Johne's disease in farmed deer

Will Johne's disease become an economically important disease in farmed deer in New Zealand? A recent report from Scotland[1] has shown that under certain conditions Johne's disease can be a major clinical problem in farmed deer.

Johne's disease, caused by *Mycobacterium paratuberculosis*, has been present in cattle and sheep in New Zealand for over 50 years. Initially, the infection in sheep occurred only in the South Island, especially south and mid Canterbury.[2] However, over the last 20 years there has been a steady increase in the number of infected flocks in the North Island. In the North Island Johne's disease has been prevalent in dairy cattle since the beginning of the century. The considerable trade in live animals, including the unrestricted movement from *M. paratuberculosis*-infected herds and flocks, has resulted in the organism becoming widespread in cattle and sheep in New Zealand. This spread has important implications for deer farming. Although cattle or sheep are rarely run together with deer, they are often used for pasture control on deer farms. As a result it is highly probable that there have been numerous opportunities for deer to become infected with *M. paratuberculosis*. The ability of *M. paratuberculosis* to survive for many weeks in the environment enhances the probability of infection spreading to farmed deer. The slow emergence of Johne's disease in sheep flocks in the North Island indicates that it may take a similar 20-year time period for the disease to emerge as a widespread problem in farmed deer.

The diagnosis of Johne's disease in deer is complicated by the similarity of lesions induced by *Mycobacterium bovis* and members of the *Mycobacterium avium* complex to those caused by *M. paratuberculosis*. In contrast to the situation with Johne's disease in cattle and sheep in New Zealand, necrosis is a feature of lymph node lesions of many deer infected with *M. paratuberculosis*. Hence a definitive diagnosis of Johne's disease in deer can only be made by the isolation of *M. paratuberculosis*. Since 1985, the date of the first isolation of *M. paratuberculosis* from New Zealand deer, 25 bacteriologically confirmed cases have been identified (Table 1). All these cases have occurred in red deer (*Cervus elaphus*).

continued overleaf

Table 1: *Mycobacterium paratuberculosis* isolated from deer

Year	Total No. Isolates	No. clinical Johne's disease	No. clinically normal
1985	1	1	-
1986	-	-	-
1987	-	-	-
1988	2	2	-
1989	3	-	3
1990	10	2	8*
1991	5	-	5
1992**	4	-	4
Total	25	5	20

* Three isolates came from no visible lesioned deer which reacted to a tuberculin skin test.
** No. of isolates for only 9 months of 1992.

These figures need to be interpreted with considerable caution since they are undoubtably an under estimate of the true incidence of *M. paratuberculosis* infection in New Zealand farmed deer. In some possible cases of Johne's disease, samples for bacteriology have not been available to confirm a presumptive histological diagnosis. The reporting of suspect cases has relied on private veterinarians and Ministry of Agriculture and Fisheries meat inspectors. Of the 25 bacteriologically confirmed cases, only five of them occurred in clinically affected animals. These deer came from five different farms and had the classical signs of Johne's disease; weight loss, and with one exception, diarrhoea. Given the interest of the deer industry in ill-thrift in adult animals, especially the fading elk syndrome, it is likely that the reported figures do correctly reflect a very low incidence of clinical Johne's disease in New Zealand farmed deer. An intriguing observation from both Scotland and New Zealand has been the occurrence of clinical Johne's disease in deer only 12 months old. Clinical Johne's disease in similar age sheep or cattle is extremely rare.

The figures in Table 1 are likely to be a far less reliable indicator of the incidence of subclinical Johne's disease. No surveys have been carried out to estimate the prevalence of subclinical Johne's disease in New Zealand farmed deer. The figure quoted for subclinical Johne's disease relates to animals identified at meat inspection as having necrotic lesions in the gut associated lymph nodes. This type of lesion may be very rare in deer infected with *M. paratuberculosis*. In the report from Scotland[1], lymph node lesions in infected deer were seldom necrotic and caseation or mineralisation was not observed.

In 1989, *M. paratuberculosis* was cultured for the first time from a lymph node which was identified at meat inspection as having a lesion similar to those caused by *M. bovis*. Direct microscopic examination revealed large numbers of acid-fast staining bacteria. No mycobacteria were isolated from this case when it was cultured using media designed for isolation of organisms such as *M. bovis* and members of the *M. avium* complex. *Mycobacterium paratuberculosis* was subsequently isolated when culturing was repeated using media supplemented with mycobactin which is required for the *in vitro* growth of this bacterium. Since 1989, 17 of 22 of the bacteriologically confirmed cases have come from clinically normal deer identified at meat inspection as having lesions similar to those caused by *M. bovis*. For the last 2-years, all suspect tuberculous deer lesions from gut-associated lymph nodes have been cultured for *M. paratuberculosis*, as well as other mycobacteria, such as *M. bovis* and members of the *M. avium* complex.

In a small number of cases, neither *M. paratuberculosis* nor any other *Mycobacterium* could be isolated from tissues which contained large numbers of acid-fast staining bacteria. It is highly likely that such cases were caused by a strain of *M. paratuberculosis* which principally infects New Zealand sheep. These strains, in contrast to those that infect New Zealand cattle, are very difficult to grow on primary culture. DNA fingerprinting has demonstrated that the strains of *M. paratuberculosis* which infect New Zealand cattle are different from those infecting New Zealand sheep.[3,4] Examination of 20 of the cervine strains by DNA fingerprinting, revealed three of them to be identical to those infecting New Zealand sheep. The remaining cervine strains were identical to the most common type isolated from cattle. There was no evidence to show that one DNA fingerprint type was more virulent for deer than the other. Both types have been isolated from deer with clinical Johne's disease. The fingerprinting studies have clearly shown that both infected sheep and cattle can be a source of *M. paratuberculosis* for deer.

Further surveillance of *M. paratuberculosis* infected deer herds is required to obtain an early insight as to whether Johne's disease is going to become a significant problem in this host species. Knowledge gained from surveillance studies will allow formulation of reliable recommendations on how to prevent deer herds from becoming infected with *M. paratuberculosis*. Such recommendations would include advice on how to reduce the probability of *M. paratuberculosis* spreading from cattle and sheep to farmed deer.

References

1 McKelvey, W A C, 1987: Johne's disease in deer. *Publication of the Veterinary Deer Society 2(6)*: 24-28.

2 Williamson, G T, Salisbury, R M, 1952: Johne's disease in sheep. *New Zealand Veterinary Journal 1*: 15-17.

3 Collins, D M, de Lisle, G W, 1986: Restriction endonuclease analysis of various strains of *Mycobacterium paratuberculosis* isolated from cattle. *American Journal of Veterinary Research 47*: 2226-2229.

4 Collins, D M, Gabric, D M, de Lisle, G W, 1990: Identification of two groups of *Mycobacterium paratuberculosis* strains by restriction endonuclease analysis and DNA hybridization. *Journal of Clinical Microbiology 28*: 1591-1596.

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