TUBERCULOSIS CONTROL FOR THE NEW ZEALAND DEER INDUSTRY

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At the 1987 NZ Veterinary Association - Deer Branch conference at Dunedin, KC Corrin (1) delivered a paper outlining progress in the control of tuberculosis within the NZ deer industry. Tuberculosis had first been diagnosed in farmed deer in 1978 and by August 1985 a voluntary scheme to accredit herds free of this disease had been implemented. By February 1987 an estimated 33% of all deer herds had joined the programme.

The scheme was operated on a user pays basis, with farmers bearing the costs of their individual testing programmes and loss of deer through reactors. With support from the NZ Deer Farmers' Association, NZVA and MAF, the voluntary accreditation programme was widely accepted; at the end of December 1988, 60% (2617/4316) of deer farmers had joined. This acceptance was fuelled by a market preference for either accredited Tb-free deer or at least animals originating from herds which were members of the scheme and whole-herd testing.

With this wide-spread acceptance of voluntary testing and to continue progress in the control of tuberculosis, the NZ Deer Farmers' Association successfully petitioned Government through 1989 to introduce a compulsory testing programme for all herds. The Deer Tuberculosis Testing Regulations (1989) came into law on 15 January 1990, with a requirement for all herds to be under test by 31 October this year.

INDICATORS OF CONTROL

Because of the importance of feral vectors in the transmission of tuberculosis to both farmed deer and cattle and the role possums, deer and pigs play in the spread of infection to non-infected areas of NZ, new rationales to control infection have had to be developed. In addition new indicators which relate to the dynamics of the disease, are being used to give a more accurate assessment of progress. These include incidence rates and relative and attributable risk assessments.

AREAS

Defining geographical limits of infected feral species and preventing their expansion has resulted in New Zealand being split into Surveillance and Special Tb Control Areas ie: areas where tuberculosis is not associated with feral animals or it is.

Table 1

HERD DISTRIBUTION AND MOVEMENT CONTROL STATUS
AS AT 30 APRIL 1990

	Total Herds	No MC Herds	% Herds on MC
NORTH ISLAND			
Surveillance	2483	48	1.9
Special Tb Control Areas	794	91	11.5
NI Total	3277	139	4.2
SOUTH ISLAND			
Surveillance	1809	39	2.2
Special Tb Control Areas	733	96	13.1
SI Total	2542	135	5.31
NEW ZEALAND			
Surveillance	4292	87	2.0
Special Tb Control Areas	1527	187	12.2
NZ Total	5819	274	4.7

If the number of herds classified as being within Special Tb Control Areas (Table 1) is greater than the rate of herd establishment, this will signify an expansion of the feral animal problem.

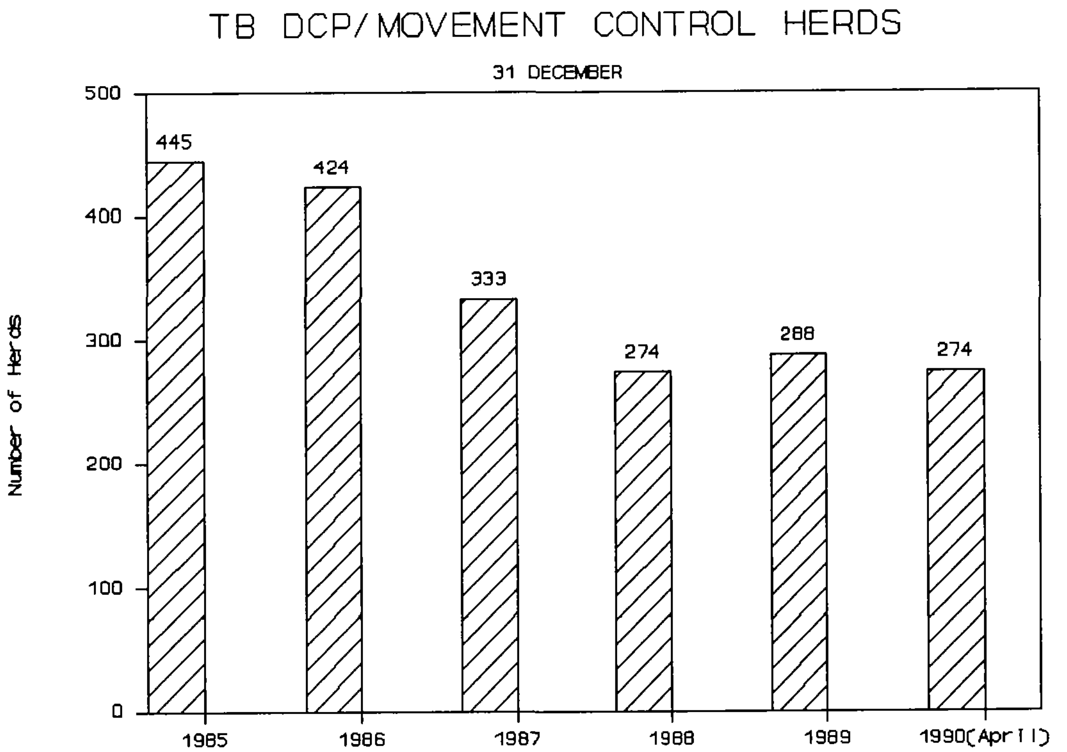
MOVEMENT CONTROL

Herds on movement control is a traditional indicator of progress. This figure peaked in July 1986 (478) and Figure 1 shows the decline and stabilisation that has since taken place. At 30 April 1990 there were 274 herds on movement control, the same number as at December 1988.

The April figure represents 4.7% (274/5819) of all herds. When analysed by Surveillance and Special Tb Control Areas, 2% (87/4292) of the herds in Surveillance Areas were on movement control, where as for Special Tb Control Areas, 12.2% (187/1527).

Sixty-eight per cent (187/274) of NZ's movement control herds are located within Special Tb Control areas.

Figure 1



Using the movement control data in Table 2 an incidence rate for movement control herds in 1989 may be calculated.

$$\frac{\text{Incidence}}{\text{MC Herds}} = \frac{\text{No. new MC herds for 1989}}{\text{Total herds - No. MC herds as at 0689}} \times \frac{100}{1}$$

The incidence rate for movement control herds in NZ's Surveillance Areas in 1989 was 1.5% and for Special Tb Control Areas 7.7%. In terms of relative risk, a herd in a Special Tb Control Area is at least 5 times (7.7/1.5) more likely to come onto movement control in 1989 than one in a Surveillance Area.

The attributable risk associated with Special Tb Control Areas is 5.2% (7.7-1.5%) ie 52 herds in a 1000 will breakdown because of factors unique to Special Tb Control Areas eg a feral source of infection. While fifteen herds in 1000 will go onto movement control because of factors which are common to both Special Tb Control and Surveillance Areas eg: diagnostic test failure, introduced infected deer etc.

Table 2

MOVEMENT CONTROL STATISTICS - 1989

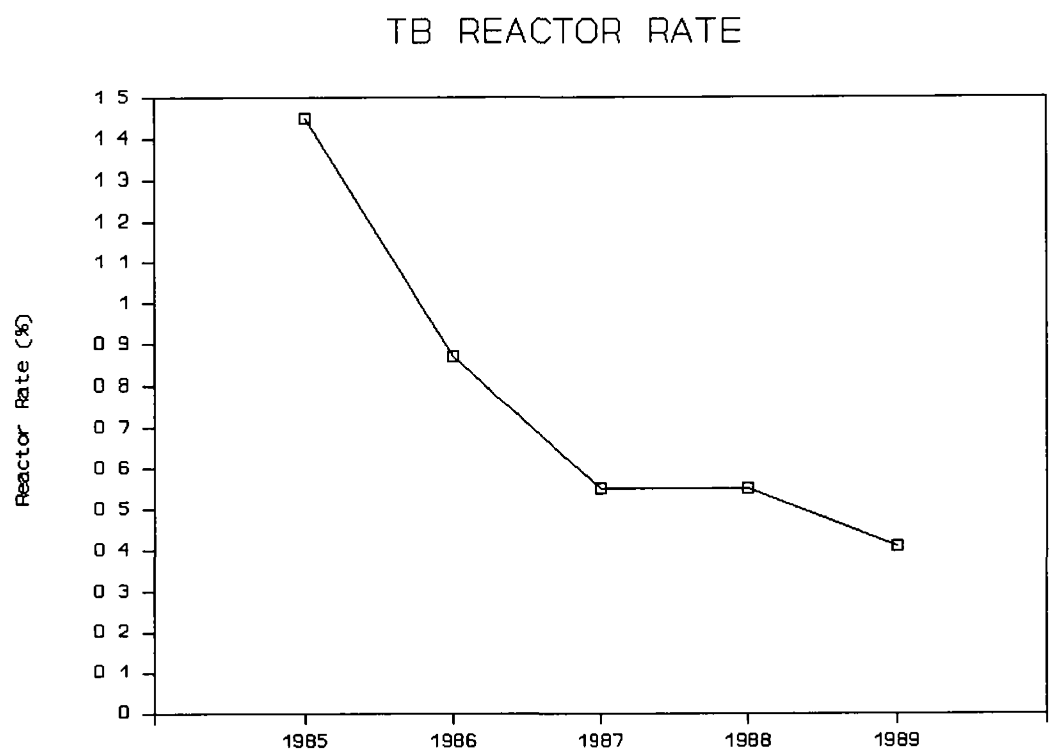
	No New MC Herds in 1989	Total No Herds 1289	No MC Herds 0689
NEW ZEALAND			
Surveillance	61	4109	101
Special Tb Control Areas	98	1423	153

REACTOR RATE AND INCIDENCE

In the 1985 calendar year, a reactor rate of 1.45% was reported by KC Corrin(1); a reactor was then defined as any animal positive to a standard tuberculin test. Using the same criteria in 1989, 2% (10272/513136) of the deer tested would have been directed to slaughter.

With the introduction of two supplementary tests in (1986 and 1988) veterinarians were given greater discretion as to what was deemed a reactor. The rapid decline in the rate between 1985 and 1986 (Figure 2) will largely be attributable to the use of the comparative cervical test. Since that time the reactor rate has continued to decrease. (This rate is defined as the number of reactors divided by the number of standard tests applied in the calendar year.)

Figure 2



A more detailed evaluation of the 1989 data in Table 3, indicates the reactor rate varies markedly between Special TB Control Areas and Surveillance Areas: 0.72 (1220/169910) and 0.25 (871/343226) percent respectively.

Table 3

Tb Data - 1989

	No Deer Standard tested	No Standard Test Positive	No Reactors	No Lesion Reactors	No TB Culls /Clinicals
Surveillance	343,226	6232	871	325	80
Special Tb Control Areas	169,910	4040	1220	482	179
NZ TOTAL	513,136	10272	2091	807	259

However the lesion reactor rate for each is almost identical - 39.5% (482/1220) and 37.3% (325/871). Where the incidence of Tb is higher the validity of the test (as measured by the lesion reactor rate) should be correspondingly greater. This result suggests supplementary tests in Surveillance Areas are having a significant effect in lifting the lesion reactor rate. The difference in the percentage of standard test positive deer with lesions between Special TB Control and Surveillance Areas (11.9 and 5.2 % respectively) also supports this observation.

Table 4

Incidence of Tuberculosis

	Total NZ Deer	No Reactors	Reactor Incidence	No TB Culls /Clinicals	TB Incidence %
1986	392,154	2390	0.61	234	0.67
1987	500,397	1870	0.37	Not available	-
1988	606,042	2132	0.35	Not available	-
1989	780,000	2091	0.27	259	0.3

To gain a more accurate assessment of the incidence of Tb in the deer industry, population figures rather than the number of deer tested should be used. Between 1986 and 1989 deer numbers in New Zealand have doubled. Despite this there has been a continuing decline in the reactor and Tb incidence (Table 4). This decline is the opposite to what has been observed in the cattle industry over the last three years. However, the incidence for deer is still 4.5 times higher than for cattle(2). This decline in the Tb incidence is attributable to the widespread adoption of the voluntary testing programme.

If the reactor incidence had remained at the 1987 level, 2886 deer would have been slaughtered as reactors in 1989 as against the actual figure of 2091.

Again by expanding the 1989 data (Table 5), the Tb incidence figures are seen to vary markedly between Surveillance and Special Tb Control Areas. Using the New Zealand totals, the incidence in Special Tb Control Areas is 3.8 (0.65/0.17) times higher than for the Surveillance areas. This has been influenced by the large number of reactors from the South Island's MacKenzie Basin Special Tb Control Area; some of the larger breakdowns in this area have not been attributable to feral animals.

Table 5

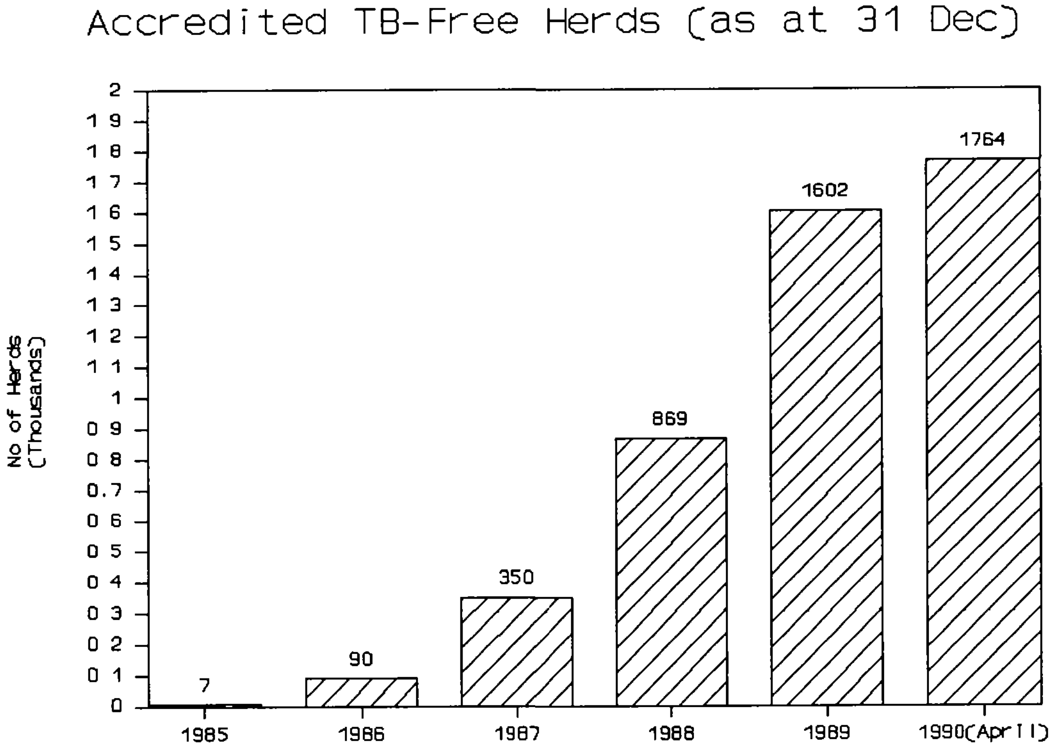
Incidence of Tuberculosis - 1989

	No of Deer (Estimate)	No Reactors	Reactor Incidence %	No Tb Culls /Clinicals	Tb Incidence %
North Island					
Surveillance	333,576	537	0.16	53	0.18
Special Tb Control Area	111,192	367	0.33	82	0.40
South Island					
Surveillance	232,388	334	0.14	27	0.16
Special Tb Control Area	104,468	853	0.82	97	0.91
NEW ZEALAND					
Surveillance	565,964	871	0.15	80	0.17
Special Tb Control Area	215,660	1220	0.57	179	0.65
TOTAL	781,624	2091	0.27	259	0.3

ACCREDITATION AND WHOLE HERD TESTING

Thirty percent (1764/5819) of New Zealand deer herds were accredited Tb-free at 30 April, 1990 (Figure 3). Since the voluntary scheme came into existence this number has risen dramatically; from December 1988 to December 1989 there was approximately a two-fold increase.

Figure 3



This rise in accredited herds can be expected to continue until approximately 75% of the herds are accredited. An estimated 20% of herds (Table 6) have yet to be tested and just under 5% are on movement control.

Table 6

Estimate of Herds Whole-Herd Testing as at 30 April 1990

	No of Herds	No Herds with Transitional Status	Estimated % Herds Testing
NEW ZEALAND			
Surveillance	4292	675	84.3
Special Tb Control Areas	1527	399	73.9
TOTAL	5819	1074	81.6

Although the percentage of herds not tested appears high, their animals are estimated to be a small proportion of the total deer when population figures are compared against deer tested. For example in 1989 over 500,000 deer were tested from an estimated population of 780,000. It must be noted that because of their age not all deer are eligible for testing and some accredited herds would not have been required to test during this period.

USE OF TESTS

Three tests are commonly used for the diagnosis of tuberculosis in deer: the standard bovine tuberculin test, the comparative cervical test (CCT) and the lymphocyte transformation test. All are being applied with increasing frequency (Figures 4, 5 and 6).

Figure 4

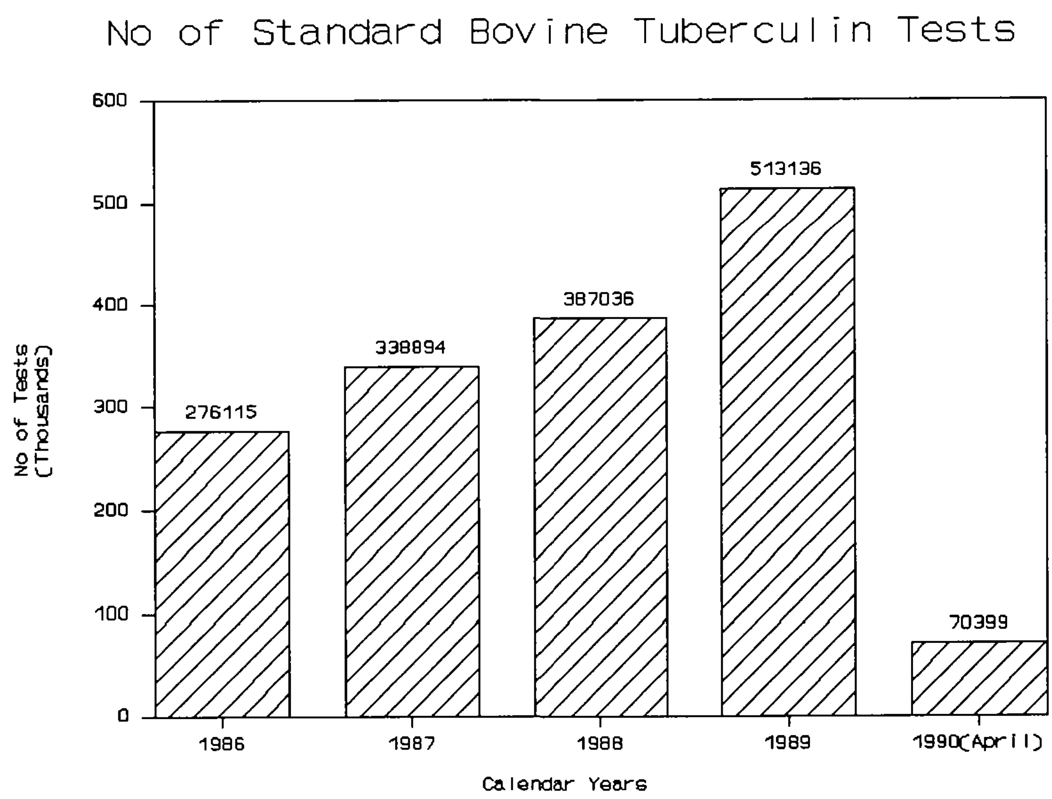
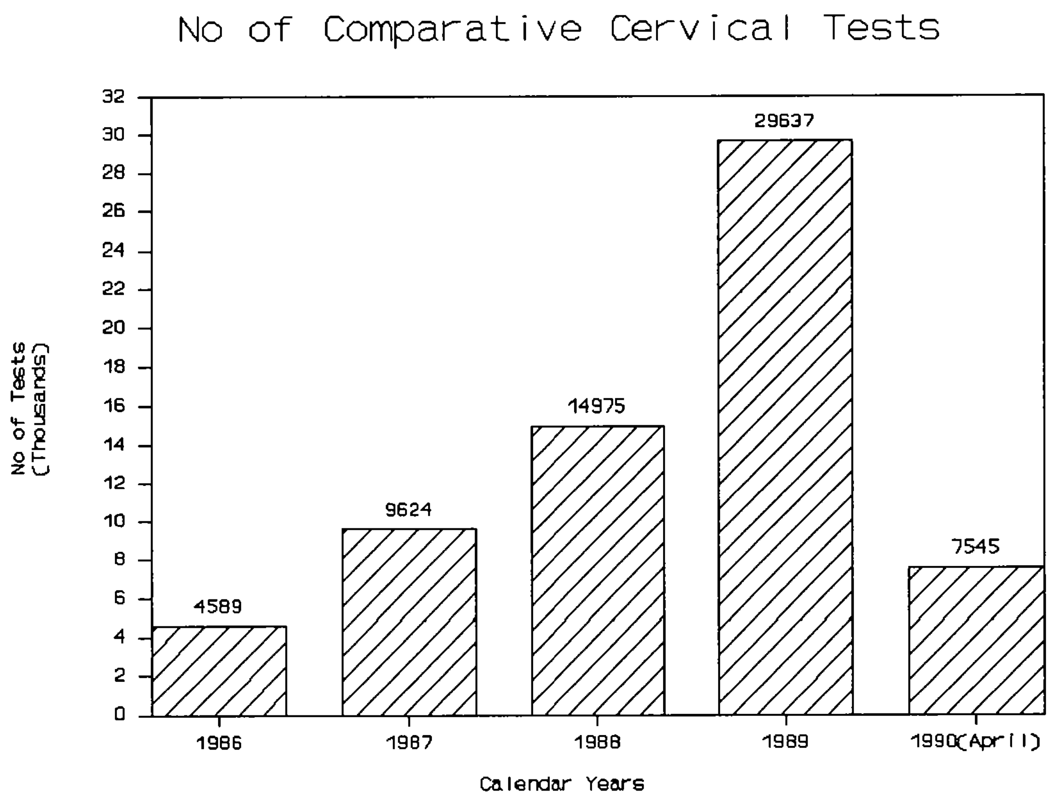
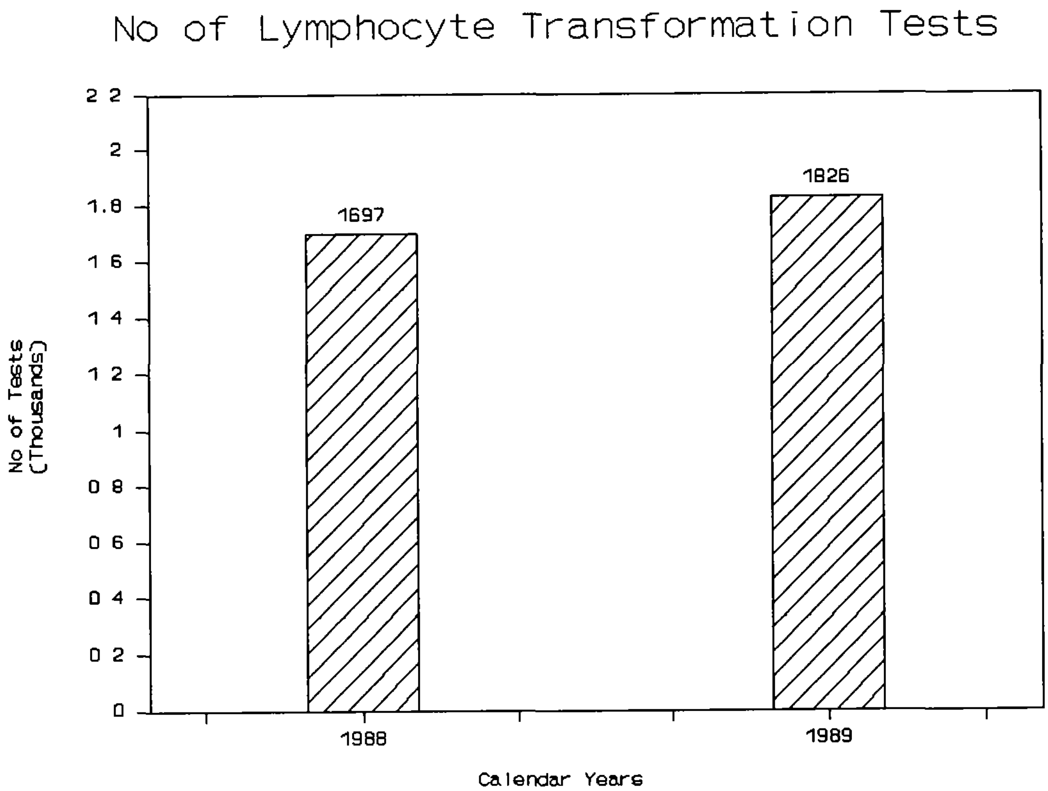


Figure 5



The CCT was originally introduced as an auxiliary test to the standard bovine tuberculin test, to assist in the differentiation of non-specific reactivity. However in 1989 the number of CCT's exceeded the standard test positives by 2.8:1. Despite the complexities of applying this test, veterinarians obviously see a clear role for its use as a primary or a 'first-up' test. Over 7,500 CCT's have already been applied in the first 4 months of 1990 compared with of 5474 for the same period in 1989.

Figure 6



COSTS

An approximate cost of operating the Tb control scheme in 1989 may be made using the following assumptions:

- Standard bovine tuberculin test $ 3.00
- CCT test $ 5.00
- Lymphocyte transformation test $ 120.00
- Loss per reactor $ 285.00 (75% of market value)

Testing costs amount to $ 1.9m while the estimated loss through reactors was $ 0.6m. MAF's administration of the scheme which involved initial start-up costs, is assessed at $ 0.6m plus $ 0.5m for possum control. This gives a total cost of $ 3.6m for an industry which earnt $ 75.4m in the same period.

SUMMARY

In the last four years significant progress has been made in controlling Tb in deer and with a rapid increase in accredited Tb-free herds it is easy to overlook the underlying difficulties the control programme will face in the next 3 to 5 year period. Already there are significant indicators for the importance of infection from feral sources.

Eradicating the disease when it is within farmed deer may be considered by many to be difficult enough but to control tuberculosis in a feral animal population will require a radical change in the current technology and this is the challenge.

Some data used in this paper is based on provisional figures drawn from MAF Quality Management's deer-Tb database.

REFERENCES

1) Corrin, KC 1987. Tuberculosis in farmed deer - progress in control. Proc NZVA Deer Branch: No 4, 157-160
2) Livingstone, PG 1990. Pers com.