New Zealand is free from Q fever

Coxiella burnetii, the aetiological agent of Q fever, infects a wide range of animals as well as humans. In humans it causes serious disease but infected animals usually remain asymptomatic, although they may carry the infection for long periods. A number of investigations have provided evidence that New Zealand is free from Q fever.

Information on Q fever has been extensively reviewed by a number of authors[1][2]. *Coxiella burnetii* infects most mammals, birds, many insects and even fish and amoebae[1][2]. All species of domestic livestock and cats and dogs are commonly infected.

Q fever is of negligible economic importance in livestock, but is significant as a zoonosis. In humans it may cause serious disease and even death but many infected people remain free from symptoms or have mild disease episodes that may be mistaken for colds or flu. In an extensive review on Q fever, Maurin and Raoult[1] reported that about 60% of people that are infected remain asymptomatic. Of those that do develop symptoms, most experience only mild disease and recover without complications. About 2% of those infected experience a severe disease requiring hospitalisation. Acute disease is usually characterised by fever, lassitude and headaches but may present as atypical pneumonia or hepatitis. The disease becomes chronic in about 10% of acute infections. Complications are rare but may include encephalitis, renal failure, congestive heart failure, respiratory failure and myocarditis. The most usual manifestation of chronic Q fever is endocarditis.

In countries where the infection is endemic there is a high prevalence of seropositive animals[3][4][5][6][7][8]. Domestic livestock, particularly cattle, remain carriers for protracted periods and sheep often excrete large numbers of organisms in their birth products at parturition (Welsh HH, Lennette EH, Albatini FR, Winn JF, 1953, cited by Marrie[2]). Livestock are the major source of infection for humans. Considerable accumulated evidence suggests that there is a higher rate of infection in groups such as abattoir workers and farmers that have frequent contact with livestock[9][10][11][12]. Cats and dogs have also been implicated as sources of infection for people[13][14]. Milk is frequently infected with the organism[3] but its ingestion is not believed to be a common means of infecting humans[15].

Most authorities believe that the main route of infection for people is the inhalation of infected particles, or direct contact with infected animals[1][2][16]. Some authors have noted a correlation between the occurrence of ticks and the disease in humans[11][17]. At least 35 species of ticks from 11 genera can be infected[18]. The organism multiplies in the tick gut and is excreted in the faeces, remaining viable in dried tick faeces for up to 586 days (Ormsbee RA, 1972, cited by Marrie[2]). Ticks may remain infected for years and the infection can pass transovarially in some species. Other ectoparasites such as mites, lice, fleas and bed bugs may also be infected but probably play a minor role in maintaining the organism. It has been suggested that infected amoebae may serve as a source of infection, as is believed to be the case for *Legionella* spp[1]. The exact role ticks play in propagating and maintaining the infection remains unclear but some authors believe they are important. A common view is that wool, hair and dust may be contaminated by infected tick faeces and may infect animals or humans. However, infection has been transmitted from infected to uninfected guinea pigs by *Ixodes holocyclus*[1], *Haemaphysalis humerosa*[19] and *Rhipicephalus sanguineus*[20].

Evidence for absence of Q fever

In view of its known epidemiological features it is difficult to explain the absence of Q fever in New Zealand. There are ample wild and domestic animals that could act as hosts, and New Zealand's temperate climate is similar to that of many countries where the infection occurs. Despite the policy of trying to prevent entry of the organism by serological testing of imported animals, there must have been opportunities for its introduction.

The most plausible explanation seems to be that, for the organism to be maintained in wild or domestic animals, an animal-tick cycle must operate. The only livestock tick present in New Zealand is *Haemaphysalis longicornis*. If it is a poor vector for *C burnetii*, this could explain the failure of the organism to establish in New Zealand[21].

The assertion that New Zealand is free from Q fever is supported by epidemiological evidence and serological investigations. If the organism were present in farm livestock, disease would be expected to have occurred regularly in people, particularly farmers and abattoir workers. The human population in effect acts as a sentinel system for the presence of infection. Q fever is notifiable in New Zealand under the category of rickettsial diseases and no case has ever been notified of anybody contracting the disease in this country (personal communication, Dr Michael Baker, Environmental Science and Research Ltd). One case has been diagnosed in a person who, shortly before falling ill, had been working with goats in Zimbabwe[22]. No other cases have been reported in New Zealand.

Early serological investigations have been summarised in a Ministry of Agriculture and Forestry (MAF) review of importation quarantine policy[21]. The cited serological investigations involved 27 sera from humans with a high risk of infection (Caughey JE, 1949, cited by MAF[21]), 1,400 human sera tested in 1953 (Kaplan MM, Bertagna P, 1953, cited by MAF[21]) and sera from 44 meat workers (Mickelson KN, 1954, cited by MAF[21]). In 1980, Blackmore and Schollum presented a paper on 'the hazards of foodborne infections for meat workers', which reported on sera

from 123 meat workers and 243 meat inspectors[23]. In all these investigations serology was negative.

More recently an extensive investigation was carried out on sheep dogs. Since antibody has been found at high prevalence in infected populations of dogs[1][2][6][7], sheep dogs would be expected to act as an excellent sentinel system if sheep or cattle were infected. Hilbink and Penrose[24][25] tested 12,556 samples from sheep dogs from all over New Zealand, with negative results. Infected animals are usually asymptomatic but in the sporadic reports of disease associated with infection, infertility and abortions are the most commonly reported abnormalities[26][27][28][29][30][31][32]. Hilbink and Penrose also found that 2,181 sera submitted to animal health laboratories from cattle that had aborted were negative for antibody against *C burnetii*. More recently, Reichel and Timbs[33] obtained negative results from 1150 sera from red deer hinds from 575 farms.

MAF regularly collects information on specimens submitted to animal health laboratories and reports findings on a quarterly basis in this publication. Of the statistics always reported for abortion cases, 11,431 samples were submitted from cattle and 2,902 from sheep between 1991 and 2000. Although specific tests for *C burnetii* are not carried out on these samples they provide assurance that abortions are being investigated regularly in both the field and the laboratory.

Collectively these investigations present a convincing case that New Zealand is free from the pathogen *C burnetii*.

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R W Worthington

7 St Michael's Crescent, Kelburn, Wellington

E-mail: worthdmr@ihug.co.nz