Abstract: Objective To identify and compare programs for eradicating virulent footrot (VFR) chosen by owners of quarantined sheep flocks in southern New South Wales. Method Data from 196 sheep flocks in the Wagga Wagga and Young Rural Lands Protection Boards were used to determine the program chosen, the influence of flock size on the program chosen and the effects of the program chosen and the use of contractors on the time in quarantine. Results The most popular programs in flocks using a single program were: total destocking (61/173; 35.3%) and inspection and culling of affected animals (71/173; 41.0%). Treatment of known infected animals was chosen in 41 flocks and of those, 10 (5.8%) used antibiotics for treatment and 31 (17.9%) used foot-bathing. Combined programs were used in 23 flocks and in 10 flocks a change of program occurred before eradication was achieved. The choice of program was, to some extent, affected by flock size, with owners of small flocks (<500 sheep) more likely to destock. The chosen program strongly influenced the time in quarantine, the shortest time being for destocking (mean 284 days), followed by culling of infected sheep (395 days), treatment with antibiotics (433 days) and finally foot-bathing (502 days). Time in quarantine was significantly shorter when contractors were used. Conclusion All the options chosen led to the eradication of VFR. However, in this sample both the choice of program and the use of contractors influenced the time taken to achieve eradication and therefore the time in quarantine. Based on time in quarantine, foot-bathing was the least desirable option for the eradication of VFR because of the significantly greater time involved, perpetuation of risk to neighbours and increased cost of inspections. These findings were derived from flocks that were quarantined, but they are relevant to all flock owners considering eradication of VFR.

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Author Address: jlievaart@csu.edu.au

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Effect on time in quarantine of program choice for the eradication of footrot from 196 sheep flocks in southern New South Wales

K MILLS\textsuperscript{a}, P McCLENAUGHAN\textsuperscript{a}, A MORTON\textsuperscript{b}, D ALLEY\textsuperscript{c}, J LIEVAART\textsuperscript{d}, PA WINDSOR\textsuperscript{a}, EGERTON JR\textsuperscript{a,e}

\textsuperscript{a} Faculty of Veterinary Science, University of Sydney, PMB 3 Camden, NSW 2570

\textsuperscript{b} Hume Livestock Health and Pest Authority, Wagga Wagga, NSW 2690

\textsuperscript{c} Lachlan Livestock Health and Pest Authority PO Box 46 Young NSW 2594

\textsuperscript{d} Charles Sturt University, Wagga Wagga, NSW 2650

\textsuperscript{e} Author for correspondence john.egerton@bigpond.com

Abstract

Objective To identify and compare programs chosen by owners for the eradication of virulent footrot from 196 quarantined sheep flocks in southern New South Wales.

Method Data from 196 sheep flocks in the Wagga Wagga and Young RLPB’s were used to determine the programs chosen by owners to eradicate footrot, the influence of flock sizes on the programs chosen and the effects of the programs chosen and the use of contractors, on time the properties remained in quarantine.

Results The most popular programs in those flocks where a single program was used were total destocking 61/173 (35.3\%) and inspection and culling of affected animals 71/173 (41.0\%). Treatment of known infected animals was chosen in 41 flocks. Of these 10 (5.8\%) used antibiotics for treatment and 31 (17.9\%) treated by footbathing. Combined programs were used in
23 flocks and in ten flocks a change of program occurred before eradication was achieved. The choice of program was to some extent affected by flock size with small flocks (<500 sheep) much more likely to destock. The program used for eradication strongly influenced the time in quarantine, the shortest time being from destocking (mean 284 days), followed by, culling of infected sheep (395 days) then treatment with antibiotics (433 days) and finally footbathing (502 days). Time in quarantine was significantly shorter when contractors were used.

**Conclusion** All the options chosen led to the eradication of virulent footrot. However, in this sample the choice of program and the use of contractors both influenced the time taken to achieve eradication hence the impact of quarantine on the owner. Based on time in quarantine, footbathing was the least desirable option for the eradication of virulent footrot because of the significantly greater time involved, perpetuation of risk to neighbours and increased cost of inspections. These findings were derived from flocks which were placed in quarantine, but they are relevant to all flockowners considering eradication of virulent footrot.

**Abbreviations**

BFR: Benign Footrot

DV: District Veterinarian

IFR: Intermediate Footrot

I/T/C-AB: inspect, treat with antibiotics and cull non-responders program

I/T/C-FB inspect, treat with footbathing and cull non-responders program

LHPA: Livestock Health and Pest Authority

RLPB: Rural Lands Protection Board

VFR: Virulent Footrot

Footrot is a disease of sheep and goats associated with infection by the bacterium *Dichelobacter nodosus*. Infection begins in the interdigital skin and, in the virulent form of the disease, progresses to the sensitive laminae underlying the soft and hard horn of the hoof. Lameness,
weight loss and wool damage characterise the disease\textsuperscript{1}. Beveridge\textsuperscript{2}, was the first to identify \textit{D. nodosus} and to suggest principles on which eradication could be based. Essentially these depended on elimination of all cases of the disease from flocks because \textit{D. nodosus} survives for only a short time in the environment. Later work defined the occurrence of distinct clinical presentations of the disease- benign\textsuperscript{3}, intermediate\textsuperscript{4} and virulent.\textsuperscript{3} In 1988\textsuperscript{5} the sheep industry in NSW decided to begin a State wide program for the eradication of virulent footrot (VFR) in sheep and goats. VFR, by definition, included clinical forms of the disease identifiable as IFR. BFR was not targeted because of its impact on the profitability and animal welfare, plus cattle\textsuperscript{6} were known to be a reservoir of benign strains of \textit{D. nodosus} benign for sheep.

Broadly speaking, there were three proven options (‘programs’), plus combinations of these, that flock owners could use to elimination footrot from their flocks. These were: complete destocking of affected flocks and replacement with footrot free sheep, sheep infected with virulent footrot (VFR cases) and culling of VFR cases and thirdly, identification of VFR cases and their effective treatment. Treatment options were either by paring and foot-bathing or injection with antibiotics\textsuperscript{1}. The treatment option included the need to cull animals which failed to respond to treatment. Owners could choose the method(s) to be used on their flocks but in the case of quarantined flocks their plan for eradication had to have the approval of the District Veterinarian (DV). They also had the option of employing accredited footrot contractors if they chose a method other than whole flock disposal. These contractors worked under the supervision of District Veterinarians employed by the Rural Lands Protection Boards (RLPB’s) of NSW. The RLPB’s were recently reorganised into Livestock Health and Pest Authorities (LHPA’s).

The eradication program was successful\textsuperscript{7}. By November 2008 there were only 23 flocks with virulent footrot known to exist in NSW. More than 6000 other flocks had been freed of the disease and the state was formally declared to be a footrot protected area in 2009. The success of
the NSW footrot eradication program has generated interest in determining which eradication options had been used by owners. Because of the voluntary nature of the program there were few detailed records how the great majority of owners elected to eradicate VFR from their flocks. However a number of properties were quarantine and the successful eradication of VFR was a condition of release of this quarantine. Official records from these flocks were used in this study which aims to identify which of the options available for footrot eradication were chosen by flock owners placed in quarantine during the NSW footrot eradication program.

**Materials and Methods**

Records of flocks quarantined for footrot were obtained from two former adjoining RLPB’s, Wagga Wagga which is now Division A of Hume LHPA, and Young, now Division C of Lachlan LHPA (we elected to use the former names of RLPB Wagga Wagga and RLPB Young). For the period 1981-2010, Wagga Wagga had a mean annual rainfall of 562.2 mm with on average 70 days with >1mm rainfall. The altitude above sea level for the Wagga Wagga area ranges from 50-300m. Annual mean maximum and minimum temperatures were 22.5°C and 9.1°C, respectively. In Young, for the period 1988-2010, mean annual rainfall was 567.9mm and with on average 67 days with >1mm rainfall. The altitude in the Young region ranges from 150-500 m above sea level. The mean maximum and minimum temperatures were 22.1 and 7°C respectively, respectively. Both areas are predominately winter rainfall with new outbreaks of footrot commonly occurring as temperatures rise in the Spring.

The records of all 113 flocks quarantined in RLPB Wagga Wagga were included whereas because of limited resources available for this study a random sample of only 100 of 172 quarantined flocks from RLPB Young was examined.

Records included information on property location, sheep numbers, quarantine dates of entry and release from quarantine, approved eradication programs including whether or not a contractor had
been employed for the eradication of footrot. All written and verbal communication with property owners were recorded. Some contained further details such numbers of sheep in individual mobs and inspections. These records were compiled by RLPB rangers as each property was quarantined to provide a single electronic file of information on each quarantined property. To supplement these records, individual physical files were available for most properties. These contained original forms and documentation.

Flocks had been quarantined either because they were present in an area which had achieved “control” or “protected” area status as defined by the NSW Footrot Strategic Plan or because they represented a continuing risk of infection in a footrot eradication group, consisting of neighbouring farms footrot eradication group which had otherwise been successful in eradication. In the former case quarantine was mandatory; in the latter it was at the request of the relevant group if that group was in a residual area (> 10% flock prevalence). Similarly 100 individual hardcopy footrot quarantine files were selected randomly from 172 flocks quarantined in RLPB Young. These documented the same information as the RLPB Wagga Wagga files. Data were entered into a Microsoft Excel spreadsheet (Table 1).

Where two programs were implemented almost simultaneously the second program implemented was noted as a secondary program in a separate column (Table 2). The decision to place a program into the primary or secondary column was based on the most likely order of actions involved i.e. a partial destock (primary) and an inspection and cull program (secondary). A program change was noted when an alternative eradication program was used at a later date within the quarantine period.
Electronic records from RLPB Wagga Wagga were used to enter data for each case (flock). Where further information was required on sheep numbers or program implementation information, individual files were consulted. Where information was incomplete or not provided, data were defined as ‘unknown’. Some initial presumptions were made about numbers of sheep on properties. For example, often a total flock size was stated yet it was unclear whether this number represented total sheep on the property or total sheep in affected mobs. RLPB rangers and the current District Veterinarian (AM) were also consulted to confirm programs implemented and to clarify sheep numbers. Similarly, if there was no mention of use of a contractor it was assumed they were not used. Only treatments attempted after the initial quarantine date were considered to be part of the program implemented. All of the RLPB Wagga Wagga records were initially included (115) but two records were removed because of duplication. The records from RLPB Young were essentially the same as those from RLPB Wagga Wagga and the data was treated in the same way. Initially, properties were categorised initially into one of four groups based on the primary program implemented (Table 2). Properties were then categorised into flock sizes of \( \leq 500 \) sheep, \( >500 - < 3000 \) sheep and \( \geq 3000 \) sheep and then sorted according to their eradication program choice.

**Inspection.** This entailed the careful examination of every foot of every sheep in the flock or mob under consideration. Mechanical handling equipment facilitated the inspection of the large numbers of sheep involved.

**Diagnosis of virulent footrot.** Virulent footrot was diagnosed clinically by veterinarians accredited for the footrot eradication program. This diagnosis was based on the characteristic damage of epidermal tissues of the hoof, including under-running of soft and hard horn, caused by *D nodosus* infection. Benign footrot was diagnosed when infections were essentially confined to the interdigital skin. A decision to classify a flock infection as benign was supported by flock history and the status of neighbouring flocks, prevailing pasture and weather conditions. Veterinarians were required also to examine and record foot-scores from sufficient sheep to be
confident that virulent footrot was not present. In some cases repeat inspections of the flock were required and sometimes material was submitted to the laboratory for culture of *D. nodosus* and testing of proteolytic enzymes elaborated by samples obtained from the flock. 

*Release from quarantine.* Properties were released from quarantine when:

1. Inspection > 7 days after destocking revealed no sheep on either the whole property or that part of it subject to quarantine. OR

2. A summer eradication program had been completed and after the following transmission period the whole flock was reinspected and, if free of footrot, released from quarantine.

*Statistical analyses* on those flocks where only one program was used to eradicate VFR included an independent test using ANOVA with a *post-hoc* Bonferroni test in SPSS 17.0 (SPSS Inc., Chicago, IL) to examine significant differences in total flock size, mean times in quarantine according to the eradication program implemented, and mean times in quarantine if a contractor was employed to implement the program.

**Results**

*Preliminary examination of data*

Data from 17 flocks (eight in Young and nine in Wagga) were excluded from further consideration because of inadequate of records.

Of the remaining 196 flocks for whom complete information was available, 173 (88.3 %), used a single program to eradicate VFR and were included in the final analysis.

Twenty three flocks used either a combined program at the outset (13 flocks) or, having failed to eradicate, changed their program (10 flocks) and were excluded from any further analysis.

*Distribution of single program choices*

Of the remaining 91 properties located in Wagga, 39 (42.9%) totally destocked, 39 (42.9%) chose an inspect and cull program, 10 (11.0%) chose an inspect, treat with antibiotics and cull non-
responders program (I/T/C – antibiotics), and 3 (3.3%) used an inspect, treat with footbathing and cull non-responders program (I/T/C – footbaths).

Of the remaining 82 properties in RLPB Young, 22 (26.8%) destocked, 32 (39.0%) did an inspect and cull program and 28 (31.5%) chose an I/T/C – footbath program.

The combined data from records in both RLPB’s Wagga Wagga and Young showed that 61 (35.3%) destocked, 71 (41.0%) chose to inspect and cull, 10 (5.8%) used I/T/C – antibiotics and 31 (17.9%) chose I/T/C – footbath.

**Combined programs (Secondary program choice)**

There were seven flocks in Wagga with combined programs. The primary program in all cases was partial destock. The distribution of secondary programs in these flocks was: inspect and cull, 4; I/T/C- antibiotics; 2; I/T/C- footbath, 2.

Of the six flocks in Young, four had partial destock as the primary program and two used the antibiotic treatment option. The four flocks which partially destocked used inspect and cull as a secondary program. Footbathing was the additional or secondary program where antibiotics were used as a primary program.

**Program changes after failure of initial choice**

There were only ten flocks where programs were changed because of the failure of the one initially chosen. Of these eight elected to destock, one partially destocked and one changed the antibiotic used for treatment. All these flocks also eventually eradicated VFR.

**Flock size and program choice.**
The mean total flock size (N=81) in RLPB Young was 2852, and the median 1500. There was 1 property of unrecorded size. The numbers for RLPB Wagga Wagga flocks were considerably lower with a mean flock size of 1543 (N= 81; 10 unrecorded) and a median of 613. Total destock programs showed a significant difference (P<0.01) in total flock size and total animals at risk when compared to other program choices (Table 3).

Due to the significance of the above data, flock size was reorganised into three categories: <500, 500-3000 and >3000. The majority (55.8%) of properties with less than 500 sheep totally destocked while 28.8% chose to inspect and cull (Table 4). Of the properties that had 500 to 3000 sheep, 44.7% performed inspect and cull programs whilst 29.6% totally destocked. Of the properties that had over 3000 sheep 56.0% performed inspect and cull programs whilst 36.0% performed I/T/C – footbath programs. Only 8.0% of these properties totally destocked.

Time in quarantine

The mean length of quarantine for RLPB Wagga Wagga flocks was 328 days. The mean time in quarantine varied with the eradication program chosen, the highest being 434 days (10 properties) for I/T/C-antibiotics. The lowest mean, 260 days (3 properties), was for I/T/C-footbath similar to the total destock group (269 days; 39 properties). The remaining 39 properties used the inspect and cull option which resulted in an average quarantine length of 366 days.

The mean length of quarantine for RLPB Young was 431 days. The mean time varied similarly to the RLPB Wagga Wagga flocks. The lowest mean was 311 days for the total destock group (22 properties). The treatment option, I/T/C-footbath resulted in a quarantine length of 527 days (28 properties). The inspect and cull option implemented on 32 properties resulted in a mean quarantine length of 431 days.
The mean length in quarantine for flocks when the data from the Young and Wagga Wagga RLPB’s was combined was 377 days. I/T/C-footbath had the highest mean with 502 days, whilst total destocking had the lowest (284 days.) Length of quarantine varied significantly (P<0.001) according to the eradication program implemented. The I/T/C-footbath category had a significantly longer mean time in quarantine (502 days v.284; P<0.01) when compared to the total destock category. The remaining comparisons between groups were not significantly different.

Use of contractors.

The criterion “use of contractor” used in our preliminary examination of the records did not distinguish between a number of different ways in which contractors worked with flocks. For example contractors were sometimes engaged after owners had failed in eradication programs after being quarantined. In other cases accredited contractors were only engaged in inspections at the time of release from quarantine.

RLPB Wagga Wagga had 17/91 (18.7%) properties where contractors were used throughout eradication programs i.e. from the time quarantine was imposed. Seventyfour (81.3%) properties did not use a contractor. Where a contractor was involved for the three programs of I/T/C – antibiotics program, I/T/C – footbaths program and inspect and cull the mean time in quarantine was 326 days and was not significantly different from the time when no contractor was involved (395 days, P value 0.20). RLPB Young had 24/82 (29.3%) properties used a contractor for the three eradication programs of I/T/C – footbaths program and inspect and cull. Footrot was eradicated from 58/82 (70.7%) flocks without the involvement of contractors. The average quarantine length for programs when a contractor was involved from the start of eradication was 369 days, which is considerably shorter than the time for those properties which did not use a contractor (546 days, P < 0.02).
Overall, 41/173 properties used a contractor to complete an eradication program. The mean time in quarantine (excluding the destock category) was 351 days, significantly shorter than the 472 days ($P = 0.02$) when no contractor was involved. Primary use of a contractor was then considered according to program choice and mean time in quarantine. The use of contractors resulted in a significantly shorter quarantine period for the I/C/T-footbath program (Table 6).

**Discussion**

The main objective of this study was to identify which of the options available were chosen by flock owners placed in quarantine during the NSW footrot eradication program$^5$. Although the records used in this study came from only two of the 42 RLPB’s in NSW, they are considered to be representative of infected flocks in areas with a relatively high prevalence of footrot at the start of the program in 1988. However, a major difference between these flocks and the majority from which footrot was eradicated in the course of the program is that the former were subject to official intervention and quarantine.

*Primary program.* The majority of properties opted either for an inspect and cull (41%) or a total destock program (35%). Total destocking is the most certain method of eliminating footrot from a property and could, theoretically, lead to release from quarantine within a few weeks. However, in many cases, owners were reluctant to dispose of all their sheep immediately. Both the financial losses incurred and the perceived value of established blood lines influenced this decision. Thus the mean time to release from quarantine after total destocking was more than six months. There was little difference in the proportion of owners selecting an inspect and cull programs in the 2 RLPB’s and this was the option more likely to be chosen (39 and 43% of owners, respectively).
In contrast to the Wagga RLPB, very vies of the 82 quarantined flocks from the Young RLPB chose to use antibiotic treatment as an aid to eradication, preferring footbathing to control the infection before attempting eradication. The reasons for this difference are not clear but could be related to greater flock size and concern about a perceived higher cost of antibiotic treatment, although it is also possible that the environment in RLPB Young was less favourable for antibiotic treatment. Furthermore, footrot of lower virulence responds poorly to antibiotic treatment.10 If there was a higher prevalence of this form of the disease in Young this may have influenced program choice.

Program and flock size. Of the properties with less than 500 sheep, more than half totally destocked (56%). However as total flock size increased (>500<3000), properties moved towards eradication programs that retained some stock, such as inspect and cull programs (45%) and treatment of infected animals (26%). There was little difference between the medium sized flocks and the ≥3000 category in the mix of programs selected. The owners of these larger flocks were perhaps more likely to be dependent on continuing income from their sheep, so total destocking was unattractive compared to an inspection and salvage program. Another interesting result was that 36% properties with more than 3000 sheep completed footbath programs. Because it was more likely that these larger flocks were in RLPB Young, the bias discussed above may have influenced this figure.

Secondary programs. Overall, a secondary program was chosen to supplement the primary program in 6% of flocks. In most cases this involved partial destock of infected mobs and an inspect and cull program on the remaining at risk animals. Such a combination of programs was probably of most appeal to owners with valuable stock. For example, mobs of broken mouth ewes were culled whilst rams, maiden ewes and low prevalence mobs were kept for inspection
and/or treatment. Where they were used these combined programs all resulted in eradication but data from these flocks were not used in statistical analyses.

In 94% of cases the initial program chosen successfully eradicated virulent footrot. This high level of success, irrespective of chosen, demonstrates that most owners can eradicate footrot. Lack of motivation and resistance to official intervention are possible reasons for the low proportion of failures which did occur. Other known reasons for failure include attempting eradication in unfavourable environments, inadequate use of antibiotics and failure, in the case of all treatments, to identify and cull non-responders. Other possible reasons for program failure are the masking of infections after footbathing and the failure to recognise absolutely all cases during the inspection of large numbers of sheep.

Program choice and time in quarantine. Time in quarantine was influenced by the method of eradication chosen. The shortest time was in those flocks which totally destocked (284 days), followed by inspect and cull (395 days), treatment of cases with antibiotics (433 days), and treatment by foot bathing (502 days).

Of the three methods (other than destocking) which led to the shortest times in quarantine, inspect and cull is the simplest and requires no outlay for treatment. The choice between the 3 programs probably depends on the prevalence of footrot in the flock, that is, whether the net cost of salvaging affected animals is lower than the cost of culling and entailed loss of production. The mean time in quarantine resulting from these three programs is consistent with the time taken for completion of a summer program, surveillance through a following transmission period and subsequent inspections in the next summer to ensure freedom from footrot.

There was a long time in quarantine associated with the use of foot bathing as a treatment method. The records were not sufficiently detailed to allow a comparison of different foot
bathing chemicals but overall, this approach appears to result in an unacceptably long period in quarantine. There are no clear reasons why this should be so. Perhaps these treatments, and especially formalin, can mask some sub-clinical (unapparent) infections which later progress under more favourable conditions.

Differences were noted between times flocks were in quarantine in RLPB Wagga Wagga compared to flocks in RLPB Young. The greater overall time in quarantine in RLPB Young may be the consequence of the greater flock sizes in that area and the effect of many more owners choosing to eradicate by footbathing. The Young area, being somewhat higher and cooler in summer than the Wagga RFLB may also be more favourable for footrot. The rainfall, number of wet days and mean minimum and maximum daily temperatures for the two areas are essentially the same.

*Use of contractors and time in quarantine.* Compared with owner operated eradication programs, contractors decreased the mean length of time in quarantine by 121 days. When employed at the outset, they were more effective than owners irrespective of the program chosen for eradication. The mean difference in time in quarantine when antibiotics were used was 217 days although the number of flocks involved did not allow testing for the significance of this difference.

The data derived from this study confirm the value of the decision to train and accredit these contractors and the positive contribution they made to the eradication of footrot from NSW.

Observations based on the data from these 173 flocks may not represent what happened in the 6,000 or more flocks from which virulent footrot was eradicated during the state wide program. For example, in the early stages of the program, about 10-15% of flock owners in some areas used both vaccine for control and antibiotics for treatment of VFR (D Salmon, pers comm.). Most flocks eradicated VFR when wool prices were high and seasons were, initially, more favourable.
for production. With the collapse of wool prices and the onset of drought in the early nineties
destocking (with some associated tax relief) became a more attractive option for many owners
with affected flocks. Furthermore our sample of quarantined flocks was by its nature not
representative of the wider sheep industry. For many reasons these flock owners were reluctant or
unable to achieve eradication without official intervention in an otherwise voluntary program.
Nevertheless, despite being derived from flocks where quarantine was instituted, these findings
may be of relevance to others considering eradication of footrot in flocks both in Australia and
elsewhere.

Acknowledgements

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acknowledge the assistance of, Mark Luff and Richard Le Lievre for their help in collating and
recalling quarantine records.

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   associated with infection by less proteolytic strains of Fusiformis nodosus. Aust Vet J 1969;
   45:345-349.


Table 1. Headings used in the spreadsheet summary of data from the property files

<table>
<thead>
<tr>
<th>Data heading</th>
<th>Description of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case number</td>
<td>Original case number from Wagga Wagga quarantine records and assigned case number for Young records.</td>
</tr>
<tr>
<td>Location</td>
<td>Property location (suburb/town/postal address)</td>
</tr>
<tr>
<td>Number of sheep</td>
<td>Total number of animals on property,</td>
</tr>
<tr>
<td>Quarantine start date</td>
<td>Date ‘Undertaking Instead of Quarantine’ signed or ‘Quarantine in 40 days’ issued.</td>
</tr>
<tr>
<td>Quarantine release date</td>
<td>Date property released from quarantine</td>
</tr>
<tr>
<td>Length of quarantine</td>
<td>Length of quarantine in days</td>
</tr>
<tr>
<td>Contractor</td>
<td>Contractor executed eradication program.</td>
</tr>
<tr>
<td>Primary Program</td>
<td>The only program used or the first used in a combination of programs.</td>
</tr>
<tr>
<td>Secondary program</td>
<td>The second or supplementary program in a combined program</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>Program change</td>
<td>Program used after failure of initial program</td>
</tr>
</tbody>
</table>

Table 2. Description of programs used for the eradication of footrot

<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>PROGRAM DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destock</td>
<td>There were two categories: (a) either all sheep on the property or (b) all sheep in known affected mobs. Sheep in unaffected, not in contact mobs, retained (partial destock).</td>
</tr>
<tr>
<td>Inspect &amp; cull</td>
<td>Sheep inspected (during summer) and all clinically infected animals culled. Inspections continued until flocks had two consecutive clean (no cases) inspections.</td>
</tr>
<tr>
<td>I/T/C – antibiotics</td>
<td>Inspected, treated with antibiotics at the initial summer inspection &amp; non-responders culled, then follow up inspections.</td>
</tr>
<tr>
<td>I/T/C – footbaths</td>
<td>At the initial summer inspection, infected and at risk animals footbathed according to product or ranger instructions. Extent of paring depended on footbath used and was not noted in the records.</td>
</tr>
</tbody>
</table>
Table 3. Effect of flock size on the program chosen to eradicate virulent footrot

<table>
<thead>
<tr>
<th>Program choice</th>
<th>Mean flock size</th>
<th>95% CI²</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/T/C-antibiotics</td>
<td>1437</td>
<td>663-2210</td>
</tr>
<tr>
<td>I/T/C-footbaths</td>
<td>3539¹</td>
<td>1931-5148</td>
</tr>
<tr>
<td>Inspect and cull</td>
<td>2616</td>
<td>1596-3635</td>
</tr>
<tr>
<td>Totally destocked</td>
<td>1100</td>
<td>484-1716</td>
</tr>
</tbody>
</table>

¹ Significantly different to the “I/T/C-footbath” and “Totally destocked” programs (P < 0.01)

² 95% confidence interval

Table 4. Program chosen to eradicate virulent footrot classified according to flock size*

<table>
<thead>
<tr>
<th>Program</th>
<th>≤500 (N)</th>
<th>&gt;500, &lt;3000 (N)</th>
<th>≥3000 (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/T/C – antibiotics</td>
<td>3.8% (2)</td>
<td>8.2% (7)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>I/T/C – footbath</td>
<td>11.5% (6)</td>
<td>17.6% (15)</td>
<td>36.0% (9)</td>
</tr>
<tr>
<td>Inspect and cull</td>
<td>28.8% (15)</td>
<td>44.7% (38)</td>
<td>56.0% (14)</td>
</tr>
<tr>
<td>Totally destock</td>
<td>55.8% (29)</td>
<td>29.4% (25)</td>
<td>8.0% (2)</td>
</tr>
</tbody>
</table>

*Data on flock size was incomplete for 11 flocks

Table 5. The effect of program chosen to eradicate virulent footrot on time flocks were quarantined

Effect of program choice on time in quarantine: combined data

<table>
<thead>
<tr>
<th>Program</th>
<th>Number of flocks</th>
<th>Average quarantine Length</th>
<th>95% CI²</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/T/C – antibiotics</td>
<td>10</td>
<td>433</td>
<td>264-603</td>
</tr>
<tr>
<td>I/T/C – footbaths</td>
<td>31</td>
<td>502¹</td>
<td>357-628</td>
</tr>
<tr>
<td>Inspect and cull</td>
<td>71</td>
<td>395</td>
<td>347-442</td>
</tr>
<tr>
<td>Totally destocked</td>
<td>61</td>
<td>284</td>
<td>198-352</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>377</td>
<td>333-421</td>
</tr>
</tbody>
</table>

¹ significantly different to the totally destock program (P value <0.05)

² 95% confidence interval
Table 6. The effect of using a footrot contractor on the mean time flock were quarantined

<table>
<thead>
<tr>
<th>Program</th>
<th>Contractor</th>
<th>No</th>
<th>95% CI</th>
<th>Yes</th>
<th>95% CI</th>
<th>Mean</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/T/C – antibiotics</td>
<td>No</td>
<td>520 (N = 6)</td>
<td>231-809</td>
<td>303 (N = 4)*</td>
<td>197-409</td>
<td>433</td>
<td>264-603</td>
</tr>
<tr>
<td>I/T/C – footbaths</td>
<td>No</td>
<td>585 (N = 19)</td>
<td>433-777</td>
<td>369 (N = 12)¹</td>
<td>253-421</td>
<td>502</td>
<td>357-628</td>
</tr>
<tr>
<td>Inspect and cull</td>
<td>No</td>
<td>419 (N = 46)</td>
<td>352-487</td>
<td>350 (N = 25)</td>
<td>297-404</td>
<td>395</td>
<td>347-442</td>
</tr>
</tbody>
</table>

* total data points not sufficient to calculate a difference

¹ significantly lower compared to No contractor (P value <0.05)

² 95% confidence interval