# YERSINIAVAX EFFICACY UNDER FIELD CONDITIONS IN WEANER RED DEER

**C.G. Mackintosh, B.M. Buddle and J.F.T. Griffin**

## INTRODUCTION

Yersiniosis remains one of the most common diseases of young deer farmed in New Zealand It is caused by *Yersinia pseudotuberculosis* (*Y pstb*) serotypes I, II and III and it is precipitated by environmental factors, especially stressors such as undernutrition, transport and harsh weather conditions Until recently the only way to reduce the incidence or prevent outbreaks of disease has been to improve management and husbandry. In 1989 and 1990 a new *Y pstb* vaccine was used in two experimental stress/challenge trials on the Invermay deer farm involving 139 and 128 weaner red deer respectively. After yarding, fasting for 24 hours and transport they received a heavy (>3-8x$10^{10}$ organisms) oral challenge with live *Y pstb* I organisms In both trials the vaccine gave significant protection against clinical yersiniosis although some vaccinated animals were affected and died due to the size of the challenge (Mackintosh *et al* 1990, 1991) In 1991 a field trial was conducted to test the *Y pstb* vaccine ("Yersiniavax") under natural conditions, and is reported here

## MATERIALS AND METHODS

The vaccine, Yersiniavax, was prepared at MAF Technology Wallaceville and contained *Y pstb* serotypes I, II and III formalin killed bacterin plus concentrated supernatant and the adjuvant DEAE dextran Twelve veterinarians took part in the field trial following a call for volunteers in the September 1990 issue of *Veterinary Cervus* They each selected one or two "high risk" farms which fulfilled criteria for trial selection Seventeen "high-risk" farms were selected on the following criteria there was a high degree of likelihood of an outbreak of Yersiniosis involving more than 5-6% of the group based on previous history, they had a mob size of >150 and the farmer was co-operative and reliable

A total of 4,958 calves were involved, with half of each mob receiving 2 by 2 ml doses of Yersiniavax, 3 to 6 weeks apart All animals were individually identified and were run together for the duration of the trial (March-September) All clinical cases of yersiniosis and deaths were recorded Wherever possible faecal and necropsy samples were sent for *Y. pstb* culture and/or histopathological examination to the nearest Animal Health Laboratory

## RESULTS

Vaccination A total of 2,463 calves on 17 farms were vaccinated and matched with 2,495 unvaccinated calves They were predominantly red deer calves although there were a few wapiti x red hybrids Approximately 20 calves did not receive their second dose of vaccine for a variety of reasons Primary doses were given between March 14 and June 6 (median date April 10) and booster doses were given between April 16 and June 26 (median date May 9) with a mean interval of 34 days (range 22-50) No adverse reactions were recorded although one veterinarian noted "the odd small lump which regressed very quickly " Each group of vaccinated calves was matched with an approximately equal number of unvaccinated calves matched for sex, age and breed type and run together after vaccination Total mob sizes averaged 291 (range 196-520)

Outbreaks Outbreaks of yersiniosis occurred in 3 of the 17 trial mobs (see Table 1) Two (A and B), were in the central North Island, and one (C) was from Canterbury Outbreak A involved 43 clinical cases, all of which died, from a total of 299 calves, with 33 deaths (22%) affecting unvaccinated and 10 deaths (6 7%) in vaccinated calves (P<0 001). Outbreak B involved 88 cases of clinical yersiniosis (34%) of which 55 died (21%) in 260 unvaccinated calves compared with 10 clinical cases (4%) of which 3 died (1%) in 260 vaccinated calves (P<0 001) Outbreak C involved 22 cases of yersiniosis (14 5%) and 3 deaths in the unvaccinated group and 13 cases of yersiniosis (8 5%) and 3 deaths in the vaccinated group This difference in the number of cases of yersiniosis is not significant (p<0 2) but the outbreak started less than 2 weeks after the first dose of vaccine was given and no new cases occurred after the second dose 3-4 weeks later

On both the farms A and B all of the unvaccinated animals were given an injection of long acting tetracycline during the outbreak Subsequently, no further cases occurred on farm A, whereas the outbreak continued on farm B, restarting about a week after the injection

None of the other farms experienced mortality rates higher than 4 7% with overall mortality rates of 1 2% for vaccinated and 0 8% for unvaccinated and the minor differences in putative cases of yersiniosis and mortality were not significant The figures in Table 1 for "Yersiniosis" are raw figures which are largely based on clinical signs of diarrhoea or are assumed to be cases of yersiniosis in the absence of other obvious diagnoses The figures for "Died" are the total

number of trial animals that died during the trial period It is very likely that some of the cases of "Yersiniosis" and "Died" were in fact not due to yersiniosis but because it can be assumed that other infections and causes of death are likely to be randomly distributed between vaccinated and unvaccinated groups they probably make little difference to the overall analysis

## CONCLUSIONS

1 The vaccine appears to be safe and does not cause significant local reactions at the site of injection

2 The vaccine gave significant protection (P<0 001) on two properties which experienced large outbreaks (22 and 21% mortality in control animals) with mortality rates of 6 7 and 1% respectively.

3 It is essential that two doses of vaccine are given in early autumn (March/April) prior to when yersiniosis is likely to occur to ensure optimal protection On properties A, B and C the first vaccinations were not given until late May and in all three cases, outbreaks started 2 to 4 weeks later, prior to the second vaccination The three properties experienced moderate mortalities (6 7, 3 2 and 8 6% respectively) in vaccinated animals and most occurred before the second dose.

4 On practical grounds it is difficult to get a significant result in a field trial of this kind for the following reasons

   a. by vaccinating half a group of animals it reduces the chance of a large outbreak developing because of the number of susceptible animals is reduced and animal to animal transmission is less likely to occur It is interesting to note that despite choosing farms that had a history of yersiniosis outbreaks (ie, at least 2 in the last 3 years) only 3 of the 17 had significant outbreaks in trial animals. However, some of these farms experienced outbreaks in other groups of weaners run separately from the trial animals It is possible that fewer outbreaks occurred because of better weather, increased awareness, better feeding, and other management factors However, it may be that vaccinating half the group reduced the occurrence of outbreaks

   b On the other hand, if an outbreak does occur in the unvaccinated animals then they will excrete large numbers of *Y pstb* organisms, and expose the vaccinated half of the group to a higher degree of challenge than would be present if all the animals were vaccinated If a herd is totally vaccinated then the vaccine should perform better than in the trial because even if the protection is not absolute it should prevent outbreaks and therefore the degree of challenge to vaccinated animals will be minimal (ie, normal environmental contamination from feral and domestic animal carriers)

   c Because the morbidity and mortality rates reached such high levels in the unvaccinated groups during the outbreaks on farms A and B, the veterinarian gave prophylactic injections of tetracycline to all the unvaccinated animals once significant protection had been demonstrated in vaccinated animals This probably reduced the farmers' losses, but because none of the vaccinated animals were treated prophylactically it may have slighted biased the overall result against the vaccine

## ACKNOWLEDGEMENT

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## REFERENCES

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Table 1 Details of clinical cases of yersiniosis and deaths on farms involved in the Yersiniavax trial

| Veterinarian | Farmer | Vaccinated | | | Unvaccinated | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | No. of animals receiving Yvax & date of vacc. (1°) (2°) | Yersiniosis (%) Total | Died (%) | No. unvacc. Total | Yersiniosis (%) | Died (%) | |
| I | A | 150 (22/5) (20/6) | 10*(6 7) | 10*(6 7) | 149 | 33*(22 1) | 33*(22 1) | Outbreak 10/6-11/7 No sick individuals treated. All unvacc were given Terramycin LA inj 11/7 - no further deaths *Y pstb* isolated from 5 unvacc , 3 Yvax Concurrent Cu deficiency prior to 2nd vacc |
| | B | 260 (20/3) (8/5) | 10*(3 8) | 3*(1 2) | 260 | 88*(33 8) | 55*(21 2) | Deaths started 28/4 *Y pstb* confirmed in 3 unvacc cases One Yvax animal heavily parasitised - All unvacc deer given Terramycin LA during outbreak. |
| II | C | 152 (20/5) (24/5) (26/6) (2/6) | 13(8 6) | 3(2 0) | 152 | 22(14 5) | 3(2 0) | Cases occurred 4/6-20/6, ie, prior to 2nd vacc No new cases after 2nd vacc |
| III | D | 100 (21/3) (1/5) | 2(2 0) | 2(2 0) | 96 | 1(1 0) | 1(1 0) | One unvacc found dead *and Y pstb* isolated One and possibly both Yvax had severe lungworm as probable cause of death *Y e* isolated |
| IV | E | 186 (12/4) (25/5) | 1(0 5) | 1(0.5) | 185 | 2(1 1) | 2(1 1) | One Yvax animal died - no PM One unvacc scour but not sampled One unvacc had broken neck |
| V | F | 127 (19/3) (30/4) | 6(4 7) | 6(4 7) | 124 | 2(1 6) | 2(1 6) | Had 10 die of yersiniosis in another mob late March Three Yvax which had only one dose died 8 wks after 1st dose *Y pstb* isol from 2 unvacc and the three above |
| VI | G | 159 (10/4) (9/5) | 4(2 5) | 4(2 5) | 160 | 3(1 9) | 2(1 25) | None confirmed *Y pstb*, one *Y e* |
| | H | 241 (28/3) (26/4) | 4(1 7) | 3(1 2) | 261 | 3(1 1) | 3(1.1) | 15 not revacc 2nd time One unvacc -broken neck. One Yvax -aspergillosis Rest scour and death |

continued . .

* significant difference between vaccinated and unvaccinated, all the rest non-significant differences

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| Veterinarian | Farmer | Vaccinated: No. of animals receiving Yvax & date of vacc. (1°) (2°) | Vaccinated: Yersiniosis (%) Total | Vaccinated: Died (%) | Unvaccinated: No. unvacc. Total | Unvaccinated: Yersiniosis (%) | Unvaccinated: Died (%) | Comments |
|---|---|---|---|---|---|---|---|---|
| VII | I | 111 (6/5) (10/6) | 0 | 0 | 111 | 0 | 0 | No cases. |
| | J | 135 (8/5) (31/5) | 1(0 7) | 1(0 7) | 135 | 2(1 4) | 0 | 15/5; 2 unvacc had diarrhoea, treated and recovered, and *Y e* isol from both. 22/6, one Yvax found dead, *Y pstb* isol but had firm faeces |
| VIII | K | 121 (29/4) (24/5) | 0 | 0 | 143 | 0 | 0 | Had outbreak yersiniosis and lost 5 weaners in another non-trial mob of weaners |
| | L | 172 (14/3) (22/4) (2/4) (17/5) (10/4) (17/5) | 3(1 7) | 3(1 7) | 127 | 1(0 8) | 1(0 8) | One Yvax and one unvacc had fatal fracture. Two Yvax died with autopsy suggestive of MCF, no *Y pstb* isol Two deaths in other non-trial mobs - probably yersiniosis |
| IX | M | 97 (8/4) (8/5) | 1(1) | 1(1) | 140 | 3(2 1) | 2(1 4) | *Y pstb* isol from dead Yvax animal (not treated) One unvacc calf treated and recovered One nonvacc calf treated and died |
| X | N | 146 (22/3) (16/4) (16/4) (8/5) | 0 | 0 | 146 | 0 | 0 | No cases. |
| | O | 100 (30/3) (8/5) | 1(1) | 1(1) | 97 | 1(1) | 1(1) | Two cases in early August with *Y sp* isolated from both |
| XI | P | 100 (10/4) (23/5) | 1(1) | 1(1) | 100 | 1(1) | 1(1) | One Yvax stag that died had only one dose (5 missed 2nd dose), both were found dead, autolysed, no diag |
| XII | Q | 106 (8/4) (21/5) | 0 | 0 | 109 | 0 | 0 | April, 9 deaths from leptospirosis, 4 Yvax, 5 unvacc No signs of scouring or sickness May-Aug. |
| | TOTALS | 2,463 | 57 | 39 | 2,495 | 162 | 106 | |

* significant difference between vaccinated and unvaccinated, all the rest non-significant differences