ANIMAL HEALTH

Common diseases of deer diagnosed at the AgriQuality Animal Health Laboratory, Palmerston North (1995-1998)

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Abstract

A range of diseases are commonly diagnosed in deer at the animal health laboratory. The majority of samples are "Optigrow" submissions assessing trace element status and meat plant submissions for disease control. A range of other disease syndromes seen over the past 3 years are summarised here.

Yersiniosis in red deer calves

Fifteen cases of Yersiniosis were diagnosed in 1998 from the beginning of May to the end of July. This compares with two cases in 1997 and seven in 1996 for the same period. In the lower North Island the disease appears sharply seasonal, with all cases in 1996/1997 occurring in May and June, while in 1998 the cases extended into July. All the cases over the three years involved young deer, most commonly in the 5 - 8 month age range. Positive diagnosis was based on the culture of a moderate or heavy growth of *Yersinia pseudotuberculosis* from intestinal content or mesenteric lymph node in cases of deaths and/or diarrhoea, where the practitioner suspected Yersiniosis. Some of the cases also had confirmatory histological evidence of an acute suppurative enteritis.

The cause(s) of the increased number of cases in 1998 are unknown. The disease is often associated with stress and the drought may have had some effect. However, the cases were widely spread and not just restricted to drought-affected areas. If anything, fewer cases may have been expected this year with the mild winter experienced.

Of the 15 cases diagnosed in 1998, 9 submissions had no vaccination history or stated that no vaccine had been used, in one case the deer had a sensitiser vaccine only, and in 5 cases the deer were stated to be fully vaccinated. This last figure raised the possibility of a vaccine failure and AgVax investigated some of these cases. We sent several *Yersinia pseudotuberculosis* isolates to AgVax to check whether any could be a new serotype not included in the vaccine. To date no new serotypes have been detected in New Zealand.

It is not possible to derive accurate and final mortality rates from the histories on submission forms. At the time of submission of samples mortality rates supplied for non-vaccinated deer ranged from 1/32 to 12/120, while those for fully vaccinated deer ranged from 4/25 to 20/500.

The current recommendation is to vaccinate as early as possible before the time of stress but not younger than 3 months of age due to possible interference from maternal antibodies. The second dose is given 3-6 weeks later. If possible it is best to avoid stress (eg weaning, transport) around the time of the first dose in particular. It is believed that if the deer are stressed their immune system may not respond as well to the vaccine. Full protection is attained 7-10 days after the second injection. Few vaccines are 100% protective and some sporadic Yersinia deaths may still occur, particularly in the face of heavy challenge. However, large losses should be prevented.

During vaccine trials it was noted that weaners from some sire lines were more likely to succumb to Yersiniosis than others, ie some animals appeared to be genetically more susceptible to the disease and vaccination was less effective in these individuals.

Diagnoses of Yersiniosis in red deer calves

Table 1: Monthly incidence of Yersiniosis cases for 96, 97, 98.

	May	June	July	Total
1996	5	2	0	7 cases
1997	1	1	0	2 cases
1998	4	6	5	15 cases

Table 2: Distribution of 1998 cases by district.

Wanganui	Rangitikei	Manawatu	Hawkes Bay	Wairarapa	Total
2	2	4	6	1	15 cases

Table 1 shows the number of cases of Yersiniosis diagnosed at the laboratory in deer calves over the last three years. Positive diagnosis was based on the culture of a moderate or heavy growth of *Yersinia pseudotuberculosis* from intestinal content or mesenteric lymph node in cases of deaths and/or diarrhoea, where the practitioner suspected Yersiniosis. Some of the cases also had confirmatory histological evidence of an acute suppurative enteritis.

Typical case history

May 1998

Several, 8 month old, well grown red stags grazing good feed were found dead with evidence of scouring. The weaners had been grazing new grass and a lot of barley regrowth. The weaners had all been fully vaccinated for Yersiniosis.

At necropsy the deer were mildly dehydrated, and the intestines were filled with foul smelling green content. There was very little haemorrhage or inflammation visible grossly. Some deer had been scouring, others had firm faeces in the rectum.

On histopathology there were multifocal eroded regions of the lamina propria with villous loss, enterocyte necrosis, and infiltration by moderate numbers of neutrophils. In some regions aggregates of gram negative coccobacilli were numerous, often intracellular. Fibrin thrombi and degenerate neutrophils expanded some lymphatics adjacent to arteries filled by neutrophils.

The lesions and associated coccobacilli plus history and post mortem findings all support Yersiniosis.

Verminous Pneumonia

In May 1998, five red deer weaner stags, aged 8 months died over a 3 day period from a mob of 96 animals. The stags were found dead and on necropsy the lungs were wet and the trachea and bronchi severely inflamed. No obvious nematodes were visible. The differential diagnosis included interstitial pneumonia and malignant catarrhal fever (MCF).

On histopathology of the lung there was multifocal to coalescing collapse of the pulmonary parenchyma with marked congestion, hyaline membrane formation along alveolar membranes and

type II pneumocyte hyperplasia. Interlobular septae were distended by oedema and eosinophils. Numerous nematode parasites were present often with associated haemorrhage and necrotic debris accumulated in bronchi. In the abomasum were numerous nematodes, both within the lumen and deep in the submucosa surrounded by eosinophil infiltrates and fibrosis.

These lesions were consistent with a diagnosis of verminous interstitial pneumonia caused by *Dictyocaulus viviparous* and a subsequent allergic reaction to them. In addition there was verminous abomasitis indicating a significant degree of parasitism and need for urgent parasite control.

Cryptosporidiosis in deer fawns

December 1997

In a paddock of 38 red deer hinds, sixteen, 2-3- week-old fawns had died and others were fading and weak. One moribund fawn had grey faecal material adhered to the perineum and was euthanased for necropsy. On histopathology numerous *Cryptosporidia parvum* organisms were seen pavementing degenerating superficial enterocytes in the small intestine. These were attributed to be the cause of the problem and have been associated with deaths in deer fawns previously.

Copper deficiency in red deer fawns

Four 1 to 2 month old Red deer in poor condition were observed to be slightly ataxic and were apparently weak in their hind quarters, running with a somewhat 'bunny-hopping' gait and standing with their hind limbs in a 'cow-hock' configuration. At necropsy one animal was found to be in poor body condition with little omental fat but no other abnormalities were noted. The liver copper result for this fawn was 26 umol/kg (>100 umol/kg considered adequate) and blood copper levels of 7 herd mates ranged from 1.5 to 6.0 umol/l with a mean of 3.3 (8.0 to 18.5 considered adequate). A histological section of rib showed minimal change, with the cortices appearing relatively thin and the bony trabeculae within the diaphysis widely separated.

Diagnosis: Copper deficiency with osteochondrosis and possible osteoporosis.

Copper deficiency in Red deer X fawns

A farmer noted three fawns from a group of 20 aged 2months which had 'restricted' movement and use of their hind limbs. All fawns appeared to have pale hair coats. Two of the fawns died and were necropsied at the laboratory. Both had been severely traumatised (assumed dam bashing) but otherwise no gross lesions were noted. Liver copper levels were very low in both fawns (17 and 10 umol/kg respectively). One fawn had pale ventral fibre tracts of the spinal cord which on LAB stained weakly for myelin (consistent with hypomyelogenesis). In the other fawn, tissues were moderately autolysed and accurate assessment of myelination was not possible. In the former fawn, in addition to the apparent myelination defect, a moderately severe focal to diffuse eosinophilic meningitis of spinal cord and brain was observed. The other fawn had a severe suppurative meningoencephalitis of spinal cord and brain stem consistent with Listeriosis.

It can be argued that in the first fawn either lesion (ie hypomyelinogenesis or inflammatory) could be responsible for the neurological signs, but that death was most likely due to maternal trauma. In the second fawn the severity of the suppurative meningitis would have been sufficient to cause death.

Interesting and unresolved aspects of these cases include:

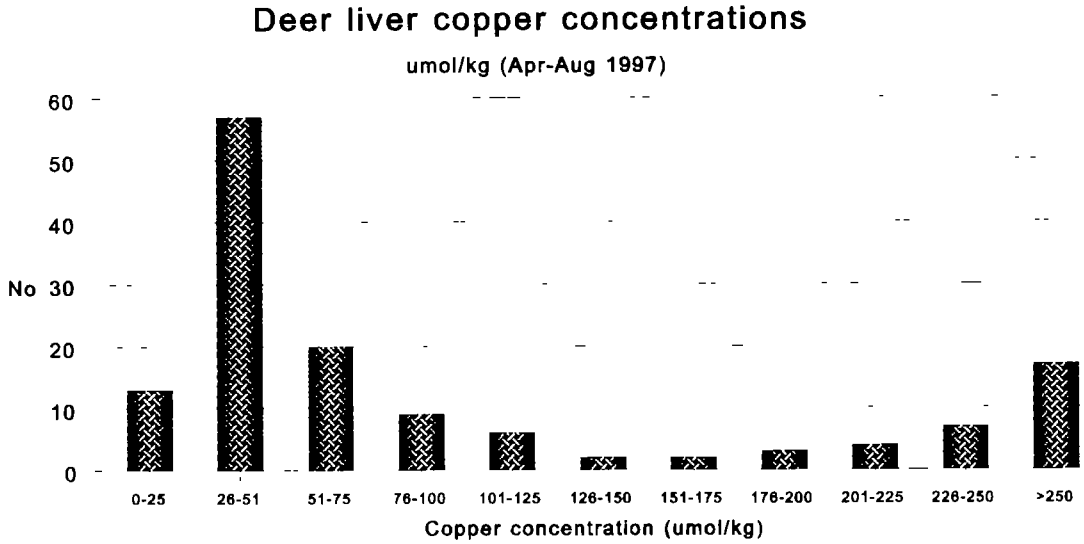
a) Copper deficiency-induced sway back is usually not a problem of red deer fawns of this age, occurring more typically in yearling and older animals.

b) The eosinophilic meningitis is highly suggestive of a parasitic infection, possibly *Elaphostrongylus cervi* larva migrans.

Copper deficiency

Copper concentrations in deer liver submissions were frequently low from April to August 1997. From 140 individual liver samples tested, 99 were below 100 μmol/kg, and 70 below 50 μmol/kg (figure 1). Between 50-100 μmol/kg is considered marginal and less than 50 μmol/kg considered deficient liver copper concentrations for deer.

Figure 1.



Samples were derived from 35 "Optigrow" meat works submissions, 3 "opportunity" liver samples from deer dying suddenly, and 3 investigations of disease; including ill thrift, ataxia and fractures. Most samples came from the Hawkes Bay (32%), Wairarapa (19%), Rangitikei (15%) and Manawatu (12%). Mixed age hinds were the most common sample group (46%), then mixed age stags (39%) and yearling stags (7%), reflecting the time of year of slaughter. Most of the deer were red deer (83%), with some crossbreds (15%) and few fallow (2%).

Mycobacterial enteritis

An adult red stag developed a wasting syndrome and was eventually euthanased. On post mortem the mucosa of the small intestine was thickened and mesenteric lymph nodes were increased in size. The practitioner's tentative diagnosis was Johnes disease or *Mycobacterium avium* infection.

The small intestine submucosa, lamina propria and the entire lymph node were effaced by a dense infiltrate of epithelioid macrophages containing large numbers of acid fast organisms on ZN staining.

Ruminal acidosis

June 1998

Seven-month-old red weaner stags being fed grain were dying. Three stags died on one day and another 3 died the next day. At necropsy there were few gross changes other than abundant grain

in the rumen and a rumen pH of 5. Ruminal acidosis was the provisional diagnosis, with a differential diagnosis of salmonella, yersinia and MCF.

Microscopically there was slight superficial epithelial ballooning.

A history of grain feeding plus a post-mortem finding of pH 5 or less is consistent with grain overload. Rumen pH should be 5.5-7.0. Once the pH gets below 5 rumen function changes and animals can die of dehydration and metabolic acidosis.

Deaths in weaner deer associated with hepatic abscesses

About 20 six-month-old weaner Red deer in a group of 500 died over a period of several weeks. Three were necropsied and the most consistent finding was the presence of scattered foci of necrosis (about 3-5cm in diameter) in the liver. One animal also had a necrotising lesion involving the rumen and a severe, fibrinous, haemorrhagic pneumonia. Histologically the liver lesions consisted of foci of necrosis containing numerous, filamentous, gram-negative bacteria consistent with *Fusobacterium necrophorum*. The lung lesion was a severe, necrotising, fibrinous, haemorrhagic pneumonia and also contained numerous filamentous bacteria. Maize was been fed out to the group and some animals were probably overeating with ruminal acidosis predisposing to ruminal necrobacillosis and metastatic hepatic necrobacillosis. Similar hepatic lesions were seen in a six-month-old Wapiti deer from another property which had experienced acute deaths in weaners.

Neoplasia

Meat plant submissions account for many neoplastic lesions seen. Cases include lymphosarcoma in a two-year-old deer with neoplastic infiltrates of thymus, prescapular and mediastinal lymph nodes. A 3 cm diameter hepatic lesion which obstructed the main bile duct was seen in a Red deer hind at slaughter. The hind was jaundiced and in poor nutritional condition. A bile duct adenocarcinoma was diagnosed on histopathology.

Another case was a thin Red deer hind shot in the Tararua Forest Park with lymphosarcoma involving the liver and renal, hepatic and mesenteric nodes

Combined parapox and dermatophilus dermatitis in Fallow deer

For two consecutive seasons a farm had experienced deaths in Fallow deer fawns affected with severe crusting dermatitis. Six of 24 fawns aged up to 2 months died with extensive dermatitis affecting mainly the face, neck and dorsal back, but in some cases also involving pasterns and axilla.

Histological changes included diffuse hyperplastic, necrotising and suppurative inflammatory lesions of surface epithelium and follicular infundibula. Typical parapox virus inclusions were present in the ballooned keratinocytes. The epidermal surface and follicles contained vast numbers of bacteria, including Dermatophilus.

In one case there was acute degeneration and necrosis of renal convoluted tubules, presumed to result from dehydration and shock.

Generalised parapox infections are recognised to occur in young deer, usually in association with predisposing trauma (eg thistles in pasture or coarse hay in bedding material). In the present cases, no predisposing factors were identified.

Malignant Catarrhal Fever

October

A farmer had 3 hinds die out of a mob of 34. The 3 that died were from of a group of 6 that were bought in recently. The hinds died suddenly with a very small amount of frank blood visible around the anus. At necropsy there was slight reddening of buccal papillae, and marked reddening of the entire gut. Frank blood was present in the large intestine and caecum, plus surface haemorrhages on serosal surface. The mesenteric lymph nodes were markedly enlarged.

On the kidney were discrete 1-2 mm white foci over the surface extending about 0.5 mm into the renal cortex. The adrenals were very reddened. The bladder mucosa was reddened with mucosal haemorrhages.

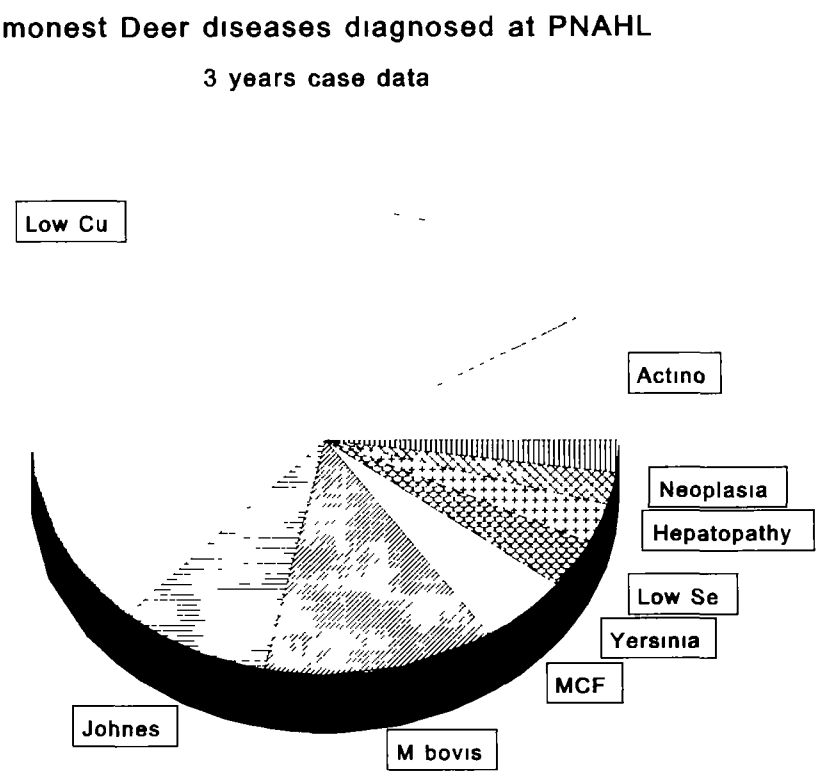
On histopathology blood vessels in the kidney, liver, submucosa of the intestine, and lymph node were surrounded by lymphocytes and macrophages. The mucosa of the small intestine was intensely haemorrhagic and had multiple bacterial colonies present in the superficial and deep layers. In addition an MCF PCR on fresh pooled kidney, liver and adrenal tissue was positive confirming a diagnosis of MCF.

Table 3: **Diagnoses of diseases in deer at the AgriQuality Animal Health Laboratory, Palmerston North 1996-1998**

	96	97	98
Actinobacillosis	6	15	5
A pyogenes	1		
Arthritis -Bacterial		1	
Clostridium septicum cellulitis/myositis	1		1
Low copper	74	80	9
Cryptosporidiosis		2	
Hepatic bile duct cysts		2	
Hepatopathy	2	5	
Johne's	8	8	9
Leptospirosis	1	2	2
M avium	2	4	
M bovis	23	13	2
MCF	4	9	2
Neoplasia	1	4	1
Osteochondrosis in fawns		1	
Parapox	3		
Polioencephalomalacia			1
Post-velvetting death - xylazine hypersensitivity		3	1
Low selenium	2	6	
Low cobalt		1	1
Verminous pneumonia		1	1
Yersinia		2	8

NB: These figures do not include cases where no diagnosis was reached or normal values were obtained.

Figure 2


Commonest Deer diseases diagnosed at PNAHL
3 years case data
Low Cu
Actino
Neoplasia
Hepatopathy
Low Se
Yersinia
MCF
Johnes
M bovis