that of travellers extends, is considerably inferior to that of the rude aborigines of Africa or America'.<sup>12</sup> McCormac had travelled in West Africa and in America. Belfast then could not expect a good recovery rate in typhus. Doberstyn reports the mortality in louse-borne Borrelian relapsing fever as from 10% to 50%.<sup>21</sup> In contrast, the mortality in the Belfast Fever Hospital in some years was so low as to exclude typhus and Borreliosis being the cause of the great majority of the cases. (Table). Good nursing will not account for the low mortality and there was no specific drug treatment. For instance in 1817–18 deaths from fever were 4.9% of 1,582 patients, in 1818–19 4.4% of 1,391 patients, in 1819–20 3.8% of 733 patients, in 1820–21 4.1% of 762 patients, 1827–28 4% of 709 patients, 1828–29 3.9% of 514 patients. The highest mortality was in 1847–48, 13.4% of 5,153 patients, when, the report says, there was a universal predominance of maculated typhus. McSkimin has recorded the mortality in the Carrickfergus Fever Hospital in 1817–18 as 5%.<sup>22</sup> When the Belfast Fever Hospital opened in 1797 in Berry Street there was only one death in the first 60 cases.<sup>20</sup> Whatever the skill of Doctor Stephenson and Doctor McDonnell, the attending physicians, it is impossible to believe that they were treating typhus or Borrelian relapsing fever.

Doctor S S Thomson, writing the Belfast Fever Hospital report for 1828–29, gives a clinical account indistinguishable from trench fever. 'The chief peculiarity observable in the cases which have come under treatment was the great tendency to come to a premature crisis. The ordinary duration of our fever is from 11 to 14 days and sometimes it runs out still longer. In many instances last year it was over in 5, 7 or 9 days; such cases were peculiarly liable to relapse. The slightest error on the part of the patient in making too free was sure to light up a new febrile accession, and this not once but repeatedly. Also relapses occurred without any ascertainable cause. Cases of this description proved extremely teasing but seldom or never fatal'. This was the year when the mortality was 3.8%.

J S Reid, the great physician and diagnostician, writing the Fever Hospital report in April 1844, records that, of 537 cases of fever in his own care, 60 were cases of typhus of whom 10 died (16%) and 477 were 'synocha', a 'relapsing fever' of whom 14 died (2.9%). Evidently Reid's 477 cases with the 'relapsing fever' were mostly not Borrelian relapsing fever. Evidently it has been an error to assume that all or most of the 'relapsing fever' in Ireland was Borrelian. If not that, what was it? The clinical features, the minimal or zero mortality, the epidemic character and the prevalence of lice are consistent with trench fever. It is true that some of these mild cases of fever might be Brill-Zinsser recrudescences of true typhus but these do not have a relapsing character.

The effect of the failure to distinguish typhus fever, Borrelian fever and trench fever from each other was to lower the total death rate from 'fever' by diluting the substantial death rates of typhus and Borrelian fever with the zero death rate of trench fever. And to produce an apparent death rate in trench fever which should not have one.

Further evidence lies in the work of Baker in Canada,<sup>23</sup> and later of Weiss. Grosse Isle is a small island, a mile long and half-a-mile wide, only 320 acres, in the St Lawrence river, 29 miles downstream from Quebec. In 1942 during the last

TABLE  
*Belfast Fever Hospital Reports*

<i>Year</i>	<i>Fever patients</i>	<i>Fever deaths</i>	<i>% deaths</i>	<i>Remarks</i>
1817–1818	1,582	79	4.9	
1818–1819	1,391	62	4.4	
1819–1820	733	28	3.8	
1820–1821	762	32	4.1	
1821–1822	276	19	6.8	
1822–1823	337	27	8.0	
1823–1824	214	21	9.8	
1824–1825	415	21	5.0	
1825–1826	356	19	5.3	
1826–1827	907	52	5.7	
1827–1828	709	29	4.0	
1828–1829	514	20	3.9	
1829–1830	244	10	4.0	
1830–1831	582	40	6.8	
1831–1832	1,061	73	6.8	
1832–1833	598	53	8.8	
1833–1834	510	43	8.4	
1834–1835	691	62	8.9	
1835–1836	575	48	8.3	
1836–1837	1,941	181	9.3	Many fever patients 'fell victims to the influenza'
1837–1838	3,363	402	11.9	Erysipelas in the hospital increased deaths in fever patients
1838–1839	1,162	113	9.7	The figures are useless because in this year scarlatina, measles, smallpox, erysipelas were included in the list of fever patients
1839–1840	1,820	206	11.3	A few of the total fever patients were not 'fever' but the fever deaths are correct
1840–1841	1,822	166	9.0	
1841–1842	1,241	126	10.1	Some uncertainty about the diagnosis in some of the fever patients
1842–1843	707	70	9.9	
1843–1844	2,284	133	5.8	See text for Reid's analysis of his cases. Were most trench fever?
1844–1845	1,864	126	6.7	'The great mildness of the symptoms of the epidemic fever'
1845–1846	740	65	8.7	
1846–1847				No Annual report
1847–1848	5,153	693	13.4	'The predominance of maculated typhus, the most fatal form'
1848–1849				The establishment has ceased to be a fever hospital

war a new disease research station was established there. Baker of the United States Army Veterinary Corps was a staff member. There were voles (*Microtus pennsylvanicus*) on the island, and, with some idea of using them as experimental animals, several were captured and dissected. In some of them the spleen was seen to be enlarged. From these spleens Baker isolated an infective agent like a Rickettsia. In 1977 Weiss and his associates showed that the 'vole agent' was a 'strain' of the trench fever organism *Rochalimaea quintana*.<sup>24</sup> Ninety-five years earlier Grosse Isle had been the site of a great tragedy.<sup>25, 26</sup> It was the quarantine station for ships entering Canada by the St Lawrence river. The year 1847 saw remarkable emigration from Ireland, much of it to Canada, and much to the St Lawrence ports. Ship after ship arrived laden with the starved, the dead, and those ill and dying from the 'fever'. Five thousand three hundred Irish emigrants died of fever and were buried in those 320 acres of Grosse Isle. Either the voles acquired the *Rochalimaea* from the Irish immigrants or the voles had always been infected. If the first explanation is true, as it likely is, it supports the existence of trench fever in the Irish. In 1982 Weiss and Dasch demonstrated some cultural, metabolic and agglutinative differences between the 'vole agent' of Baker and *Rochalimaea quintana*.<sup>11</sup> They proposed that the vole agent of Grosse Isle (and presumptively of Ireland) be named *Rochalimaea vinsonii sp. nov.*

Rutherford in 1916, at the time of the great epidemic of trench fever in the army in France, reported that the trenches were swarming with long-tailed field voles.<sup>27</sup> He thought these might be the source of the infection. Zdrodovskii and Golinevich draw attention to a reported disease in Russia, 'paroxysmal rickettsiosis', which in some clinical respects resembles trench fever.<sup>28</sup> The animal reservoir was thought to be the 'red forest vole', *Clethrionomys glareolus*, Schreber, and the vector a tick.

Smal and Fairley describe the discovery of the 'bank' vole *Clethrionomys glareolus* in south-west Ireland in 1964.<sup>29</sup> Although there has been spread, this vole is still confined to the south and west. Fairley considers that this vole is a recent introduction to Ireland. It seems important this bank vole should be examined to see if it is infected with a Rickettsia or a Rochalimaea.

## REFERENCES

The Annual Reports of the Belfast Fever Hospital are held in the Archives Office of the Royal Victoria Hospital, Belfast. Microfilm copies are in the Queen's University Medical Library and in the Public Record Office of Northern Ireland.

1. Bergey DH. Manual of systematic bacteriology. Vol 1; editor, NR Krieg. Baltimore: Williams & Williams, 1984: 698-701.
2. Byam W et al. Trench fever. London: Oxford University Press, 1919.
3. American Red Cross. Trench fever: report of Commission, Medical Research Committee. By RP Strong. Oxford: Oxford University Press, 1918.
4. History of the Great War. Medical services. Diseases of the War; ed. by WG Macpherson, WP Herringham, TR Elliott, A Balfour. Vol 1. London: HMSO, 1923.
5. McNee JW, Renshaw A. A relapsing fever occurring with the British forces in France. *Br Med J* 1916; 1: 225-34.
6. Vinson JW. Louse-borne diseases world wide: trench fever. In: Proceedings of the International Symposium on the Control of Lice and Louse-borne Diseases. Washington (DC), 1972. Washington (DC): Pan American Health Organization, 1973: 76-9. (Pan American Sanitary Bureau. Scientific Publication no. 263).

7. Vinson JW. *In vitro* cultivation of the rickettsial agent of trench fever. *Bull WHO* 1966; **35**: 155-64.
8. Hollingdale MR, Herrman JE, Vinson JW. Enzyme immunoassay of antibody to *Rochalimaea quintana*. *J Infect Dis* 1978; **137**: 578-82.
9. Reid JS. Annual report of the Belfast Fever Hospital for 1843-44.
10. Hurst A. Trench fever. *Br Med J* 1942; **2**: 318-20.
11. Weiss E, Dasch GA. Differential characteristics of strains of *Rochalimaea*: *Rochalimaea vinsonii* sp nov, the Canadian vole agent. *Int J Syst Bacteriol* 1982; **32**: 305-14.
12. McCormac H. An exposition of the nature, treatment and prevention of continued fever. London: Longman, 1835.
13. Woodhead GS, Varrier-Jones PC. The clinical thermometer. *Lancet* 1916; **1**: 173-80.
14. Little R. Practical observations on fever particularly with reference to the plan of treatment which has been generally pursued in the Belfast Fever Hospital for several years. *Dub J Med Chem Sci* 1835; **7**: 35-65.
15. MacArthur W. Some pestilences of the past, ii: The Yellow Plague. *Trans R Soc Trop Med Hyg* 1959; **53**: 430-2.
16. Louis PCA. Recherches anatomiques, pathologiques et thérapeutiques sur la maladie connue sous les noms de fièvre typhoïde, putride etc. 2 éd. Paris: Baillière, 1841.
17. Reid JS. Annual report of the Belfast Clinical and Pathological Society for 1859-1860: 76-81.
18. Osler W. The principles and practice of medicine. 3rd ed. Edinburgh: Pentland, 1898.
19. Megaw JWD. Louse-borne typhus fever. *Br Med J* 1942; **2**: 401-3.
20. Malcolm AG. A history of the General Hospital, Belfast. Belfast: W & G Agnew, 1851.
21. Doberstyn EB. Studies of louse-borne relapsing fever in Ethiopia. In: Proceedings of the International Symposium on the Control of Lice and Louse-borne Diseases, Washington (DC), 1972. Washington (DC): Pan American Health Organization, 1973: 42. (Pan American Sanitary Bureau, Scientific Publication no. 263).
22. McSkimin S. The history and antiquities of the County of the Town of Carrickfergus. 3rd ed. Belfast: Printed for the author, 1829.
23. Baker JA. A rickettsial infection in Canadian voles. *J Exp Med* 1946; **84**: 37-51.
24. Weiss E, Dasch GA, Woodman DR, Williams JC. Vole agent identified as a strain of the trench fever rickettsia *Rochalimaea quintana*. *Infect Immun* 1978; **10**: 1013-20.
25. Woodham-Smith C. The great hunger. London: Hamish Hamilton, 1962.
26. Heagerty JJ. Four centuries of medical history in Canada. Vol 1. Bristol: Wright, 1928: 117-30.
27. Rutherford WJ. Trench fever: the field vole a possible origin. *Br Med J* 1916; **2**: 386-7.
28. Zdrodovskii PF, Golinevich HM. The rickettsial diseases. London: Pergamon, 1960.
29. Smal CM, Fairley JS. The spread of the bank vole *Clethrionomys glareolus* in Ireland. *Mammal Rev* 1984; **14**: 71-8.