VACCINATION OF DEER : LEPTOSPIROSIS AND CLOSTRIDAL DISEASES

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1. LEPTOSPIROSIS

Leptospirosis is a potentially serious disease of deer under some circumstances, particularly in association with pigs and/or cattle. Most infections in deer are clinically inapparent but renal and liver lesions, abortion and redwater have been reported. The vaccine is used by some deer farmers who regard their herds at risk or who have had leptospirosis problems in the past. It was therefore logical to examine serological responses to the vaccine. A hardjo-pomona vaccine ("Leptavoid", Wellcome N.Z. Ltd) was used.

Six previously unvaccinated hinds were vaccinated twice, one month apart and thereafter annually on two occasions by cervical subcutaneous injection of a 2ml dose. Jugular venepuncture samples were collected at intervals throughout the course of the trial. Samples were tested for antibodies to serovars hardjo and pomona using a microscopic agglutination test with a final dilution of 1:24.

Titres are presented in Table 1. No adverse reaction occurred following vaccination. The two deer with prevaccination titres to hardjo produced an apparent anamnestic response to the vaccine. The urine of these deer was negative for leptospires so presumably they had been infected previously. The initially seronegative deer produced a low response rate to the first vaccination but all produced a response to pomona after the 1 month booster and only 1 failed to produce a response to hardjo. A similar response rate occurred after annual revaccinations. Responses differed year to year, possibly due to different vaccine batch potencies. The magnitude and prevalence of responses were similar to those using the same vaccine in cattle, but the vaccinal titres in deer fell below detectable levels much earlier than in cattle. In fact 83.9% and 96.8% of cattle had titres to hardjo and pomona, respectively, after 12 months, whereas no deer had titres after 3-5 months.

This experiment did not set out to show if the vaccine protected deer from infection or if so, for how long. It has been shown that the vaccine protects cattle against infection for up to 12 months, and even some cattle with undetectable titres were protected. It is possible this situation

also occurs in deer. The vaccine had been used apparently successfully in the face of a leptospirosis outbreak in 6 month old deer, manifested by death with kidney lesions, in N.Z. and its use must certainly be recommended in herds where leptospirosis has been confirmed.

I believe that until further experimental work is carried out that where leptospirosis is a problem, a conservative approach using two doses of vaccine annually may be appropriate. A proposed vaccination programme could involve:

1. Previously unvaccinated deer.
   (i) All deer on property injected
   (ii) All deer given booster after 4 weeks
2. Annual programme. Having vaccinated and sensitised the herd:
   (i) A six monthly vaccine. Probably immediately after the rut, and again before calving to coincide with the precalving clostridial vaccine, or for stags, at velveting.
   (ii) Weaners should be vaccinated no sooner than 3 months of age. Thus the leptospiral vaccine programme could commence at the same time as the clostridial vaccination programme. A booster 4 weeks later would be necessary.

FURTHER FIELD TRIALS

More work is under way with the pomona-hardjo vaccine. A deer herd has been found to have a hardjo titre prevalence of 60% after a farmer contracted leptospirosis (hardjo) after having handled only deer. It is possible the infection was contracted from handling hinds with dystocias or by picking up dead foetuses which may have been late abortions with leptospirosis. The yearling stags from this property have been blood and urine sampled and split into two groups - vaccinates and non vaccinates, containing equal numbers of seropositive and seronegative deer in each group. The groups will be monitored by blood and urine samples and the effect of vaccination in preventing further seroconversion and leptospiurea assessed. This type of trial can yield considerable information about both the epidemiology of leptospirosis in deer, and about vaccine effectiveness in the face of a natural challenge.

Table 1 Reciprocal of Pomona (P) and Hardjo (H) titres of adult female red deer following vaccination with a L. pomona-hardjo vaccine.

Vaccination and sampling intervals	Deer Number 1		3		8		10		11		12	
	P.	H.	P.	H.	P.	H.	P.	H.	P.	H.	P.	H.
Prevaccination												
(18.6.81)	-	-	-	-	-	384	-	24	-	-	-	-
Sensitiser Vaccination (18.6.81)												
Week 1	-	-	-	-	48	384	48	48	-	24	-	-
Week 2	-	-	-	-	24	768	48	192	-	48	-	-
Week 3	-	-	-	-	48	1536	48	192	24	48	-	-
Week 4	-	-	-	-	-	1536	24	192	-	48	-	-
Booster vaccination (17.7.81)												
Week 5	-	-	24	24	192	3072	48	96	48	48	48	24
Week 6	-	24	24	48	96	1536	48	192	48	48	48	24
Week 7	-	24	24	48	192	1536	48	96	24	24	48	24
2 Months	-	24	24	48	192	3072	48	384	24	96	48	48
5 Months	-	48	24	24	48	384	-	96	-	24	-	-
9 Months	-	-	-	-	-	304	-	24	-	-	-	-
12 Months	-	-	-	-	-	192	*	*	-	-	-	-
First Annual Booster (17.6.82)												
Week 3	-	-	24	48	384	384			24	24	24	-
Week 5	-	-	24	-	768	768			24	24	24	-
4 Months	-	-	-	-	96	768			-	-	-	-
12 Months	-	-	-	-	#	#			-	-	-	-
Second Annual Booster (31.5.83)												
Week 2	-	96	48	96					24	96	96	48
Week 4	24	96	24	48					24	96	24	96
Week 6	-	24	24	24					-	24	48	24
3 Months	-	-	-	-					-	-	-	-

* = Died # = Culled

2. CLOSTRIDIAL DISEASES

The use of clostridial vaccines in deer appears to be widespread. The vaccination programmes applied by farmers probably vary greatly: many give only a single vaccine, some give a 4ml dose while others give 2ml.

The occurrence of clostridial diseases is apparently not common. MAF Animal Health Laboratory statistics from 1979 - 1983 are presented in tables 2 and 3.

Table 2 Clostridial isolates from deer 1979 - 1983 (Animal Health Laboratory Statistics).

Cl. perfringens type D	26
Cl. perfringens untyped	9
Cl. septicum	6
Cl. novyi	3
Cl. chauvoei	1
Clostridium (unidentified)	2
Total	47

Clostridial organism isolates were made from fewer than 1% of all deer cases submitted to Animal Health Laboratories.

Table 3 Clostridial "cases" in deer 1979 - 1983 (Animal Health Laboratory Statistics).

Sudden death	perfringens type D	17
	septicum	4
	perfringens (untyped)	2
	novyi	1
	chauvoei	1
Scouring and G.I. Signs	perfringens type D	3
	perfringens (untyped)	3
	novyi	1
	unidentified	2
Ill thrift	perfringens type D	2
	perfringens (untyped)	1
Musculosketal	perfringens type D	1
	perfringens (untyped)	1

Nervous signs	perfringens type D	1
No history	septicum	2
	perfringens type D	2
	perfringens	2

It is clear from individual case histories that few of the cases where these isolates were made were actually diseases caused by the organism i.e. many were incidental isolates.

TRIAL

A trial was set up to investigate a 5-in-1 clostridial vaccine in deer. The objectives were:

1. To examine the blood antibody titre responses following vaccination.
2. To ascertain whether the response to a 2ml dose is the same as for a 4ml dose.

Group 1. 10 three month old red deer were given a 2ml dose of vaccine followed by a 2ml booster 6 weeks later. Blood samples were collected at 7 day intervals for 63 days and three further times up to 110 days.

Group 2. 9 three month old red deer were vaccinated with a 4ml dose, revaccinated 6 weeks later and blood samples collected at 0, 14, 42, 56, 75, 84 and 110 days.

Antibody titres were measured by Mr D. Liardet, ICT-Tasman. Results are presented in Table 4. Antibodies to Cl. chauvei have not yet been measured.

Antibodies were measured on pooled sera, as is standard for this type of work. Although at certain times, individual animal titres were analysed to see the degree of uniformity.

There were no dectable PK titres before the first vaccination. The booster was followed by a peak response to all components after 14 days.

Table 4 Pooled vaccination responses to a 5-in-1 clostridial vaccine in red deer. The sensitiser was given on day 0, and the booster on day 42.

Days Post 1st vacc.	2ml dose				4ml dose			
	PK	MO	BD	TET	PK	MO	BD	TET
0								
7	0.67	-	-	-				
14	0.67	-	-	-	0.67	-	-	-
21	0.67	-	-	-				
28	0.67	-	-	-				
35	0.67	-	-	-				
42*	0.67	-	-	-	0.67	0.67	0.67	0.67
49	1.0	0.67	1-2	0.67-1.0				
56	1-2	0.67	2.0	1-2	1-2	0.67	1-2	1-2
63	0.67-1.0	0.67	1-2	0.67-1.0				
75	0.67	-	-	-	0.67	0.67	0.67	0.67
84	0.67	-	-	-	0.67	-	-	-
110	0.67	-	-	-	0.67	-	-	-

KEY: PK = Cl. perfringens type D
MO = Cl. septicum
BD = Cl. novyi
TET = Cl tetani
- = Not tested
* = Time of 2nd injection

Titres fell to undetectable levels rapidly. There was no difference in antibody response between the 2ml and 4ml dose. All animals showed a similar response i.e. the levels were uniformly low in all deer.

The striking feature of these results is the low level of antibody response, and the short duration of response. Peak titres are only 10-20% of titres for these antibodies following vaccination in sheep, cattle and goats (Liardet, pers. comm). The reason for this is not clear, but the results raise many questions including:

Why were antibody responses so low?
Why did antibody levels fall so rapidly?
Does the vaccine protect deer?

It is possible that the titres were lower than in sheep and cattle because natural exposure to the organism may not have taken place, and therefore the deer may not have been "pre-sensitised".

If the vaccine does not protect deer then the low incidence of clostridial disease in farmed deer may be due to a naturally low susceptibility and therefore vaccination would be unwarranted. Conversely, the low incidence on farms may be a result of current widespread vaccination (or perhaps sheer good luck!). In fact, this data questions the importance of clostridial diseases in deer. It may be necessary to experimentally infect deer with the causative organism or toxin to answer the question of susceptibility of deer species to clostridial diseases. To date this has not been done. We have yet to analyse samples for all antibodies. This data will be published in full in due course in the New Zealand Veterinary Journal.