Q fever is absent from New Zealand

To investigate the presence of Coxiella burnetii in sheep and cattle, the two major ruminant populations of New Zealand, samples from aborting cattle and sheep dogs were tested for antibodies. A total of 2,181 bovine and 12,556 canine samples were all negative. On the basis of these results and previous reports it is concluded that New Zealand is free from coxiellosis or Q fever.

Q fever or coxiellosis occurs worldwide. The disease was first described and investigated simultaneously in the USA and Australia in the 1930s. Later it was reported frequently in the Mediterranean basin. A WHO review published in 1955 reported the disease present on all continents but, remarkably, the disease was considered absent in the northwestern part of Europe including the Netherlands, the Scandinavian countries, Poland and Iceland. Since that study, however, seroprevalence in humans and animals and isolation of the causative organism, C. burnetii, has been reported from most of these countries too.

C. burnetii is excreted by its animal hosts in urine, faeces, birth products and, to a lesser extent, milk. This excretion results in direct transmission to other animals and humans. It may also lead to indirect transmission through fomites and, most importantly, aerosols in dust, in which the highly resistant organism can survive in a desiccated state for several months.

In the animal host a transient rickettsiaemia is followed by a dormant stage. In the animal host a transient rickettsiaemia is followed by a dormant stage. In the animal host a transient rickettsiaemia is followed by a dormant stage. In the animal host a transient rickettsiaemia is followed by a dormant stage. In the animal host a transient rickettsiaemia is followed by a dormant stage. In the animal host a transient rickettsiaemia is followed by a dormant stage. In the animal host a transient rickettsiaemia is followed by a dormant stage. In the animal host a transient rickettsiaemia is followed by a dormant stage. When the organism may multiply extensively in the placenta resulting in the shedding of large numbers of organisms during parturition or abortion.

In its arthropod hosts C. burnetii may multiply in parts of the gut and the salivary glands. Trans-ovarian and trans-stadial transmission takes place in a number of tick species and transmission to the offspring is also through blood sucking, tick faeces, etc. All these factors result in the maintenance of Coxiella in two well recognised, essentially independent reservoirs; a wildlife reservoir and one in domestic ruminants. From these two reservoirs it may spread to an unlimited number of accessory hosts.

The rationale of this investigation

In recent times the highest number of Q fever cases has been observed in Great Britain, Spain and Australia. In contrast, despite being close to Australia and having close contacts with it, New Zealand is generally believed to be free from Q fever. To investigate the correctness of this assumption, which is often met with disbelief, a serological survey was carried out in aborting cattle and in sheep dogs. These groups of animals were chosen because they were relatively easy and cheap to access and were expected to show the highest possible seroprevalence should the disease be present in the two major ruminant populations of New Zealand, i.e. cattle and sheep.

Aborting cattle: Q fever has been associated with infertility in cattle and, to a much lesser degree, directly with abortions. Nevertheless, even if the association with abortion is fairly weak, one may expect that during advanced pregnancy, when most abortions occur, elevated antibody titres will be found since Coxiella multiplies well in the trophoblasts of the placental villi.

Sheep dogs: Seroprevalence at various rates has been reported for dog populations in different areas of the world. Prevalences of 48 and 66% were found respectively in hospitalised dogs and stray dogs in California. Wild canids in that part of the USA showed a seroprevalence of 78%. Seroprevalences of about 32% have been reported from Switzerland and Sicily. The organism has been isolated from the blood of an infected dog and from Rhophilus sanguineus ticks feeding on it. Other ticks, such as Ixodes ricinus and Haemaphysalis leachi, taken from dogs were also found infected. Experimental oral and subcutaneous infections followed seroconversion have been described.

After parturition, infected sheep excrete C. burnetii in the faeces, milk, birth fluids and, in particularly high numbers, in their placentas. Many New Zealand sheep dogs have access to these sources of infection or are likely to be exposed to the aerosols and dust generated from them. They can, therefore, be expected to be reliable sentinels.

Results in the sheep dogs

Plasma samples from 12,556 dogs collected for a Taenia ovis antibody survey were used. The samples were collected by the New Zealand Hydatids Council from among the dog population of approximately 500,000.

When these samples were traced back, the donors were found to be well distributed over the country and the number of samples per region was in proportion to the total number of dogs in each region. The plasma samples were examined in an enzyme linked immunosorbent assay (ELISA). All were negative except for ten, which gave reactions exceeding the set cut-off levels. These ten dogs were resampled. Three of their sera were tested in the ELISA, the micro-agglutination test (MAT) and two different micro-immunofluorescence antibody tests (MIFAT). Results of this second ELISA were similar to those of the original ELISA but none of the sera gave unequivocally positive results in the other tests. The majority of them were clearly negative.

In addition, thirty serum samples were collected from ewes ≥3 years old, on each of the four farms from which the four dogs with the highest ELISA reactions originated. These sheep sera were tested in the complement fixation test (CFT). A selection of five sheep samples from each farm was also tested in the ELISA. All sheep sera were negative. The original ten ELISA reactions were therefore considered to be false positive.

Results in cattle

In the period from 1 January 1990 to 31 July 1992, 2,181 bovine serum samples were tested in a CFT. These sera were from all abortion cases submitted to regional animal health laboratories over that period. All except six samples were negative, even in the initial 1:4 serum dilution. The six samples giving reactions were all slightly anticomplementary and were negative in the ELISA.

Discussion

Since Coxiella infections normally run a subclinical course in humans, the disease is heavily under-diagnosed. However, due to their extreme susceptibility to infection, humans are excellent sentinels in terms of seroconversion.

This aspect has not been very well utilised in New Zealand. Since it is generally assumed that C. burnetii is absent from New Zealand, serological tests have, in recent times only been carried out in suspected cases related to overseas travel (personal communication, A. Chereshsky, Center for Disease Control, Porirua, New Zealand). A positive diagnosis, based on a strong (512-fold) increase in titre has been made only once. All evidence in this case pointed towards an infection contracted overseas.

The assumption of freedom from Q fever is, therefore, largely based on the conclusions of an international WHO survey carried out in 1953, which reported that 1,400 (undefined) sera were found negative.

Some further evidence has been provided by two other serosurveys. One was carried out in 1947-1948 and comprised four patients with atypical pneumonia, 11 abattoir workers and 12 dairy farmers who had been exposed to the cattle tick Haemaphysalis bispinosa (longicornis). All these persons were seronegative. The second survey was carried out in 1980 among 112 meat workers and 243 meat inspectors from 24 abattoirs. These were also all negative.

To this limited evidence, our negative results add new, updated and substantial proof that Q fever has not established itself in the ruminant population of New Zealand.

Since there is ample opportunity for contact between wildlife and farmed ruminants, it is very likely that wildlife in New Zealand is not a reservoir of C. burnetii either. One may speculate about
the reasons for this unique situation. Several factors may play a role. There is only one potential maintenance vector present in New Zealand; the cattle tick *Ixodes* *persulcatus* *burnetii.* This parasite may well be an inefficient vector. Moreover, its presence is not ubiquitous as it is absent from the colder areas of the South Island and its density is low in the colder areas of the North Island. Apart from birds, the range of potential small vertebrate hosts is limited to mice (*Mus musculus*), rats (*Rattus rattus, Rattus norvegicus, Rattus exulans*), rabbits (*Oryctolagus cuniculus*), hares (*Lepus europaeus*), weasels (*Mustela nivalis*), stoats (*Mustela erminea*), ferrets (*Mustela furo*), hedgehogs (*Erinaceus europaeus*), possums (*Trichosurus vulpecula*) and wallabies (*Macropus species*).

Importation of animals has always been restricted and testing for antibodies has normally been required. Several factors may play a role. There is only one potential maintenance vector for *Q* fever in New Zealand. The cattle tick *Ixodes* *persulcatus* *burnetii* is present in New Zealand; the cattle tick *Ixodes* *persulcatus* *burnetii* is the reason for this unique situation.

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**References**


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