

EPIDEMIOLOGY OF CLINICAL Q FEVER IN NORTHERN IRELAND

by

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IRELAND was once thought to be free of Q fever (Kaplan and Bertagna, 1955). An investigation of patients, abattoir workers, veterinary surgeons, farm workers and farm animals in Northern Ireland showed that Q fever was present and entered the country sometime between April 1957 and February 1962 when the first known clinical case occurred (Connolly, 1968). In the Republic of Ireland a survey was carried out between 1966 and 1970 which showed that Q fever was present there as well (Hillary, Shattock and Meenan, 1971).

Some epidemiological and clinical data on 57 patients in Northern Ireland with Q fever are reported here.

MATERIALS AND METHODS

The serological methods were described previously (Connolly, 1968). A four fold or greater rise of Q fever antibody between acute and convalescent sera indicated recent infection and a static Q fever antibody titre of 1:160 or greater together with supporting clinical and epidemiological data was regarded as evidence of Q fever infection in the recent past. All sera were also screened against adenovirus, psittacosis and *Mycoplasma pneumoniae* antigens and where appropriate influenza virus types A, B, and C, parainfluenza types 1 and 3 and respiratory syncytial virus antigens.

RESULTS

Fifty-seven patients with Q fever were diagnosed between 1962 and 1973. Fifty patients had rising titres of Q fever antibody and seven had static high titres as defined above. A non-specific rise of Q fever antibody has been described in certain adenovirus infections (Van der Veen & Heyen, 1966; Stephens, 1971) but a rise of antibody to adenovirus or the other antigens tested was not found.

Yearly incidence

The yearly incidence of clinical Q fever was as follows: -

1962	3	1965	3	1968	4	1971	5
1963	1	1966	11	1969	6	1972	5
1964	3	1967	2	1970	1	1973	13

Q fever has occurred every year for the past 12 years with higher incidences during 1966 and 1973.

Monthly incidence

The month of the year when the patients' illnesses began was as follows:

J	F	M	A	M	J	J	A	S	O	N	D
6	1	5	18	8	2	3	—	4	4	2	4

Over one half of the patients had their illnesses during March, April and May with a peak incidence during April.

Age and sex

The age and sex of the patients was as follows:

Age in years	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	TOTALS
Male	1	4	8	9	18	7	2	—	49
Female	—	—	2	—	2	1	2	1	8
Totals	1	4	10	9	20	8	4	1	57

Forty-nine patients (86 per cent) were male and there was a higher incidence in the 40-49 year-old age group. The youngest patient was a 3-year-old boy and the oldest was a 73-year-old woman.

Illnesses

The clinical illnesses associated with Q fever infection were as follows:

<i>Illness</i>	<i>No. of patients</i>	<i>Percentage</i>
Pneumonia	38	67
Influenza-like	10	17
Pericarditis	3}	
Myocarditis	3}	14
Endocarditis	2}	
Meningitis	1	2
Total	57	100

The majority of patients (67 per cent) had pneumonia of the "viral" type. A 49-year-old man had the additional complication of jaundice and another man had swelling of the right parotid gland but mumps serology was negative. Another patient had recurrent bouts of depression after his pneumonia and committed suicide. Three patients had bilateral pneumonia. In some patients the radiological signs of pneumonia were slight and could easily have been missed but pleuritic pain, headache and pyrexia were usually present.

Patients with influenza-like illnesses and pyrexias of unknown origin had severe headache, pyrexia, aches and pains and excess sweating for a prolonged period. In this group a three-year-old boy also had generalised swelling of lymph nodes while a boy of 10 years had pharyngitis and conjunctivitis. Four patients were detected during influenza epidemics when they were clinically diagnosed as influenza but influenza serology was negative.

Seven of the eight patients with cardiac complications had a rising titre of Q fever antibody which indicated that their illness was in the acute stage. Three patients had pericarditis. Two men aged 32 and 46 years developed pericarditis associated with a friction rub and a pericardial effusion, while a 54-year-old woman had prolonged cardiac failure in association with her pericarditis. Three patients had myocarditis. Two men aged 28 and 40 years developed myocarditis with associated arthritis. The younger man also had slight jaundice and supraventricular tachycardia. Another 40-year-old man developed heart block associated with his Q fever infection. Two patients had endocarditis. A 21-year-old man rapidly developed congestive cardiac failure and died. At post-mortem, a large vegetation was present on the mitral valve which contained unidentified organisms. Only a single serum was obtained from this patient before death but it had a high titre (1:320) of Q fever antibody. A 33-year-old man had a long history of rheumatic heart disease. He developed subacute endocarditis but repeated blood cultures for bacteria were sterile. He was treated for a prolonged period with tetracycline and recovered.

A 22-year-old man had the signs and symptoms of "viral" meningitis in association with his Q fever infection. His respiratory system was normal clinically and radiologically. The CSF contained 48 white blood cells/mm³ of which 95 per cent were lymphocytes and the protein was 56 mg./100 ml.

Farm animal contact

Thirty-one patients (54 per cent) had a definite history of contact with farm animals mainly cattle. Twenty-four patients (42 per cent) were occupationally exposed and 7 patients (12 per cent) had casual exposure to farm animals. The occupationally exposed group included 8 farmers, 5 part-time farmers, 2 farmers' wives, 2 cattle truck drivers, a cattle dealer, a cattle grader, a veterinary surgeon, a farm electrician, a farm joiner, a farm sack salesman and a sheepskin assessor in a hide company. The part-time farmers worked at other jobs during the day but kept some cattle for their own use. It is of interest that a relative of a part-time farmer arrived by air from North Queensland, Australia to stay at his house just before the onset of his Q fever. Of the 7 patients who had casual exposure to farm animals, 3 patients had parents who owned or worked on farms and exposure occurred when the farms were visited. In addition, the parents of a child with Q fever used a field well which was also used by cattle. A medical practitioner also developed Q fever after a holiday on a cattle farm in Co. Westmeath, Republic of Ireland. Another two patients had contact mainly with horses although one of the patients was known to help a veterinary surgeon from time to time.

Probable direct or indirect contact with farm animals occurred in 10 patients (18 per cent). Eight patients lived in rural areas and included a medical practitioner, a nurse, 3 building trade labourers, a labourer, a textile mechanic who was exposed to dust and chaff when fixing the ceiling of his old house and an evangelist who held tent missions in fields used by cattle. Two patients lived in Belfast and included a child who was on a caravan holiday close to a Q fever infected farm and a Post Office employee who worked near an abattoir.

No definite contact with farm animals could be found in 16 patients (28 per cent) and their occupations had no connection with farming. Only one patient lived in a rural area, the rest lived in towns. In a town a mother and her daughter became ill at the same time with Q fever pneumonia. A blood sample was later obtained from their dog and it contained Q fever antibody. The other patients in this group were a retired company director, two clerks, a road sweeper's wife, a docker's wife, a fitter, a welder, a machinist, a weaver, a typewriter mechanic, a boilerman, a van driver, a chauffeur and a schoolboy.

Unpasteurised milk

Twenty-two patients (39 per cent) regularly drank raw cows milk but all also had definite or probable contact with farm animals. Of the 35 patients (61 per cent) who drank pasteurised milk 19 (33 per cent) had definite or probable farm animal contact. One patient who drank pasteurised cows milk also imbibed large quantities of raw goats milk. Sixteen patients (28 per cent) neither drank raw cows milk nor had any known farm animal contact. Of the five patients aged 19 years or less only one boy aged 3 years drank unpasteurised milk.

Geographical distribution

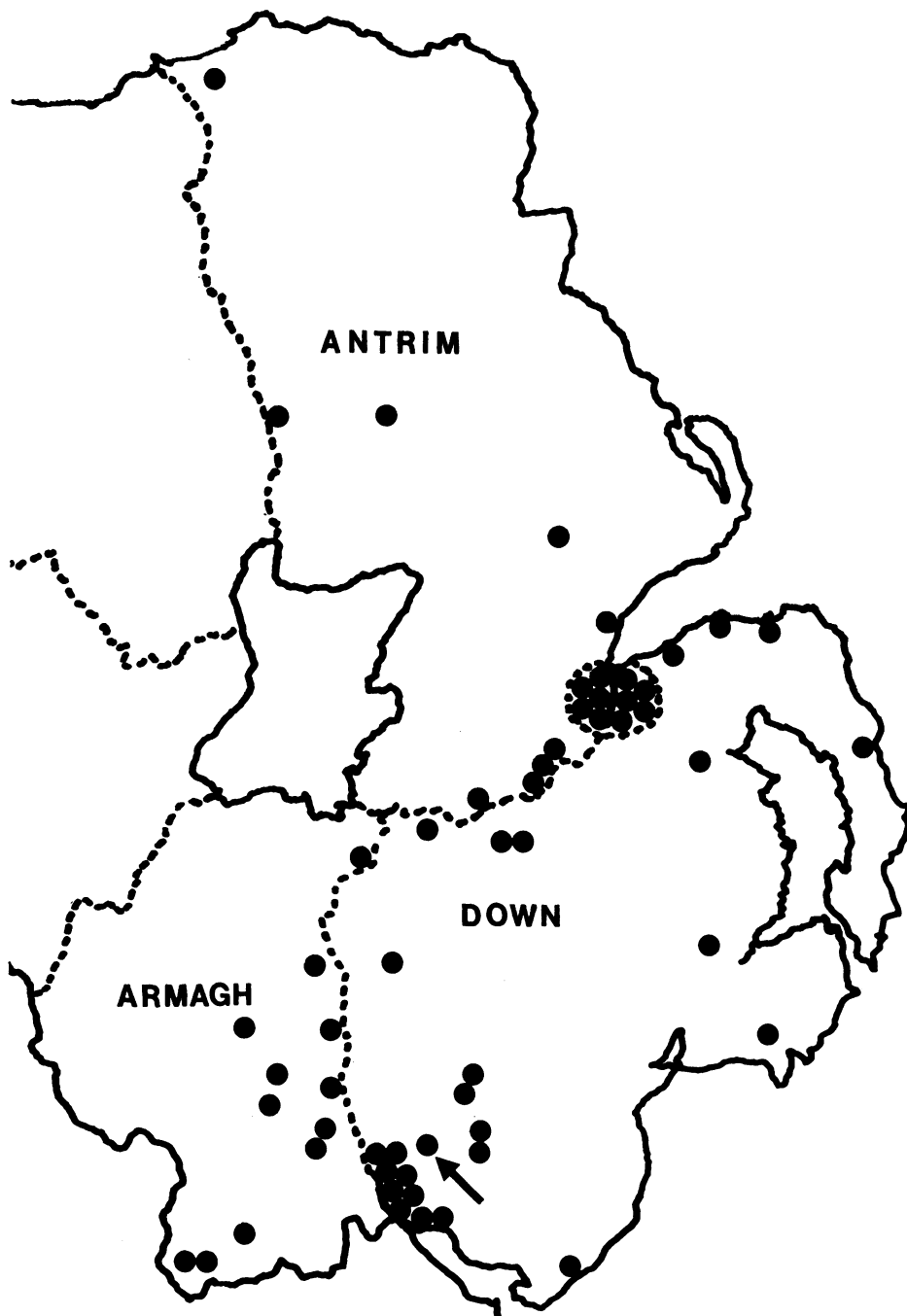
The number of patients with Q fever in each county was: Down (26), Armagh (12), Belfast Borough (10), Antrim (9) and their location is shown in the Figure.

Sera were received from all over Northern Ireland for diagnosis but the patients with Q fever were all confined to Belfast and the three eastern counties. There was a clustering of patients in the South Down and South Armagh region.

DISCUSSION

The results show that Q fever is now endemic in Northern Ireland. The peak incidence of cases during March, April and May could be correlated with the calving and lambing in the spring. Virtually all lambing is between January and May. It is known that apparently healthy domestic livestock may shed enormous numbers of *Coxiella burnetii* in milk, urine, faeces and particularly in the placenta (Welsh, Lennette, Abinanti and Winn, 1958). Q fever predominantly affected males during their working life but it is difficult to explain the preponderance of cases during the fourth decade of life.

The patients with Q fever were selected in that their illnesses were severe enough to require hospital admission or investigation. It is probable that many other patients have been infected with little or no illness as was shown in the previous survey (Connolly, 1968). The disease is mainly acquired by inhaling contaminated dusts and aerosols particularly in the vicinity of farm animals. It is not surprising therefore that pneumonia or influenza-like illnesses were the commonest illnesses experienced. The heart was involved in 7 patients during the acute stage of Q fever, and another fatal case had endocarditis associated with presumed chronic Q fever. It is important to consider Q fever in endocarditis when bacteriological



Distribution of patients (closed circles) with Q fever in Belfast and the three eastern counties of Northern Ireland. The first known case which occurred in February 1962 is arrowed.

blood cultures are repeatedly sterile so that the correct treatment may be given (Kristinsson and Bentall, 1967; Freeman and Hodson, 1972). Severe headache is a prominent symptom in most patients with Q fever but the CSF is normal. The patient with proven meningitis was exceptional although the Public Health Laboratory Service reported 5 patients (2 per cent) with meningitis or encephalitis out of 231 cases of Q fever during 1967-69 (British Medical Journal, 1970). Additional unusual features of systemic Q fever were present in some patients such as arthralgia, parotid swelling, generalised lymphadenopathy and conjunctivitis. Jaundice was present in two of our patients (4 per cent). Powell (1961) found that abnormal liver function tests were very common in Q fever but clinical jaundice occurred in only 4 per cent of patients.

Seventy-two per cent of patients had definite or probable contact with farm animals. Not only are cattle and sheep imported from other areas of Great Britain where Q fever may be endemic but human exposure may occur at livestock markets where animals from many areas are brought together. Sheep had a three-fold higher incidence of Q fever antibody in one farm studied in Northern Ireland (Connolly, 1968) and also in a more widespread survey in the Republic of Ireland (Hillary, Shattock and Meenan, 1971). Other domestic animals such as horses, pigs, pigeons, geese and fowl may also become infected with Q fever (Babudieri, 1959). Three patients had close contact with their dogs which were shown to be infected with Q fever at some time in the past and one dog brought bits of sheep placenta into the house (Connolly, 1968). Three other patients from rural areas also noted close contact with their dogs just before the onset of Q fever but the dogs were not tested.

Perhaps of more interest were the 16 patients (28 per cent) who had no known contact with farm animals and only one patient lived in a rural area. All of them drank pasteurised milk. *C. burneti* is very resistant to adverse physical conditions and it may be carried long distances on clothes, straw, vehicles and other infected microenvironments (Clarke, Lennette and Romer, 1951). In town dwellers dogs may be a source of infection particularly if they have access to fields or are fed uncooked meat or bones infected with *C. burneti*. The movement of infected livestock either on foot or in vehicles through towns and villages may disseminate *C. burneti* particularly to those who live along the road (Babudieri, 1959). In this group of patients, a docker's wife and a road sweeper's wife may have been infected from *C. burneti* carried home on their husbands clothes. Road sweepers and crew of ships transporting livestock have a high incidence of Q fever infection (Babudieri, 1959). The clothing of people coming from infected areas either in Northern Ireland or abroad (e.g. North Queensland) may carry *C. burneti* which then infects people far from the original source of infection.

The fact that only 39 per cent of patients drank unpasteurised cows milk and all these patients had contact with farm animals would suggest that unpasteurised milk is not an important source of Q fever infection in Northern Ireland. While an outbreak of Q fever probably related to the consumption of raw milk has been described in Staffordshire (Brown, Colwell and Hooper, 1968) and *C. burneti* was isolated from pooled cows milk in Northern Ireland during 1966 (Connolly, 1968)

and again in 1972, most of the evidence points to infection by inhalation of infected dust or aerosols. The percentage of unpasteurised milk sold to domestic consumers in Northern Ireland has decreased every year and only 2 per cent was unpasteurised in 1972/73.

The clinical cases were all confined to Belfast and the three eastern counties of Northern Ireland. The previous survey (Connolly, 1968) showed that three times more veterinary surgeons in practice and ten times more abattoir workers in Belfast and the three eastern counties had Q fever antibody in their sera when compared with the same occupations in the three western counties. On the other hand, 23 per cent of farmers tested throughout Northern Ireland had Q fever antibody in their sera so it is surprising that clinical cases have not been detected in Counties Londonderry, Fermanagh and Tyrone. The clustering of clinical cases in the South Down and South Armagh region would suggest that Q fever may exist across the border in Co. Louth and Monaghan in the Republic of Ireland.

SUMMARY

Fifty-seven patients with Q fever were diagnosed in Northern Ireland between 1962 and 1973. The highest yearly incidence was in 1966 and 1973 and the peak monthly incidence was in April. Q fever predominantly affected males during their working life with a maximum incidence in the fourth decade of life. Pneumonia was the commonest manifestation of Q fever but influenza-like illnesses, pericarditis, myocarditis, endocarditis and meningitis also occurred. Seventy-two per cent of patients had definite or probable contact with farm animals and all those who drank unpasteurised milk also had farm animal contact. Dogs may have been involved in infecting three patients. All the patients were confined to Belfast and the three eastern counties of Northern Ireland.

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