INTERVENTION STUDIES TO ASSESS THE EFFICIENCY OF ON-FARM CONTROL PROGRAMS AGAINST TUBERCULOSIS IN NEW ZEALAND

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In New Zealand the Australian brushtail possum (*Trichosurus vulpecula*) is a reservoir host and vector of bovine tuberculosis (TB). [1] Effective TB control must include possum control, which is principally conducted by regional councils financed by industry and government. As a consequence of these intensive possum control operations, the incidence of TB in cattle and deer herds and the numbers of herds under quarantine for TB control have decreased. However, in many areas continuous vector control efforts are necessary to keep TB in livestock at low levels. With decreasing numbers of cattle and deer herds infected, the marginal returns from large-scale possum operations are decreasing. Thus, responsibility for TB control will increasingly be assigned to individual farmers.

Direct contact between livestock and moribund terminally-ill tuberculous possums is the most likely way of transmitting TB from possums to cattle and deer. [2] TB in infected possum populations is not evenly distributed, but clustered around denning sites which cover a cross-sectional area of around 40 square metres. These areas ('TB hot-spots') can be permanent or temporary.[3] Farms with known TB hot-spots within paddocks, and with high TB incidence in cattle were used to design and evaluate on-farm TB control programs.

Materials and Methods

Two control measures for reducing the risk of direct contact between possums and cattle were investigated: 1) localised possum control twice a year in TB hot-spot areas, and 2) grazing management during winter and summer (intended to keep cattle and deer away from these areas, either by not grazing the paddocks or by fencing off the TB high risk areas). Data from a longitudinal study of TB in possums showed that most tuberculous possums die during winter or summer, hence the greatest risk of exposure of livestock occurs in these seasons. Consequently, for this study interventions based on grazing management were focused on these two periods. Localised possum control was done by trapping or bait stations using anticoagulants or cyanide.
Two intervention studies were conducted between 1995 and 1999. Study 1 commenced in June 1995 and involved a total of 35 farms in four areas with known

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TB infection in wildlife and was conducted by an agricultural consultancy agency (Agriculture New Zealand) and the government veterinary organisation (AgriQuality). These organisations used a team-approach, consisting of a panel of seven experts, to design possible on-farm control strategies with the farmers. Farmers were then encouraged to use these strategies additionally to those used by conventional sources of government and regional councils. Seventy farms, matched by herd type and area were used as control farms, and obtained the usual TB control from conventional sources, but no additional expert advice.

The second intervention study of 34 farms (Study 2) commenced in December 1996 and was conducted by a two-person research team of the EpiCentre, Massey University. The team worked closely with the farmers and encouraged them to use the control strategies. The team also conducted wildlife surveys and possum control on the farms during the first two years of the project. A further 34 farms in the same area, matched by herd type, were used as control farms.

TB testing data were stored in MS Access 97 (Microsoft Corporation, Redmonds, WA), and MS Excel 97 (Microsoft Corporation, Redmonds, WA). Only animals with typical tuberculous lesions at slaughter were included in the analysis. Statistical analyses comparing two-year cumulative TB incidences and number of farms becoming clear of TB were performed in NCSS 2000 (Number Cruncher Statistical Systems, Kaysville, Utah, U.S.A.), and SPSS for Windows version 9.0.1 (SPSS Inc. Headquarters, Chicago, Illinois, U.S.A.). Power analysis was done in Power and Precision, release 1.20 (Borenstein, Rothstein, Cohen, U.S.A.). The power analysis showed that 260 intervention farms and 260 control farms would be needed to show a 10% difference in the number of farms becoming clear of TB between intervention and control groups.

Results

In study 1, the two-year cumulative TB incidence prior to the start of the project (1993/94) was compared with that in 1997/98 at the end of the project. Both groups of farms achieved a reduction in cumulative incidence (Table 1).

	Cum inc 93/94	Cum inc 97/98	Reduction
Intervention farms	0.0321	0.0164	48.9
Control farms	0.0198	0.0169	14.6

Table 1. Reduction in 2-year cumulative TB incidence for intervention and surveillance farms of the first intervention study.

In Study 1, 23 (65.7 %) of 35 intervention farms and 45 (65.2 %) of 70 control farms came off movement control (MC) restrictions from 1996 until the end of 1998 (χ^2=0.24, p=0.622). Subsequently, 8 of the intervention farms and 6 of the surveillance farms became infected again and had MC restrictions reimposed.

For Study 2, the two-year cumulative TB incidence for 1998/99 at the end of the project was lower than in 1995/96 prior to the start of the project (Table 2).

	Cum Inc. 1995/96	Cum inc. 1998/99	Reduction
Intervention farms	0.0426	0.0027	93.7 %
Control farms	0.0260	0.0109	58.1 %

Table 2. Reduction in 2-year cumulative TB incidence for intervention and control farms of the second intervention study.

In Study 2, 30 (90.9 %) of 34 intervention farms and 22 (78.6 %) of 34 control farms came off MC from 1997 until the end of 1999 (Fisher's exact test p=0.28). Five of the intervention farms and three of the surveillance farms became infected again and had MC restrictions reimposed.

Discussion

Both studies found greater absolute and relative reductions in two-year cumulative TB incidence on intervention farms compared to control farms. The magnitude of the reductions of cumulative incidence were greater in study 2 (94% and 58% for intervention and control farms respectively) than in Study 1 (49% and 15%). Possible explanations for this apparent difference include the different geographic locations and periods in which they were conducted. Study 1 was conducted in four regions of New Zealand, whereas Study 2 was confined to a single region and commenced 18 months later than Study 1. The differences in cumulative incidence between intervention and surveillance farms were not significant in either of the studies, but significance was not expected because of the small sample sizes.

In Study 1, the same proportion of intervention and surveillance farms came off Movement Control during the three years of the project. In contrast, the second study achieved a higher proportion of intervention farms coming off MC than control farms (91% vs. 79%). Although not statistically significant, this suggests that the Study 2 approach of using a small 'hands-on' team may be more effective. The fact that possum control work was done without the farmer having to invest time and money may have been a factor. Once farmers saw the effects of the interventions during the first two years, they were more likely to undertake the work themselves in the third year.

Reference

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