

Leptospirosis — a diagnostic problem and an industrial hazard

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SUMMARY. Three cases of human leptospirosis occurred on a small dairy farm at the foot of the Black Mountains in Powys. We describe the clinical course of these three patients and consider the sources of infection and the industrial implications.

Case history 1

THE 36 year old son of a yeoman farmer, previously of excellent health and robust physique, presented at the surgery complaining of generalized aches and pains, nausea, sweating and shivering. No abnormal signs were found on clinical examination; paracetamol was prescribed. He was seen at home two days later because his condition had deteriorated. By then he was vomiting; slightly icteric sclerae were noted. During the next two days the jaundice deepened, the patient developed severe pharyngitis and began expectorating green sputum. At this stage liver function tests showed the jaundice to be of the hepatocellular type. Three days later the patient developed a right foot drop. Complement fixation tests revealed a high titre of leptospirosis. Subsequently this was found to be *Leptospirosis icterohaemorrhagiae*.

Despite the eight-day interval between the onset of illness and the diagnosis of the disease, the patient was treated with penicillin. One month after onset the jaundice was subsiding but there was extensive exfoliation of the skin. The patient's condition gradually improved but physiotherapy was needed for the foot drop. Liver function returned to normal. He was able to return to his normal work after five months.

Case history 2

The second patient was the first patient's brother.

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Twenty-four days after his brother had become ill this patient presented with a flu-like illness of four days' duration. The symptoms were generalized pains, particularly aching legs, nightmares and sweats. There were no abnormal signs. In view of our experience with the first case, we arranged liver function and complement fixation tests, and began penicillin therapy immediately. Leptospirosis was confirmed at a titre of 1/1,024 rising to 1/4,096. To everyone's surprise the serotype was found to be *hebdomadis* and not *icterohaemorrhagiae* as in the first case.

The course of this patient's illness was less severe and there were no neurological signs or jaundice; nevertheless, he was still unable to work for five months.

Case history 3

Because the first brother was ill, a relief milker had to be employed at the farm; he turned out to be the third patient. He presented with headaches, anorexia and vomiting about two weeks after the first symptoms had developed in the second patient. There were no abnormal signs. Serological tests showed leptospirosis titres which rose from 1/512 to 1/4,096. The serotype was again shown to be *hebdomadis*. He was treated with penicillin immediately but, even so, was unfit for work for eight weeks.

Discussion

Leptospirosis is caused by the genus of small spirochaetes, *Leptospira*. The most commonly encountered serotypes in human infection in the United Kingdom are *icterohaemorrhagiae*, *canicola* and *hebdomadis*. There are 130 serotypes and several subtypes (for example *hardjo* and *sejroe*). There are even more serogroups of these serotypes with antigens common to each group (for example serotype *hebdomadis* has 28 separate serogroups).

Hazards of Working on Farms

Table 1. Occupational group or likely source of infection and serogroup, 1978.

Occupational group or likely source	Serogroup				Total
	Hebdomadis sejroe	Hebdomadis	Icterohaemorrhagiae	Canicola	
Miners			1		1
Farmers, unspecified (farm workers)	7		6		13
Pig farmers			3		3
Dairy and cattle farmers	17		1		18
Abattoir workers	2				2
Meat inspector	1				1
Veterinarians			1		1
Contact with sewage			2	1	3
Immersion in or contact with polluted water			4		4
Contact rats (direct)			2		2
Contact dog				2	2
Acquired abroad		2	1		4
Trader (street market)			1		1
Not known	4		4	2	10
Total	31	2	26	5	65

Source: Coghlan (1979).

A reservoir of leptospirae exists in small animals; these cause infection in other animals, such as cattle, pigs, dogs and man. Leptospirae are shed in the urine. Human infection is caused either by direct contact with infected urine (with entry via conjunctivae and abraded skin) or by indirect contact with infected water or straw. Human infection with *L. icterohaemorrhagiae* serogroup (Weil's disease) most commonly occurs via contact with infected rats. A chain of infection with *L. hebdomadis* serogroup exists from mice and voles to cattle and hence man.

The first outbreak of human leptospirosis due to the *hebdomadis* strain was reported in 1969 (Saluka and Moore) when four cowmen developed a mild anicteric illness. The incidence of the disease in the United Kingdom was reviewed by Coghlan (1979) (Table 1).

Unless leptospirosis is suspected, diagnosis is notoriously difficult. The incubation period is about 10 days and is followed by a nonspecific, influenza-like illness lasting for four to seven days, consisting of fever, joint pains and headache—leptospirae may be isolated from blood and cerebrospinal fluid. The severity of the illness depends upon the virulence of the strain and many infections are thought to be subclinical or misdiagnosed as influenza.

About two days after the initial symptoms have subsided, the immune stage follows. The features of a severe infection include prolonged fever, meningeal irritation, jaundice and hepatorenal failure. Diagnosis may be confirmed by demonstrating a rising antibody titre from the second week onwards. Leptospirae may be cultured from the blood during the first week or from the urine from the third week onwards. Treatment is

with parenteral penicillin during the first week; symptoms also need treatment and the family require help and reassurance.

Clinical illness caused by the *hebdomadis* serogroups in cows usually appears as the common features of bovine illness—a transient fever and mastitis. Abortion may occur. In cows the disease appears to be more common than is generally appreciated. Orr *et al.* (1979) found that over 42 per cent of sera taken from cattle in an abattoir in England had a high titre of antibodies to subserotype *hardjo*. The same study found that the incidence of *sejroe*, another subgroup of *hebdomadis*, was as high as 42.2 per cent in some abattoirs in England. Other serological tests reported by Michna (1971), Ellis and Michna (1976) and Ellis *et al.* (1976), have supported these figures.

The situation which gave rise to these three cases of leptospirosis of two different serotypes on a small farm during a short period of time was thoroughly investigated. The investigation was carried out with co-operation between doctors, veterinarians, laboratory staff, an environmental health officer, the local rat catcher and, most important, the farmers themselves.

The possibility of some connection between the outbreaks of two serologically different illnesses was examined. We undertook an extensive study of the existing literature but could find no reports of any such concurrent outbreaks.

We arrived at certain conclusions. It seems that the first patient had been cleaning out an old hay loft. A rat which was caught in the hay loft was shown in post-mortem examination to have *L. icterohaemorrhagiae* in its blood and kidneys. It is probable that the first patient

was infected by contact with hay which had been contaminated by infected urine from the rats.

The second farmer and the relief milker were probably infected from cow's urine. It is interesting to note that the relief milker had lost a finger nail in a minor accident about two days before he started work at the farm. A section of the herd had recently been bought into the farm from a distant market; these animals were shown to be harbouring *L. hebdomadis*. The farmer recalled a milk illness in this section of the herd some weeks earlier. This was confirmed by a drop in the recorded milk yield. This illness may have been due to the leptospirosis infection.

A further interesting point is that the farm had recently installed a 'herring-bone' milking parlour. This modern arrangement has the milkers working in troughs below the cows, so that they are more likely to be splashed with urine on the hands and in the eyes. Many cows carry *L. hebdomadis* and the human form of the illness is potentially severe, as illustrated by the time our patients lost from work and the discomfort of their symptoms. It is therefore important to recognize this industrial hazard, to make it known to farms and, perhaps, to recommend protective clothing or other preventive measures. Leptospirosis has already been recognized as a major occupational hazard among dairy workers in such places as New Zealand and Israel (Philip, 1976; Shenberg *et al.*, 1978). We could identify no additional factors which made the three farming

people particularly susceptible to leptospirosis at that time. We also conclude that infection with the two different serotypes was coincidental, although remarkable.

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