Tb in Deer – Current Progress and Future Options

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Abstract

Since the introduction of a voluntary accreditation programme for farmed deer in 1985, the number of herds infected with *Mycobacterium bovis* (Tb) has steadily reduced. This voluntary programme was replaced by a compulsory scheme in January 1990 and this in turn has been incorporated into the Animal Health Board's current Tb Pest Management Strategy.

As at the end of February 2000, the number of infected deer herds was 95, 81 of which are in the South Island At its peak in July 1986, 478 deer herds were under Tb movement control As in the cattle industry, the majority of infected herds (>80%) are now located within Tb Vector Risk Areas, where wild animals maintain a reservoir of Tb for farmed stock.

While more than two-thirds of infected deer herds have 4 or fewer tuberculous animals, sporadic epidemics in individual herds still occur.

The current Pest Management Strategy will end in June 2001 and discussions on the objectives for the next phase are now taking place While reductions in the number of infected herds surpassed the objectives of the current strategy, further improvements over the next decade are required if New Zealand is to meet international standards and avoid potential barriers to markets

In the next stage of the Strategy, the Animal Health Board's objective is to achieve 0.2% period prevalence for both cattle and deer herds by 2010/2011

The key component for this Strategy will be to limit the effect of infected wildlife on farmed animals If adopted, the financial input into vector control will double and the area controlled will treble In addition, vector control within all existing operations will be intensified.

Other changes will be required as the Strategy moves closer to international benchmarks. This includes tighter control over the movement of deer and cattle from "Tb Control" areas To maintain an "officially Tb free" status (C2 or higher), owners will be required to trade with herds which also have an "officially free" status The formation of the "Tb Control" areas will result in some herds having their testing programme intensified but in "Tb Free" areas, testing of deer herds with a C2 status or higher, will be on a triennial basis rather than biennial The testing of a maximum of 250 animals in larger herds will cease

In support of this Strategy proposal, the Animal Health Board will maintain its research effort into the role, detection and control of infected vectors and the development of vaccination regimes for use in wildlife

Introduction

In 1996 the Animal Health Board (AHB) introduced the first Pest Management Strategy for the control of bovine tuberculosis in farmed cattle and deer This Strategy followed a number of control initiatives, which started as voluntary programmes and progressed at various times into compulsory schemes funded by industry and the state

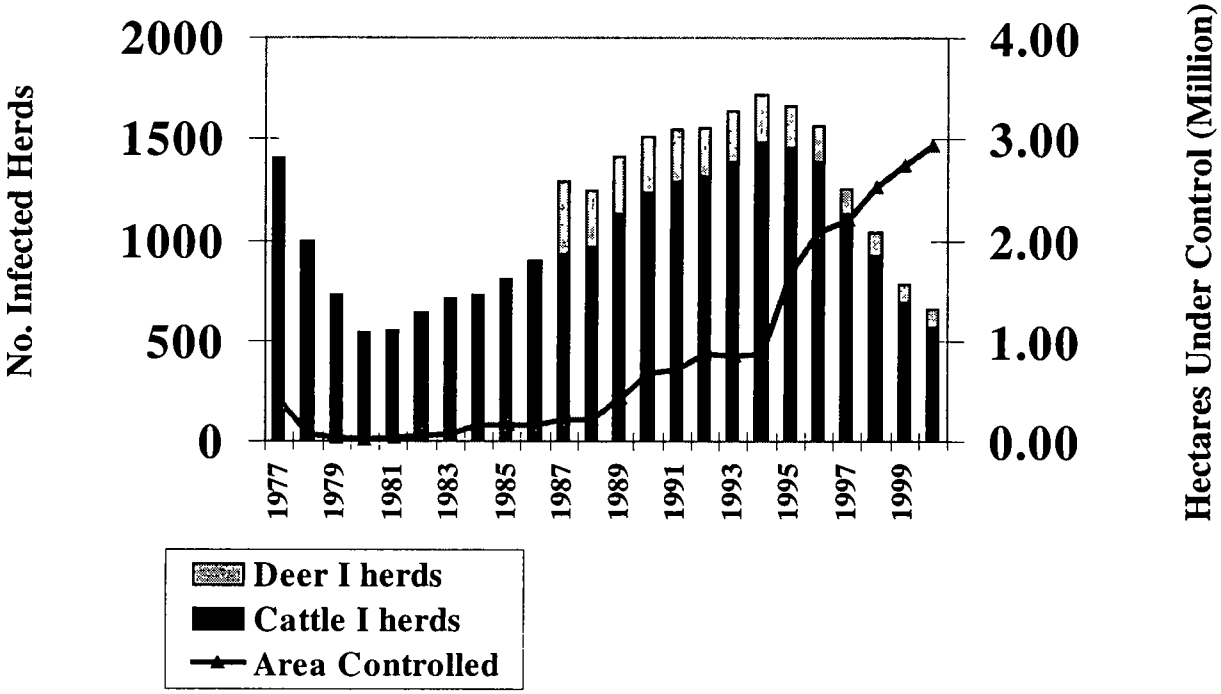
For the term of its first Strategy, the AHB set the following targets:

1. Reducing the point prevalence of Infected herds in Vector Free Areas to < 0 2%; and
2 Reduce point prevalence of Infected herds in Vector Risk Areas to ≤ 11%
3 Prevent Vector Free areas being classified as Vector Risk

Measuring Progress

Prior to the Strategy, the number of infected cattle and deer herds was increasing, peaking in the 1994/95 year (Figure 1) This increase resulted primarily from minimal control of wildlife acting as reservoir hosts for farmed cattle/deer.

Figure1 *Number of Infected Cattle and Deer Herds and Land Area (ha) Under Vector Control at June*



With an increasing commitment to sustained vector control during the late 1980s/early 1990s and an increasing proportion of Vector Risk areas coming under control, the Animal Health Board has exceeded two of its Strategy objectives

Currently the point prevalence for all (cattle and deer) herds in Vector Free areas is 0.14% and within the Vector Risk areas, 4 45%

Factors Contributing to This Progress

Control of wildlife reservoirs (principally possums, *Trichosurus vulpecula* and ferrets, *Mustelo furo)* has played a major role in reducing the number of infected herds since 1994/95 This has not only resulted from an increased expenditure (from approximately $5m pa in 1990 to $24m in 2000, corrected to 1990 dollar values) but also in the method and quality of the control.

Operational work is sustained and is undertaken to achieve measured reductions in possum numbers using residual trapping indices as the benchmark. As well as taking account of vegetation cover and denning sites, the intensity of the control is increasingly stratified by properties where infected herds have grazed

Operators use a wider variety of control methods, both in the range of toxins and toxin presentation, as well as applying other methods such as trapping

In addition to vector control, other important initiatives contributing to the reduction in the number of infected herds include

1 The use of parallel blood tests in infected cattle/deer herds that are either heavily diseased or are exhibiting chronic infection The tests used include an Interferon Gamma (IFN-γ) Assay and a Lymphocyte Proliferation Assay (LPA) in cattle and an ELISA test in deer

2 Utilising IFN-γ as an ancillary retest in cattle when non-specific reactivity to the tuberculin skin test is suspected.

3 Introducing a "High Risk" category for infected cattle herds when the lesion rate is 3% or higher at any one test. In such herds, animals are restricted to moving to slaughter only. This restriction may be applied to all animals within the herd or to a cohort group

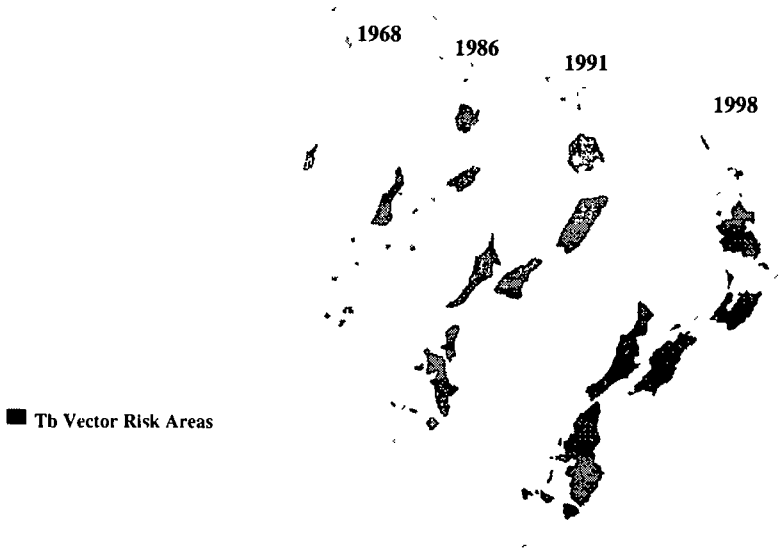
4. The use of parallel blood tests for cattle leaving infected cattle herds, when the herd has not had a clear test after the last diagnosis of Tb (this testing does not apply to movements directly to slaughter)

5 The suspension of a herd's Tb status after receiving cattle or deer from an infected herd.

Expansion of Vector Risk Areas

Although progress on reducing Tb levels within both the Vector Free and Vector Risk areas of New Zealand has exceeded the Animal Health Board's Strategy objectives, containing the disease within the original boundaries has been unsuccessful (Figure 2)

***Figure 2**· Expansion of Vector Risk Areas*



Since the start of the current Strategy, 5 new Vector Risk areas have been declared and 22 extensions to existing Vector Risk areas have occurred Financial constraints on the extent or timing of vector control has contributed to this issue while in other instances, the emergence of the ferret in the epidemiology of the disease in New Zealand, has contributed to the expansion

The Deer Industry

Progress in reducing Tb levels within the deer industry has slowed in recent years (Figure 3) The disease is now more commonly diagnosed in South Island herds, 81 of the country's 95 infected deer herds are within the South Island As for cattle, the majority of infected deer herds (>80%) are farmed in Vector Risk areas.

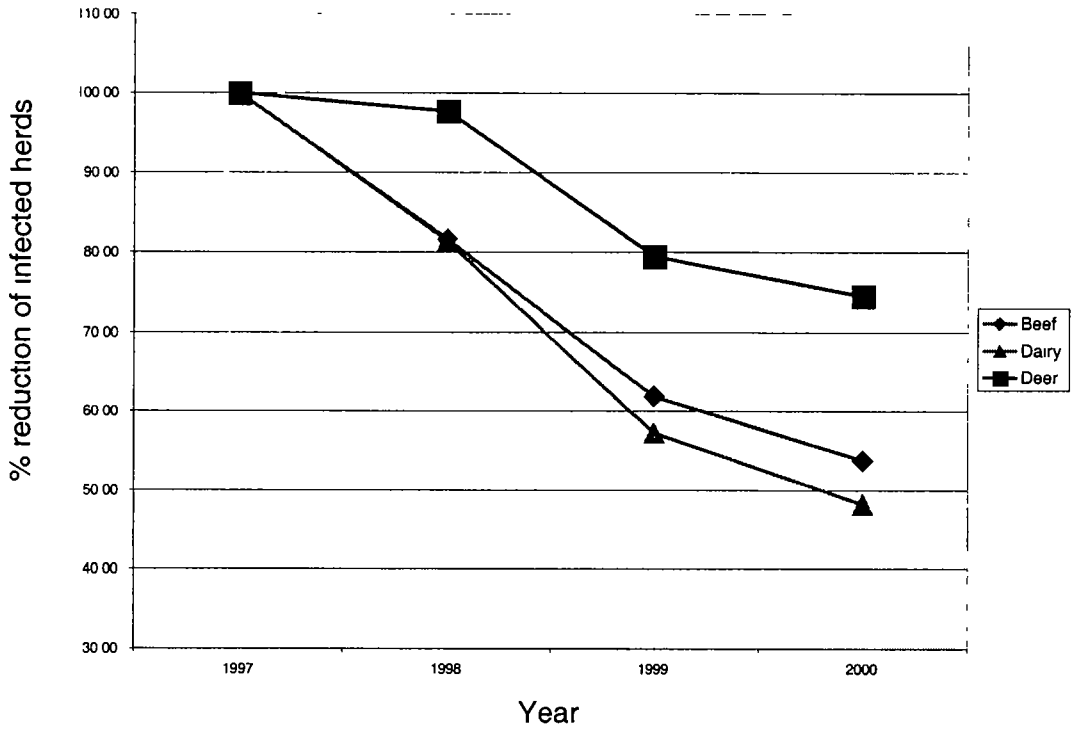
Sporadic (and sometimes devastating) epidemics occur within individual herds. Since 1 June 1997, 13 herds in Southland and Otago have had 20 or more lesion cases and in one herd, in excess of 400 infected deer were slaughtered.

Despite such instances, owner resistance to testing is becoming increasingly common, particularly for herds located within testing zones on the fringe of Vector Risk areas and within infected herds where biannual testing is required.

The intensive testing of herds within designated fringe zones which surround each of the Vector Risk areas, provides early warning as to the success/failure of the vector control programmes The number of lesion cases diagnosed at breakdown is 2 or less for 90% of all breakdown herds and is irrespective of herd size For this reason the policy of testing all deer 12 months of age and over on an annual basis has been standardised within the fringe testing zones

Johnes disease is continuing to emerge as a complicating factor in the diagnosis of Tb at slaughter. Visually and histologically, the lesions are indistinguishable from those caused by *Mycobacterium bovis* and the site of the lesion is not always a reliable method of differentiating the two diseases. Johnes disease lesions in retro-pharyngeal lymph nodes are becoming a relatively common

Figure 3. *Change in the Percentage of Infected Herds 1997 to 2000*



Review of the Current Tb Pest Management Strategy

On 30 June 2001, the Animal Health Board's current Tb Pest Management Strategy ends The Board is now in the process of preparing a proposal for a second Tb Strategy and anticipates this will be presented to Government during October 2000.

The rationale for the current Strategy is to protect New Zealand's interests in the export of our animals and animal products These risks remain and make the continuation of the current programme a necessity.

Consumer awareness of food-borne disease issues has heightened; reaction to the BSE outbreak in the United Kingdom and the Belgium dioxin scare are recent examples. In addition, the AHB has focussed the New Zealand programme on reducing Tb levels as quickly as possible and the current Strategy is not fully compliant to international standards overseen by the *Office Internationale Epizooties* (OIE).

For these reasons maintaining the status quo is not an option the AHB wishes to follow

In assessing the risk New Zealand faces from its current Tb levels, the industry view is there is a 20% chance of losing markets in the United States or Europe within the next 10 years. Such a loss could cost up to $1 3 billion

The resulting reduction in farm gate prices have been estimated to be:

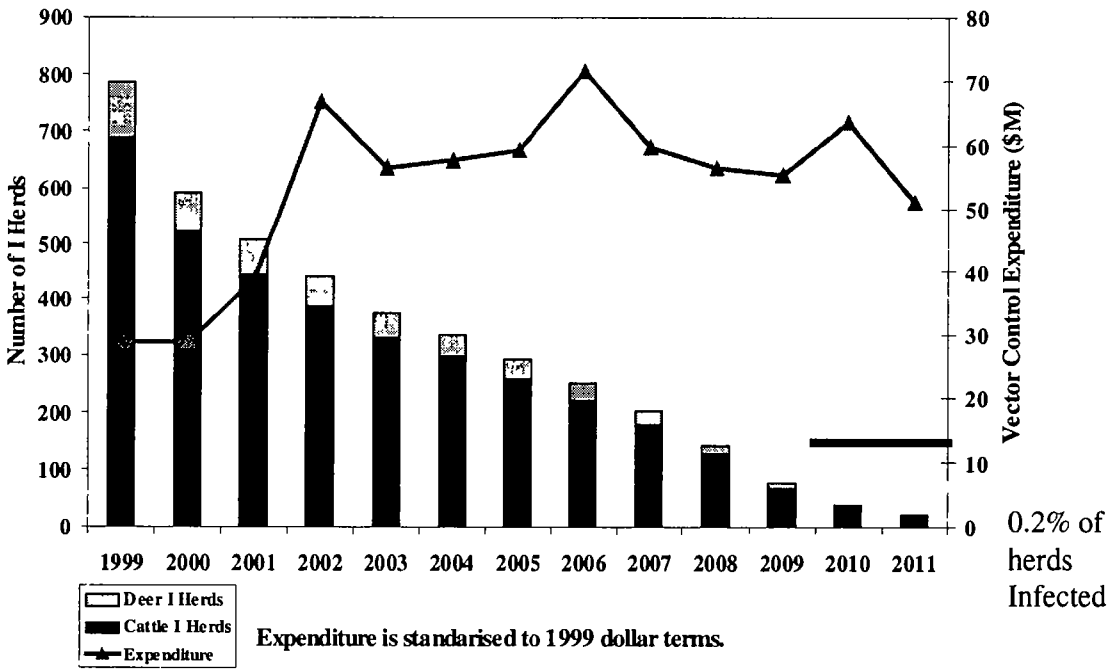
- Dairy- 20% for 2yrs, 5% for a further 3yrs,
- Beef- 50% for 2yrs, 10% for a further 3yrs,
- Venison- 36% for 2yrs 8% for a further 3yrs.

An additional $100m has been allowed for the implementation of a recovery plan

To overcome these risks, the Strategy proposal which the AHB currently has out for public consultation, recommends that more rapid progress be made on reaching the internationally acceptable level of Tb. This requires the period prevalence of infected herds to be 0.2% or less and the AHB objective is to reach this level by June 2011

To achieve this goal, the scope of the current vector control programme would be substantially increased Control operations within existing areas would intensify and the total area under control would treble to 9 million hectares. The cost of these changes would be $60m per year, double the existing budget (Figure 4)

Figure 4 *Predicted Number of Infected Herds Under the Proposed Strategy*



The testing programme and conditions for the movement of stock would also alter. While the proposed changes will not meet all the requirements detailed by OIE, they will allow New Zealand to argue herds with a Tb status of C2 or higher, are equivalent to OIE's "officially Tb free" classification. To maintain this officially free Tb status, owners will be required to record movements of stock into their herd, and herds with a C2 plus status will be downgraded if they receive animals with a status lower than C2.

Within the proposal, movements of cattle/deer between areas that have Tb levels above the international standard of 0 2% (Control areas) and those below (Tb Free Areas), will be more tightly controlled For herds within Tb Control areas, pre-movement testing would be required for all herds

regardless of status and only stock from a herd with a status of C2 or higher, will be permitted to move into a Tb Free area

In the Tb Free areas, pre-movement testing would only be required for herds with a infected or C1 status and such movements from these herds could only be to a Tb Control area or directly to slaughter.

In reviewing who pays for the Strategy, the AHB is required under the Biosecurity Act to determine who are the beneficiaries and who are the exacerbators (or contributors to the disease)

For all measures associated with the control and eradication of Tb within a herd and the prevention of transmission from herd to herd, the beneficiaries are cattle and deer farmers and their directly associated industries For this reason the AHB has indicated 100% funding by cattle & deer farmers/industry for this component, ie no change from current philosophy.

For funding vector control, the AHB proposes the following split·

- Crown as landowner 55%
- Crown for public benefit 5%
- Cattle & deer owners 30%
- Regional government share 10%

Consultation on the proposed approach to Tb control over the coming decade will continue until 30 June 2000 and will result in a new Strategy proposal going to Government for ministerial consideration in October 2000. The Minister may also call for a "board of inquiry" on the proposal, which effectively allows further public comment before the Strategy is approved.

Animal Health Board Research

To assist in the delivery of the Strategy, the AHB administers a research and development fund In 1999/00 financial year, $2 6m of applied research was funded In allocating these funds, the AHB utilises the expertise of a technical advisory group, which comprises of scientists, researchers, veterinarians, the AHB's Technical Manager and two of the Board's directors

The majority of funds go to research projects that have a short (1-5 years) or medium (6-10 years) term focus These projects can be categorised into 5 broad areas

1 Immunology, vaccines and diagnostic tests,
2 Toxin related research,
3 New bait, traps, control methods and monitoring,
4 Epidemiology and modelling of Tb (this includes decision support systems);
5 Biological Control

Within each of these areas the following programmes received funding during the 1999/00 year:

Immunology, Vaccines and Diagnostic Tests:

- Tb vaccine delivery systems for wildlife and domestic livestock;
- Development of a Vaccination Strategy Against Wildlife Tuberculosis,
- Aerosol model for *Mycobacterium bovis* infection of possums,
- Formulation of BCG for oral vaccination of possums;
- Serial study of Cervigam,
- Interim Trial - modified Bovigam re-test procedure;
- Culture of parallel test validation samples

Toxin Related Research:

- Assessment of worker risk to 1080,
- Impact of 1080 'dust' and chaff on invertebrate populations;
- Micro-encapsulation of zinc phosphide;
- 1080 literature collation and review paper,
- Human exposure through food contamination,
- Unique aspects of gut function in possums - a target for possum specific toxins;
- Rapid method for the field assessment of 1080 concentration

New Bait, Traps, Control Methods and Monitoring

- Seasonal constraints on ferret control,
- Anal gland scent as a novel, cost-effective method of attracting ferrets;
- Low-cost bird repellents for possum baits,
- Optimising by-kill of feral deer from an aerial 1080 possum control operation;
- Feratox for ferrets;
- Completing the development of Cholecalciferol gel bait,
- Effect of habitat, season, trap shyness and timing on RTC estimate,
- RTC methodology for low-density possum populations,
- Long life baits;
- Rapid low-cost field method for selecting bait type before control;
- Enhanced analysis and interpretation of possum trap catch data;
- Survey at Blue Duck, Special Project Karamea,
- Definition of a vector control database;
- Longer life bait markers for bio-control,
- Neuro-transmitter antagonists to prevent bait shyness in possums (memory blockers)

Epidemiology and Modelling of Tb

- Epidemiology of Tb in wild deer;
- Hohotaka possum maintenance control experiment - monitor and survey;
- Ferrets as maintenance hosts for Bovine Tuberculosis;
- Ferrets as maintenance hosts - Vector Control;
- Eradication of tuberculosis from possum populations,
- Spatial clustering of low density possum populations,
- Detecting the geographic distribution of Tb by using wildlife populations as sentinels,
- Possums in swamps their behaviour and control,
- Longitudinal survival of Tb possums,
- Modelling effective aerial control of possums,
- Ferret neophobia to traps,
- Ferret trappability with live compared with dead prey;
- Movements and home ranges of female ferrets in winter;
- Mapping possum dispersal across buffers with genetic markers,
- Spatial and temporal patterns of bovine Tb in possums in the Ahaura Valley Westland;
- Evaluation of the effectiveness of individual farm Tb control programmes;
- Implementation of EpiMAN(Tb), a decision support system for management of Tb

Biological Control

- Plant-derived contraceptive antigens for possum biological control

Reference

1 Anonymous Bovine Tuberculosis National Pest Management Strategy 2001-2011 Toward a Tb Free New Zealand, a Discussion Paper on the Future Options Animal Health Board, 20 March 2000.