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Johne's Disease - why Johne's disease is so difficult to control

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ABSTRACT

Johne's disease caused by infection with *Mycobacterium avium* subspecies *paratuberculosis* affects New Zealand cattle, sheep, goats and deer. The disease is difficult to control because of the long incubation period, the long survival of the organism in the environment, shedding by apparently healthy but infected animals and the unreliability of diagnostic tests to detect subclinical or even clinical disease. A brief contrast with the approach to control in New Zealand and Australia is made.

Keywords: Johne's disease.

INTRODUCTION

Johne's disease is a chronic enteric disease caused by infection with *Mycobacterium avium* subspecies *paratuberculosis*. It has almost a worldwide distribution and affects domestic ruminant species (cattle, sheep, goats, deer, camelids) as well as wildlife such as rabbits, foxes and stoats and has been isolated from humans.

In most cases infection is believed to occur by ingesting an infective dose of the bacterium early in life, but because of the long incubation period, clinical disease does not usually occur until after 2 years of age in cattle and sheep. Offspring may also be infected while *in utero* if the mother is heavily infected. Over a period of several weeks affected animals lose weight, develop chronic diarrhoea and die if they are not culled or destroyed. There is no known cure for the disease. Only a small proportion, usually less than 1% of animals in a flock or herd develop clinical signs (Davidson, 1970).

The slow course of the disease means that it is easily spread by carrier animals and may be present in a herd or flock for many years before it is detected.

HISTORY

Johne's disease was first diagnosed in New Zealand in 1912 in a cow imported from Jersey. Subsequently a further case in a New Zealand bred cow was reported in 1928. Both these cases occurred in the Taranaki district and further investigation uncovered its presence on other farms in that district. These events were of considerable concern and options for control were discussed in

Parliament. Despite attempts at control, the disease continued to spread in the dairy industry.

Johne's disease was first reported in New Zealand sheep in 1952 in Canterbury, South Island. Subsequently increasing numbers of farms in the South Island were affected and in 1972 the disease was reported in North Island flocks. Johne's disease was diagnosed in goats in the early 1980s and in deer in 1985 (West, 1997).

Under the Stock Act 1931, Johne's disease was notifiable and the spread of disease has been monitored until September 2000 when it was removed from the schedule of notifiable disease. However it is generally accepted that these figures significantly underestimate the true prevalence of disease. It is now believed that infection is widespread in New Zealand perhaps affecting 60 – 70 percent of sheep flocks and dairy herds (Brett, 1998). Farmed deer are affected to a lesser degree.

Johne's Disease Steering Committee

In 1995 the New Zealand Ministry of Agriculture and Forestry initiated a review of Johne's disease and distributed a public discussion paper on the future management of Johne's disease (Anon, 1995). They also formed a steering committee of interested groups to oversee further research. As a result, a checklist of strategies to assist farmers and their advisors consider and implement a Johne's disease management programme was produced (Rhodes, 1998) and an economic evaluation of control options for the New Zealand livestock industries was published (Brett, 1998). Although accurate costs

TABLE 1: Estimated cost of Johne's disease to New Zealand – Brett, 1998.

Clinical cases as a percentage of female breeding stock

Industry	1%	2%	3%
Dairy	1. Isolated calf management 2. Vaccination	1. Isolated calf management 2. Vaccination 3. Test and Cull	1. Isolated calf management 2. Vaccination 3. Test and Cull
Sheep	1. None	1. Vaccination	1. Vaccination
Deer	1. Vaccination 2. Test and Cull	1. Vaccination 2. Test and Cull	1. Vaccination 2. Test and Cull
Beef	1. Vaccination	1. Vaccination	1. Vaccination 2. Test and Cull

TABLE 2. Options for the control of Johne's disease – Brett, 1998.

Industry	Cost per clinical case (\$)	Minimum cost (\$'000)	Most likely cost (\$'000)	Maximum cost (\$'000)
Dairy	1,616	3,800	18,925	31,744
Sheep	70-75	918	9,910	14,063
Deer	1,080	205	341	4,875
Beef	720	62	-	6,238
Total	-	4,985	29,176	56,920

remain elusive, it is evident that relative to the value of the industries themselves, Johne's disease does not cause large economic losses in the New Zealand industries. The total cost across the cattle, sheep and deer industries was estimated to be \$29.2 million (Table 1).

The disease control options for each industry was ranked depending on the prevalence of clinical disease (Table 2).

These recommendations largely involve management procedures and vaccination as control options rather than eradication. It is noted that despite the relatively small economic impact of Johne's disease, the social stigma associated with having the disease present on a farm can be detrimental to the farmers' morale. By treating the disease as a manageable condition and giving farmers a range of control options from which to choose, it is believed this will reduce the unnecessary negative stigma and reduce the costs of increased stress and worry to farmers. This approach contrasts with the approach taken in Australia.

Johne's Disease in Australia

Johne's disease was first diagnosed in sheep in New South Wales, Australia in 1980 although the disease had been present in the dairy cattle industry for some years (Sergeant, 2001). The disease in sheep is believed to be caused by specific sheep strains which can also affect goats and occasionally cattle reared with infected sheep flocks. Since 1980 the disease in sheep has been diagnosed in other states but large areas including Western Australia, Queensland and Mainland South Australian have very few, if any, infected flocks (Kennedy and Allworth, 2001). Less than 1 percent of the Australian national flocks are known to be infected.

In 1995 the New South Wales state government and sheep industry began to develop a strategic plan to control the spread of ovine Johne's disease and eradicate it from infected properties. During 1997 a national programme was formulated but uncertainty between state and Commonwealth governments and industry organisations lead to an independent assessment being commissioned (Hussey and Morris, 1998). This acknowledged that, based on current knowledge of the disease, there was some uncertainty as to whether it could be eradicated.

The report recommended support for the control of Johne's disease and research to determine the feasibility and cost effectiveness of eradication. Diagnostic techniques such as abattoir surveillance and pooled faecal culture have assisted in identifying flocks as infected or as low risk which, along with zoning, has helped control the spread of disease. Eradication from sheep farms has been by destocking for up to 18 months (including two summers). However this level of control comes at a high

cost, not only in financial terms (A\$40 million over 6 years) but also the increased stress and negative social stigma associated with having Johne's disease in the flock or herd.

Why is Johne's disease difficult to control?

In 1956, Armstrong (1956) described the following factors that make Johne's disease difficult to control.

1. the long incubation period
2. the long survival of the organism in the environment
3. the shedding of the organism by apparently normal but infected animals
4. the unreliability of diagnostic tests to detect subclinical or even clinical disease

These factors still apply today and these, along with the uncertainty about the role of wildlife reservoirs and whether cross species infection occurs of cattle and sheep strains, makes Johne's disease very difficult to control. Other speakers in this session will address some of these issues in more detail.

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