On-farm recommendations for management of Johnes Disease: A series of case scenarios

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The following is a presentation of Johne's disease (JD) scenarios discussed in break-out workshop sessions, along with a summary of recommendations or options proposed.

This workshop aimed to:

- Heighten veterinarian's awareness of the significance of JD to individual farm types
- Develop and discuss a range of risk management options for the prevention of introduction of JD to a "JD-free" herd
- Develop strategies for management of JD infected herds

SCENARIO 1:The "JD – Free" Commercial Deer Farm

Description of the case

- Central South Island mixed deer, sheep and cattle operation, farming a mixture of hill and flat land.
- Stock numbers
  - Red deer breeding hinds 600
  - Replacement yearling females 80
  - Replacement weaner females 90
  - Wapiti cross red finishes 360
  - Breeding stags
    - Red 6
    - Wapiti Cross Red 10
  - Sheep Romney cross breeding ewes 1200
    Lambs sold January/February
  - Angus beef cows 150
    Weaners sold April
- 200 "Superior" Breeding hinds bred to Red stags for replacements
- 400 Red deer hinds bred to Wapiti cross sires
- Hybrid progeny retained for finishing in a management system employing alternative forages, grain and irrigation.
- Currently no clinical evidence of Johne's disease.

Farming goal

Maximise financial returns. (Note: This is a profit driven operation)

Farming Aims

Achieve goal by:

- Breed genetically superior red deer hinds
- Finish Wapiti hybrid progeny by December 15
- Maximise returns from surplus stock
- Retain the option for future live sales of surplus "superior" red male progeny.
- Development plan:
  - Expand deer fence area immediately
  - Increase breeding hind numbers by 300 by immediate capital purchase
  - Purchase additional "superior" red stags and terminal sires

Risk Evaluation

Being profit driven, the owners are highly aversive to disease risk. Johne's disease is considered to be the most significant disease risk to this operation.

Risk Management Challenge

- Is the herd really free of JD? How can that status be confirmed/rebutted?
- What are the current or potential JD risks to this operation?
- What management plan can be implemented to reduce the risk of JD to this operation.

Workshop recommendations

1. Confirmation of JD status

1.1. Historical data

- Previous clinical disease … signs of JD but unconfirmed?
- Non-specific reactions to the Tb skin test
- Deer or other stock introductions… status of source(s)
- Check practice case records
- Status of neighbouring farms
- DSP records of lesions

1.2 Diagnostic data

- Clinical inspection of the herd for signs
- Blood samples for ELISA/AGID(GD)…. Sensitivity/specificity questions, numbers of samples? Class of animal? (suggest adults targeted) NB. CFT not recommended in deer.
- Faecal samples for culture: Questions about numbers of samples, and pooling options (eg. 1 sample of 100 pooled vs. 2 of 50, 5 of 20 etc.). This process has not yet been validated for sensitivity.
- Target non-specific reactors to the Tb skin test to possibly improve herd-based sensitivity of culture
- Post mortem surveillance of any animal dying, regardless of suspected cause
- Request specific PM surveillance of any deer going through a DSP

2. Current and potential risks and management

- Expansion of deer fence onto sheep and cattle area
  - Evaluate risk that cattle/sheep are infected
  - Spell the pastures for 18 months before stocking with deer. This could be done by leaving fallow, or cropping, or harvesting hay/silage
  - One-way deer stocking policy: move deer off the original area into newly fenced area, but do not bring them back onto the area believed to be JD-free. For example, use the newly fenced area for finishing stock, and ask for DSP surveillance
  - Graze to minimise soil ingestion
- Purchase of deer from other properties
  - Select "JD-free" herd(s) of origin: difficult. See 1 above.
  - Faecal test all purchases: pooled sample culture
  - Blood test a sample of hinds, and every sire stag
  - Quarantine on arrival on a limited part of the farm only: this is difficult because of the time needed, and then if JD was introduced, subsequent management of that part of the farm would be a problem
- Purchase of semen rather that live stags, particularly for the "elite" hinds.

- Manage elite and commercial hinds on separate parts of the farm, so if JD was introduced it could be contained in that management group. This option would prevent movement of hinds from commercial to elite groups, but not from elite to commercial, because the commercial herd is a lower value herd. Newly introduced deer could be confined to the newly fenced area, which is highest risk.
- Rabbits/hares (evidence shows these can carry JD). Only respond if JD is in the neighbourhood

SCENARIO 2: The "JD–free" red deer stud farm

Description of the case

- Intensively managed red deer farm on rolling country in the Nelson district.
- Animal numbers:
  - Mixed age hinds 325
  - Yearling hinds 115
  - Weaner hinds 149
  - Mixed age stags 84
  - Yearling stags 115
  - Weaner stags 138
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- Genuinely closed deer herds since 1987 (no live deer introduced)
- AI with new strains in 1993/1994, progeny used as sires from 1996 to present.
- Deer-only operation
- Breeding records kept for the past 16 years and breeding values available for all sale of deer
- Basic bloodline Rakaia red deer hinds, imported European live animals mid -1980's.
- Selection for growth, temperament and antler
- Private sales of mid range breeding stags for past five years
- Private sales of trophy stags last two years
- No evidence of Johne's disease

Farming Goal

- Capitalise on Investment in Breeding and Selection

Farming Aims

To achieve goal by:

- Starting an annual on-farm auction to bid up the value of stags and surplus hinds
- Increase hind herd size by retaining more progeny
- Purchase and develop more land for an expanded breeding and selection operation
- Introduce new genes from other deer studs particularly for trophy antlers and body size
- Establish an alliance with a nearby safari park to access genes from superior trophy stags prior to hunting. Suitable progeny returned to that hunting park in future.

Setting JD Risk Management Challenge

- Is the herd really free of JD. How can this status be validated/rebutted
- What are the risks and how can the herd minimise or eliminate risk of
- Purchasing new land and expanding deer operation
- Introduction of genes from another deer stud
- Introduction of genes from Safari Park deer

Workshop recommendations

Confirmation of JD status

See above scenario

Risks and management

1. Purchasing new land

- See above scenario for expansion. Many of the same principles apply.
- Ascertain history of stock on that farm in the past 2-3 years
- Options include leaving fallow, cropping or forage harvesting for about 18 months
- One direction stocking policy, so that the home farm retains status, until the status of the new property is confirmed by lack of JD over a 2-3 year term
- Graze to minimise soil ingestion
- Use only own-bred animals for increasing the herd size

2. Introducing genes from another stud

- If live animals, see scenario 1.
- Prefer semen or embryos. Embryos would be lowest risk. Semen from "JD-Free" farm is possible. If not proven, blood sample donor stag for Elisa/CFT/GID, faecal sample for ZN smear and culture, Semen culture and PCR

3. Introducing genes from Safari park stags

- Highest risk because herds of origin more difficult to evaluate. Also, safari parks buy stags from many sources.
- Stags ideally must not be brought onto the stud, but if this was imperative, they could be tested as for semen donors above.
- If subdivision was available, the stud could send selected hinds for mating on the safari park. They would not be able to return to the stud. Progeny could be snatched and hand reared. Not an attractive option.
- Semen collection on the safari park but only from clinically healthy animals. This may be an option of there are yards for sedation and collection. If not, the stag may be darted in the open. Neither are favoured options for very valuable stags… ie the ones to be selected in this case, because of the risk of stag death after xylazine, or other anaesthetic accident, or further, risk of injury to the stag while recovering from sedation with huge antlers affecting balance
- The preferred option was to collect semen immediately after the animal had been shot. The testes and epididymes can be processed successfully. This allows a post mortem examination of the intestinal tract and mesenteric lymph nodes, along with collection of blood for the above battery of tests, faecal culture and smear, semen PCR and culture.

These procedures will reduce the risk, although with current technology, risk cannot be eliminated totally.

A further consideration is that it appears unlikely that JD will become established by the intrauterine route, even if semen does contain *M. paratuberculosis.*

SCENARIO 3: Dealing with a Johne's disease outbreak

Farm data and history:

Stock numbers 400 breeding hinds
15 breeding stags
55 velveting stags
230 weaners/rising yearlings bred on the property
230 bought in weaners/rising yearlings

History: You are called to the farm in early October because a number of the weaners/rising yearlings are scouring and some have died. The farmer had given them anthelmintic treatment in August and September and he thought that some had picked up a bit, but were now going back. A total of about 15 had died over the last 8-10 weeks, but he had not done any PMs.

- Your approach?
- Questions?
- Differential diagnosis?
- Diagnostics?
- Necropsy findings?
- What would you expect with JD?
- How would you confirm it?

Additional information given on demand

- Virtually all the dead weaners/rising yearlings have been lost out of the home bred animals, whereas none have been lost from the 230 bought-in animals which are a red-hybrid type, purchased between May and June from four properties.
- One of the differences between these two mobs is the way that they have been fed over winter. The farmer's own animals were fed on grass and barley with a 350 - 400 g per day maximum that they have built up to slowly. Animals were grazed for 7 to 10 days per paddock, with good residual (8cm) grass left behind at each shift. They all appeared to be doing well. Over the winter the bought-in animals were fed on swedes and balage and it wasn't until the spring that they were moved back onto grass.
- In the effected mob the first animal to appear sick was seen in late July - early August. It started to scour and waste away and subsequently died. A couple more occurred early August and at this stage there were a number with green diarrhoea and the farmer suspected worms so he gave them pour-on "Cydectin".
- By this stage the bulk of the animals appeared to be doing well and the farmer was quite pleased because he felt that he had overcome any Yersiniosis problems that the farmer had had in previous years.
- However a small number of animals continued to scour through August and September and he gave them another pour-on drench.
- In September/October the farmer separated out 10-15 small scouring animals and put them into a small paddock and they subsequently died.
- Johne's disease is endemic in the farmer's sheep flock. In the sheep flock the farmer loses between 1 - 2 % of ewes annually. Occasionally in bad years it is over 2 %
- The farmer has recently increased the area of the deer farm by including new sheep farm areas including 17 ha of sheep farm fenced for deer last year. Half of this new area was grazed by weaners this winter. In fact the weaners grazed the new area from April onwards and sheep had been on that area approximately 4 - 6 weeks previously. The sheep had been grazed on the area all summer and into the autumn.

- The farmer also suspects a case of Johne's disease in a young hind in previous years. Last year the farm lost one 18-month-old hind with typical signs of wasting away and scouring.
- In May this year the farmer sale-tested 80 17-18 month old animals and 17 out of the 80 were positive to the skin test. These animals were re-tested with a CCT and they all came through with avian reactions. Subsequently one of these animals has died with typical Johne's, although this diagnosis was not confirmed.
- The previous winter the farmer sent a dry hind to the deer slaughter plant and a lesion was found in the mesenteric lymph nodes. It was classified as suspect Tb and it was subsequently diagnosed and confirmed as Johne's disease.
- The farmer has also had a yearling with suspect Tb at the slaughter plant subsequently confirmed as Johne's disease. The area is non-endemic Tb (low vector risk) and the herd is C7 Tb free.

Workshop recommendations

Your approach?

Thoroughly question farmer and record complete history of current outbreak and previous deaths and animals with similar clinical signs. Examine affected mob. Take appropriate diagnostic samples. Necropsy seriously affected individuals.

Questions?

When did problem first appear to arise? When did were weaners first sick and what were the clinical signs etc? What was done, treatments given? Was there any improvement? When did subsequent cases occur? Signs, treatments etc? Have they had similar cases in previous years?

What have feed conditions been like over the winter? Feed shortages? Do they weigh weaners?

What animal health treatments have there been? Vaccinations, anthelmintic treatments, trace element supplementation?

Unexplained deaths in previous years? Necropsies? Reports of lesions in animals at the works?

History of fencing of progressively more sheep farm each year and increasing deer farm. Johne's disease confirmed in sheep on this farm.

Tb testing history. C5 status but increasing number of non-specific reactors, which are cleared as "avian" on CCT.

Differential diagnosis?

Johne's disease
Avian tuberculosis
Parasitism (unlikely - Cydectin treatment given twice without obvious effect on problem)
Yersiniosis (unlikely – animals too old and chronic nature of illness).
Other enteric diseases (Salmonella?)
MCF
Pasteurellosis

Diagnostics?

Faecal sample poorer weaners for FEC and FLC.
Blood sample poorer weaners for Johne's GD.
Necropsy

Necropsy findings? What would you expect with JD? How would you confirm it?

Two very poor scouring weaners were selected and euthanased. Necropsy revealed enlarged mesenteric lymph nodes with caseous granulomatous lesions, oedematous mesenteries, slightly thickened jejunum and terminal ileum. No other significant findings.

Diagnosis made of suspected Johne's disease. Fresh and fixed samples of gut lymph node lesions and gut sent to laboratory for confirmation (histopathology, PCR and/or BACTEC culture on tissues).

Recommendations?

Send entire group of weaners to DSP, and do not keep any for replacements.

Cull any clinically affected hinds or any hinds that appear to be losing weight or are unusually light condition.

Consider doing GD on suspect hinds and culling positives.

SCENARIO 4: Dealing with the stud herd with Johne's Disease

- Animal numbers:

Mixed age hinds	325
Yearling hinds	115
Weaner hinds	149
Mixed age stags	84
Yearling stags	115
Weaner stags	138

- Land was originally a sheep farm but was increasingly deer fenced over the last 15 years ago and now deer-only operation
- Basic bloodline Rakaia red deer hinds, imported European live animals mid -1980's.
- Over the last 10 years they have had problems with non-specific reactors to Tb test and problem increasing
- 5 years ago there were a few cases of mixed age hinds losing condition and dying, but no necropsies done
- 3 years ago there were three month old stags sent for slaughter, which had lesions in mesenteric lymph nodes. Samples were taken and came back as ***M. paratuberculosis***
- Last year they lost 5 weaners at 10 months of age from acute Johne's disease, diagnosed at necropsy by the vet and confirmed by histology and culture.
- Farmer stopped their annual stud sale and has called you in to advise on options for:
  - Eradicating Johne's
  - Controlling Johne's and living with a low incidence
  - Setting up a new herd free of Johne's

Workshop recommendations

Eradicating JD (in existing herd).

- Not an option with existing tests.

Controlling and reducing incidence

1. Vaccination not an option currently.
2. Live with low incidence.
   - Discuss options with farmer re farming policy for next 5 years for trading/trophy/velvet/semen sales/embryo sales. Discuss options for control

and management. Discuss previous sales to clients and implications. Fund research??
- Remove clinically affected hinds or animals losing weight and necropsy.
- Screen suspects in commercial MA and yearling hind mobs with GD/ G1 ELISA and cull positives. (perhaps blood sample pre-calving when stress highest on hinds may show up positives best??)
- Screen all elite stud animals with GD/ G1 ELISA
- Repeat faecal sample elite stud animals.
- Minimise stress on weaners (optimise nutrition, control parasites, prevent trace element deficiencies, vaccinate optimally etc)
- Weigh animals regularly to monitor conditions and pick up weight loss early.
- Use DSP to monitor subclinical JD.
- Run separate mobs and restrict to areas of the farm to isolate problem groups.

3. Switch from stud to commercial options.
   - Venison
   - Velveting
   - Buy in weaners annually and send all to DSP.

Setting up JD-free herd

1. Set up new herd on same farm.
   - Harvest genetics; freeze embryos, semen etc.
   - Slaughter entire herd and de-stock for 2 years or retire part of farm and rest for 2 years and then restock with "clean" animals.

2. Set up new herd on a "clean farm".
   - Problem of verifying "clean" status of land. Use land that has not had ruminants grazing on it for 2 years, eg arable land, forestry, orchard, horse grazing etc. or land on which previous animals were "low risk" because all were tested clear with negative BACTEC (pooled?) faecal culture.
   - Harvest embryos from elite hinds and transfer into "clean" surrogate mothers on "clean" farm. Note problem of verifying "clean" status of hinds. Maybe repeat faecal sampled for BACTEC culture.
   - Hand rear calves from elite mothers. Allow calves to suckle colostrum from mothers and then rear on milk-replacer.

NB. All options should be discussed thoroughly with the farmer and a cost/benefit analyses run using best estimates of costs and likely outcomes.