JOHNES DISEASE IN DEER IN NEW ZEALAND

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Abstract

Over the past eight years ten cases of presumptive Johnes Disease have been diagnosed in deer in New Zealand, one in Rusa deer, one in a Wapiti cross and the rest in red deer. Five have been in the South Island and five in the North Island.

Clinical signs have included emaciation, diarrhoea and sudden death. Autopsy findings have been variable and have included ileal thickening and mesenteric lymph node enlargement. Microscopically, granulomatous enteritis with many acid fast organisms present in macrophages has been the usual finding.

Currently Johnes Disease in deer is an uncommon disease. There are no indications that it will become a major problem.

Introduction

Johnes Disease (JD) is a disease that occurs in cattle and sheep and in goats in New Zealand (NZ). It is a disease that is reported to affect a wide range of ruminants in the world including red deer (Elaphus cervus) (Chiodini et al, 1984; Katic; 1961) A list of these is given in table 1. It was expected that it would appear in deer in NZ.

Johnes Disease is caused by infection with the bacterium Mycobacterium paratuberculosis (M. paratuberculosis). Infection is usually by mouth. When this occurs early in life, probably before weaning in cattle and sheep, the organism lodges in small numbers in the lymphoid tissue of the intestine and in the local lymph nodes. It causes little effect in these sites over the next few years, occasionally multiplying and shedding small numbers into the environment. This continues for the natural life of some animals; in others the infection is eliminated; in a third group the organism enters a phase of spectacular multiplication causing the condition known as Johnes Disease. It is shed into the environment in large numbers and eventually results in the death of the animal (Gilmour 1976). This is depicted diagrammatically in figure 1. Infection in cattle later in life does not usually cause disease.

The organism can survive in the environment for at least

one year, probably longer in some situations (Chiodini et al 1984).

Case Information

The first New Zealand case of granulomatous enteritis associated with acid fast organisms (afo) was reported in a Rusa deer in 1979 (see table 2). It was not until 1985 that a disease resembling JD was detected in red deer. Later in 1985 and in 1986 several other cases were reported. Details of each case are given in table 2.

The 10 cases reported here all occurred on different properties. In case 10 one other animal showed similar clinical signs and was considered to be JD. No laboratory confirmation was obtained.

The necropsy report indicated that enlarged mesenteric lymph nodes with pale centres were a significant post mortem finding.

Microscopically the lesions in the intestine, liver and nodes were very florid and were characterized by large numbers of afo laden macrophages. In the intestine large numbers of these extended from the mucosa through into the other layers of the intestinal wall including the subserosa in case seven.

Masses of these macrophages were present in the liver, mainly in the portal tracts. In the lymph nodes large areas of both cortex and medulla were heavily infiltrated by these macrophages.

In the three cases where the lungs were examined microscopically small clumps of afo laden macrophages were found in the interstitial tissues. This is not found in JD in cattle, goats or sheep (Jubb et al, 1985).

Mycobacterial culture was attempted in seven cases. Culture results from case 10 are awaited. Only in case 6 was an organism identified as M. paratuberculosis isolated. It resembled a bovine strain culturally. Restriction endonuclease analysis of the organism indicated that it had a unique pattern, generally similar to cattle strains but significantly different to them (de Lisle, pers. comm). The negative culture results in the other five cases cultured suggest that the causative organism resembles the strain present in sheep in NZ as this is very difficult to culture.

The first case of JD in red deer is recorded by Bourgeois (1940) in a red deer in Switzerland. It showed emaciation

and was euthanased. At autopsy characteristic lesions of Johnes Disease in cattle were found and acid fast bacilli were observed in smears of the colonic mucosa.

Dorofejev and Kalachev (1949) also report JD in red deer but no details are available.

In 1961 Vance reported a case of JD in a five year old male red deer which had been born on a game farm in New York State and shipped to another game farm in Edmonton, Canada at the age of three years. Two years after this the stag developed diarrhoea and became emaciated. Acid fast organisms were found in its faeces and its serum gave a positive complement fixation test for M. paratuberculosis. When the deer died several months later the large intestinal mucosa was thickened and the mesenteric nodes were enlarged. No histological examinations were done and M. paratuberculosis was isolated from the mesenteric nodes.

Thoen et al (1977) reported the isolation of M. paratuberculosis from 22 exotic animals that died in zoos. This included 11 deer but no details were given of the type of deer nor of the lesions seen at necropsy.

Weber and Christoph (1980) found antibodies against M. paratuberculosis in 7.3% of serum samples from 96 red deer in a hunting ground in Germany. They suggested that the source of infection was cattle and sheep.

Williams et al (1983) inoculated M. paratuberculosis isolated from free ranging big horn sheep into a range of animals including North American elk, a subspecies of red deer. Over the following 12 months no clinical signs of JD were seen in these animals. When the animals were killed the only gross lesions seen were in the mesenteric lymph nodes: they were slightly enlarged and contained two to four mm diameter yellow-white gritty foci. Microscopically these nodes showed granuloma formation with central necrosis and mineralization. Neutrophils and afo were present in the necrotic areas. Similar but milder lesions were present in the ileum; the liver of two of the eight elk showed similar mild lesions. The authors reported that focal necrosis and mineralization were more severe and widespread in Cervidae.

Recently Ross (1987) has reported that JD has been diagnosed in farmed red deer in Britain. Affected animals develop thickening and perhaps erosions of the large bowel with consequent progressive loss of condition.

The NZ cases show some variation in the clinical presentation of the disease and the lesions associated with it. The scanty overseas reports also show variations in

these factors.

Conclusion

We do not know the current prevalence of M. paratuberculosis infection or JD in deer in NZ. It is likely that many deer farms have been established on properties where M. paratuberculosis is present. So far the number of reported cases of JD is small.

The difficulties of diagnosing M. paratuberculosis infection, as opposed to JD, in deer as in all farmed ruminants makes control of the disease difficult. Prompt identification and removal of animals affected with JD is the only action available. Maintenance of good levels of nutrition and husbandry should help prevent clinical cases developing.

Vaccination against JD is possible in cattle and sheep and may become more common in NZ. However it often sensitizes animals to tuberculin and would cause problems in tuberculosis eradication programmes.

Johnes Disease is a scheduled disease and cases should be reported to the Ministry of Agriculture and Fisheries.

These appear to be the diagnostic features of JD in deer in NZ:

* clinical signs: diarrhoea is usual, most show loss of condition, some show a relatively short illness.

* afo will probably be present in the faeces of affected animals (no information available on serological tests).

* gross lesions are variable: ileal mucosal thickening occurs in some cases as does mesenteric node enlargement. Liver enlargement may also occur.

* microscopic lesions will probably include granulomatous enteritis with many afo present in macrophages affecting the ileum and caecum, granulomatous inflammation with afo laden macrophages in the mesenteric lymph nodes and foci of afo laden macrophages in the liver and other organs.

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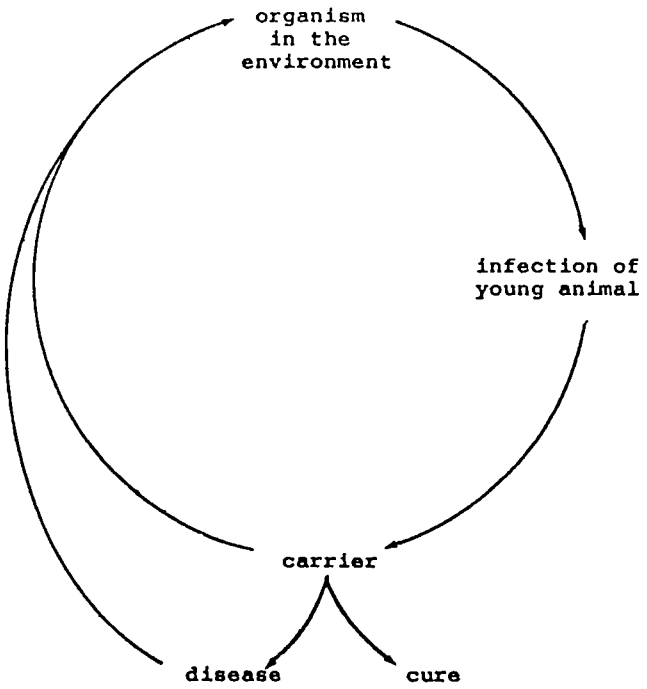

Figure 1: Johne's Disease Cycle

Table 1: Animals affected by Mycobacterium paratuberculosis

Domestic	Wild life
Cattle	Deer - white tailed
Sheep	- sika
Goats	- red
Camels	- axis
Reindeer	- roe
Llamas	- fallow
Zebu cattle	Moose
Red deer	Bighorn sheep
	Aoudads
	Mouflons
	Rocky Mountain goats
	Dwarf goats
	American bison
	American buffalo
	Water buffalo
	Bactrian camels
	Dromedary camels
	Antelopes
	Stone buck
	Tule elk
	Llama
	Yak
	Gnus
	Zebu cattle

from Chiodini et al (1984) and Katic (1981)

Case	1	2	3	4	5	6	7	8	9	10
Year	1979	1983	1985	1985	1985	1986	1986	1986	1986	1986
Type of deer	Rusa	Wapiti Cross	Red	Red	Red	Red	Red	Red	Red	Red
Location	Northland	Manawatu	Hawkes Bay	South Canty	Waikato	South Canty	South Canty	West Coast	Taranaki	Central Otago
Age	Adult	2 years	Adult	4 years	Aged	3 years	4 years	3 years	4 years	4 years
Sex	Male	Male	Male	Female	Female	Female	Male	Female	Female	Male
Number in group	na	300	na	40	100	na	100	50	200	200
Farm of origin	na	North Otago	na	South Canty	na	born on property	born on property	Southland	feral	born on property
JD status on farm of origin	na	na	na	+	na	na	na	na	na	na
Clinical signs - loss of condition	na	+	+	+	+	+	+	+	+	+
- diarrhoea	na	+	+	+	+	+	+	+	+	-
Clinical Pathology - afo in faeces	na	+ (single organisms)	na	+	+ (clumps)	na	na	na	+ (clumps)	ne
Duration of illness	2 weeks	4 months	na	5 days		2 months	10 days	6 weeks	4 months	na
Died/euthanased	died	euthanased	na	died		died	died	died	died	euthanased *
Gross lesions - emaciation	na	-	+	-		+	+	+	+	+
Ileum mucosal thickening	na	+	+	-		+	+	-	-	+
Mesenteric nodes - enlargement	+	-	+	-		+ liver enlarged	+	+	+	+
Microscopic lesions of JD - ileum	+ (duodenum)	+	ne	+		+	+	+	-	+
- caecum	ne	+	ne	+		+	+	+	-	-
- node	ne	+	+	+		+	+	+	ne	+
- liver	ne	+	ne	+		+	+	ne	-	-
- lung	ne	ne	ne	+		+	+	ne	ne	ne
Mycobacterial growth	no growth	no growth	no growth	no growth	ne	M para-tuberculosis	ne	ne	no growth	ne

na not available or not known + these signs/lesions present afo acid fast organisms * Case 10 2 animals affected, only 1 necropsied

JD Johne's Disease - these signs/lesions absent ne not examined

Table 2 : Johnes Disease in deer in New Zealand: case details