



## Update on Johne's Research Group activities and current research

- Report on national Johne's disease database (Jaimie Glossop)
- Potential for the use of a Johne's disease vaccine in deer (Colin Mackintosh)
- Research updates
  - Massey University epidemiology study (Jaimie Glossop)
  - AgResearch Invermay (Colin Mackintosh)
  - AgResearch Wallaceville (Geoff de Lisle)
  - Joint AgResearch Wallaceville and Invermay project
  - Landcare Research Lincoln wildlife study (Graham Nugent)
- Miscellaneous
  - Johne's disease website information
  - Pan-industry approach
  - Deer Slaughter Premises solutions
  - Other Sustainable Farming Fund activities

### Report on national Johne's disease database (Jaimie Glossop)

At a recent meeting of representatives of the Johne's Research Group, the Deer Farmers Association, Massey University and meat processing companies, there was universal agreement that a national database of information relating to the Johne's disease status of deer farms throughout New Zealand would be a great asset.

It would facilitate judgements on carcasses with lymph node lesions after slaughter and assist in managing control of Johne's disease in the field. The current approach to developing such a database is a link to the existing, highly successful Ovis Management database, which provides information on the incidence of sheep measles at a national level. A complimentary connection with the Animal Health Board's newly developed Disease Management Information System (DMIS) database would allow processing of existing information about national and regional Johne's disease incidence in deer slaughter plants.

The database would have several purposes:

- It would make it easier to collect information about

the incidence and prevalence of Johne's disease at national, regional and farm level.

- It would enable prevalence trends to be tracked, and the effectiveness of control measures to be monitored: ie. it would provide data to help determine strategies at industry and farm level.
- It would provide instant access for approved parties (eg. Deer Slaughter Premises vets, processors, marketers, the Animal Health Board) to determine herd status (this is important for carcass detain decisions and in the future it could aid market access by demonstrating that the industry is managing and monitoring the situation).
- It would identify problem farms for control measures.

The Johne's Research Group is currently looking at ways of proceeding with this, and Massey researchers are currently working with Ovis Management Limited and the Johne's Research Group to put together a development and management plan for the database.

# Potential for the use of a Johne's disease vaccine in deer

(Colin Mackintosh)

“Gudair” is the only vaccine for Johne's disease licensed for use in New Zealand and it is approved for use only in sheep and goats. Gudair may be used in certain circumstances in cattle but only when there is no risk of bovine Tb. This is because Gudair vaccination has been shown to sensitise cattle to the Tb test. Preliminary results from a recent trial at AgResearch Invermay, jointly funded by FRST and DEEResearch, showed that the vaccine also sensitises deer to the Tb test. This limits its usefulness in breeding animals but it may be possible to get the licence extended to deer intended only for slaughter, because they could be “works monitored” for Tb rather than being Tb-tested on the farm.

Scientists Colin Mackintosh from Invermay and Peter Wilson and Cord Heuer from Massey University are investigating the feasibility of a limited field trial of the vaccine. If it is to go ahead, such a trial would require careful planning and organisation. A provisional licence

from the New Zealand Food Safety Authority (NZFSA) would be required along with agreements by selected farmers, selected Deer Slaughter Premises and the Animal Health Board that all necessary prerequisites can be met to safeguard the integrity of the Tb Control Scheme.

There is an urgent need for a multi-faceted approach to Tb control that incorporates ways of dealing with Johne's disease including resolving the problems with primary and ancillary Tb tests and the potential use of Johne's vaccines. There are concerns that vaccination may affect trade and marketing of deer products. Some markets may be reluctant to take Johne's-vaccinated carcasses because of problems experienced 10 to 15 years ago with injection site lesions in lambs that were vaccinated with Neoparasec vaccine when they were very young. The deer industry is making a real effort to resolve these issues as soon as possible.



The red weaner on the left shows obvious signs of Johne's disease, with faecal soiling of the tail, back end and hocks.

Photo: Colin Mackintosh

### Massey University epidemiology study

(Jaimie Glossop)

Sampling for the deer Johne's disease nation-wide case-control study got underway in July 2005. The primary aim of the study is to determine the factors that increase the risk of introducing *M. paratuberculosis* to a deer farm and/or that increase the risk of clinical signs of Johne's disease (eg: scouring and weight loss, lesions at slaughter and non-specific Tb skin test reactors) once the bacteria are present.

The Johne's status of approximately 195 deer farms throughout New Zealand was determined by either active sampling on-farm or by tissue culture from slaughtered deer. The Johne's status of participating farms ranged from 'low risk' (ie: no Johne's disease diagnosed

on-farm and no clinical signs of Johne's disease evident) to 'heavily infected' (ie clinical disease outbreaks have occurred and multiple pooled faecal samples were culture-positive). The field work was completed in November. Information gathered from the survey will be summarised in the following 6 months and will be made available in deer farming publications as soon as possible after that.

It is anticipated that the study will identify significant factors that influence the occurrence of disease on deer farms, and flowing on from this phase of the study key factors will be investigated in more detail in the next 2 to 3 years.

### AgResearch Invermay

(Colin Mackintosh)

#### Invermay dose rate and strain trial results

- 1 Clinical Johne's disease occurred only in the deer that received the highest dose of organisms.

**Conclusion** – Outbreaks of disease in yearlings are probably due to heavy challenge of the fawns when they are less than 3 months of age. The infection will be from infected dams that are carrying the bovine strain and shedding it in their faeces or in their milk.

**Advice to farmers** – Cull all clinically affected hinds as soon as possible to prevent contamination of pastures and reduce spread to the next generation of fawns. If economic, blood test hinds and remove all positives in order to minimise the number of subclinically infected hinds in the herd.

- 2 The bovine strain (isolated from an infected deer) appeared to be much more pathogenic for deer than the sheep strain (isolated from an affected merino sheep).

**Conclusion** – It is believed that most spread of the cattle strain is now a result of direct deer to deer contact, but deer are also at risk from infected cattle, especially dairy cattle (they are commonly infected).

**Advice to farmers** – Don't graze deer with or alongside dairy cattle or on pasture that has been grazed by dairy cattle in the previous 2 years. There may be less risk from grazing deer with sheep than with cattle.

#### 3 Other results

- When deer were dosed in late March, the first clinical cases occurred in August and September.
- There was good correlation between deer being positive to the Paralisa test and the severity of the disease. This made the Paralisa particularly useful for culling out the most heavily infected deer, which were the ones most likely to be shedding bacteria in their faeces.
- The Paralisa was better at detecting infections with the bovine strain than with the ovine strain, and this was probably because the bovine strain caused disease that was more severe.
- Control deer that were run with the infected deer all became infected during the trial.

#### Intra-uterine Johne's transmission study

Last year a trial at Invermay showed that the foetuses from eight of nine hinds suffering from clinical Johne's disease were infected while still in the uterus in late pregnancy. The hinds were in poor condition, with scouring and loss of muscle mass over the loins. This type of intra-uterine infection is likely to result in the fawns developing Johne's disease at an early age.

This year a similar trial is underway, funded by DEEResearch, involving subclinically infected red hinds (hinds that are infected but not yet showing clinical signs). Preliminary results suggest that a number of their fawns have been infected while in the uterus, but the work is ongoing and no conclusions can be drawn as yet.

# AgResearch Wallaceville

(Geoff de Lisle)

## Lesion identification

All deer at slaughter are examined for the presence of bovine Tb and samples are taken from animals with suspect or typical lesions. The microscopic appearance of these lesions is determined by examining histological sections. To the naked eye and even when examined microscopically, the lesions of Johne's disease in deer can be very similar and often indistinguishable from those of bovine Tb.

When bovine Tb can't be ruled out, the District Disease Control Manager may request that samples be cultured, but routine culture procedures for bovine Tb will not identify the Johne's disease organism if it is present. For over 10 years the Wallaceville Laboratory has been using additional culture media that support the growth of the Johne's organism when culturing suspect Tb lesions from the gut lymph nodes of deer. These specific culture methods indicate whether the suspect lesions are caused by avian Tb, bovine Tb or Johne's disease organisms, and ensure that the disease status of the herd is correctly determined. The results of this testing have also provided valuable data on the spread and distribution of Johne's disease in deer.

## Strain typing of Johne's bacteria

In New Zealand there are two types of Johne's organism that have been identified by DNA typing procedures. The "bovine" type mainly infects cattle and the "ovine" type mainly infects sheep. Studies in this laboratory in the early 1990s showed that farmed deer could be infected with either type. While the bovine type predominated,

both types were isolated from deer with clinical Johne's disease. Recent research has led to the development of a rapid PCR test to type the Johne's bacillus. The new PCR test has been used on DSP lesions from about 100 herds throughout New Zealand. Over 95% of the herds were infected with the "bovine" type. The "ovine" type was identified in four herds. These results indicate that the "bovine" type is more pathogenic for deer than the "ovine" type, but both cattle and sheep must be considered as potential sources of infection for deer.

## Prevalence of Johne's disease

By 2000, Johne's had been confirmed by either culture or PCR in 299 deer herds in New Zealand, and since then this number has steadily increased. Currently Johne's disease has been confirmed in over 600 herds. This represents approximately 12% of deer herds in New Zealand. Given the limitations of the data this figure will be an under-estimate of the true prevalence. Many herds are known to have been infected with the Johne's bacillus for several years, indicating that once a herd is infected, the infection persists indefinitely. The number of infected herds has reached such a level that some control options such as quarantining infected herds are no longer practicable.

Furthermore, the inadvertent purchase of infected deer is becoming increasingly more likely. Therefore, if farmers believe the deer on their farm are free of Johne's disease, they should take steps to prevent infection coming onto the farm, and the best way of doing this is to keep a closed herd and not intergraze their deer with sheep or cattle.

## Joint AgResearch Wallaceville and Invermay project Pooled faecal culture

Pooled faecal culture (PFC) is the technique whereby faecal samples from between 10 and 25 deer are thoroughly mixed together and a subsample cultured for the bacterium that causes Johne's disease. A collaborative study between Wallaceville and Invermay showed that this is an efficient cost-effective way of screening large numbers of deer in a herd without losing too much sensitivity. Any decrease in sensitivity when ten samples are cultured rather than one sample is offset by being able to screen more animals for the same cost. If the prevalence of infection is thought to

be very low (ie <4%) then it may be necessary to use only five faecal samples per pool to increase sensitivity.

The PFC is useful for screening herds to see if any deer are infected with *M. paratuberculosis*. A negative result does not guarantee the herd is free of infection, but it gives a high level of confidence that it is free or that infection is at a very low level. Repeated screening with negative results over time increases the confidence level that the herd is free of infection, just as repeat Tb testing increases the "C" or clear status of herds for freedom from Tb.

# Landcare Research Lincoln wildlife study

(Graham Nugent)

Surveys of three Johne's disease-infected deer farms have shown that rabbits, hedgehogs, cats, hares, ferrets, and gulls can also be infected with *M. paratuberculosis* bacteria. On these three farms, 12 to 26% of the wild animals tested so far have been infected. On one farm almost half the rabbits were infected and on another over half the hedgehogs, whereas hares were not infected nearly as often on any of the farms. One hedgehog in particular had a sizeable abscess, but most of the infected animals showed little visible evidence of the disease.

These high prevalences and the differences between species and farms suggest strongly that there are various ways animals can become infected (not just through contamination of pasture).

However, the surveys in no way confirm that wildlife are important in maintaining Johne's disease infection on farms. The wildlife may simply be spillover hosts that do not pass the disease back to livestock. The strain of *M. paratuberculosis* in wildlife has still to be confirmed, and there are no clear indications as yet that the disease is cycling within wildlife.

Nonetheless, the results do add considerable weight to the possibility that infection in wildlife may be one of the reasons Johne's disease is such a difficult disease to control in livestock, and it may be that active pest management could become an important factor in controlling the disease on farms, or in preventing its spread between farms.

## Miscellaneous

### Johne's disease website information

As part of its Sustainable Farming Fund programme, the Johne's Research Group has begun negotiations with Vetgate on forming a website to present information on Johne's disease that could help deer farmers manage the disease. A domain name has been registered – [www.Johnes.org.nz](http://www.Johnes.org.nz) – and an opening page has been designed.

There is merit in this being a shared site containing information about Johne's disease in sheep and beef and dairy cattle as well as deer.

Any information put on a website will have to be carefully selected and it is envisaged that the Deer Farmers' Association and Deer Industry New Zealand will be involved in determining the deer industry's contributions.

### Pan-industry approach

Like the deer farming industry, the sheep and cattle farming industries have become increasingly aware of the production restraints arising from Johne's disease, and there is a growing commitment by all industries to address these issues. Because deer offer a better research model and in the light of the initiatives of the Johne's Research Group, it is envisaged that the Johne's Research Group and Deer Industry New Zealand will become closely involved in a sector-wide approach to seeking solutions. There are advantages in this because the greater resources of the sheep and dairy industries promise a more concerted and better funded effort to find answers.

### Deer Slaughter Premises solutions

Johne's Research Group communications with Deer Slaughter Premises (DSPs) have indicated a growing awareness at DSPs of the Johne's disease issue and a very positive attitude towards seeking solutions. This has already had some positive spin off with regard to the database and the handling of detain carcasses. For instance PPCS now bone out detain carcasses on the assumption that they will be cleared of Tb and be available for export. This helps to ensure that not all Johne's disease-identified carcasses are financially penalised, and in most instances farmers will receive full export payment.

### Other Sustainable Farming Fund activities

The Johne's Research Group under its Sustainable Farming Fund programme has produced a series of Bulletins on Johne's disease in deer, and these have been distributed to deer farmers with copies of Deer Industry News. This current Bulletin is the eighth in the series and there are more in the pipeline. Copies of Bulletins One to Seven can be obtained from the Johne's Research Group convenor, Peter Aitken ([aitken@orcon.net.nz](mailto:aitken@orcon.net.nz)). A hard back Manual of information about Johne's disease in deer fully indexed and including JRG activities and summaries of relevant research is being prepared and should be available by mid-2006.

The Johne's Research Group also plans to develop roadshows and to present disease management information through monitor farms, although progress on these initiatives has been slowed by the demands of the current work programme.

## Other publications produced by the Johne's Research Group include:

- **JRG Information Leaflet**

*"Johne's disease in farmed deer". Colin Mackintosh*

- **JRG Bulletin One**

*"Johne's disease in New Zealand farmed deer. What does this mean for you and your farm in 2004?"*

- **JRG Bulletin Two**

*"Detained carcasses: Johne's disease lymph node lesions in slaughtered deer and their implications"*

- **JRG Bulletin Three**

*"Update of current research on Johne's disease in deer"*

- **JRG Bulletin Four**

*"How to manage Johne's disease"*

- **JRG Bulletin Five**

*"Research update"*

- Intrauterine transmission of Johne's disease in farmed red deer
- Is Johne's disease common in wildlife on infected farms?
- Summary of the results of on-going Australian research on Johne's disease in sheep
- Update on Johne's disease research in Australia

- **JRG Bulletin Six**

*"Glossary of technical terms relating to diagnostic tests for tuberculosis and Johne's disease in deer"*

- **JRG Bulletin Seven**

*"A large epidemiological study gets underway at last". Jaimie Glossop.*

**Acknowledgement:** This Bulletin has been produced by the Johne's Research Group with the assistance of the Sustainable Farming Fund.



Photo: Debbie Stowell  
Warnham & Woburn Society Photo Awards, 2004