

MANAGING JOHNE'S DISEASE – MINIMISE THE WASTAGE

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Introduction

Johne's disease is a deadly disease with no known cure. It has been observed on approximately half of surveyed farms in New Zealand, affecting up to 6.2% of the herd. This means the most affected farms could see about 30 out of their 500 cows affected. Nationwide, we expect about 25,000 cows to be affected at any one time. Preventing the spread of Johne's disease to susceptible young animals is the mainstay of Johne's control.

What is Johne's disease?

Johne's disease (JD) is a bacterial infection of an animal's intestinal tract, caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP). This bacteria crosses the gut lining, where it is taken up by the animal's macrophages (a cell involved in the immune system). If the numbers of MAP crossing the gut are high enough, they will not be killed; they will instead replicate inside the macrophages. The animal will be unable to clear the infection and antibiotics will be ineffective. As JD progresses, the gut lining thickens, resulting in decreased absorption of nutrients and loss of protein.

Disease timeline

The highest risk period for infection is within the first six months of a calf's life, and it is not until they are older than eighteen months that we deem them to be resistant to the infection. Cattle rarely show signs of disease until they are over 2 years old. This is because JD has a very slow rate of progression from initial infection to the stage that the gut has been affected enough to cause a visible problem. The age that we typically see clinical JD in cattle is four to six years of age, though the exact age that an animal shows clinical JD depends on the age that they

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became infected, the amount of MAP that they received, and exposure to other diseases and stressors.

What are the clinical and subclinical signs?

The exact signs that a cow will show depends on the stage of the disease process she is in. There are four proposed stages JD:

1. Initial infection
2. Silent carrier
3. 1st clinical signs
4. Final phase.

At any one time, the number of animals is highest in stage 1 and lowest in stage 4. This means that the number of animals showing clinical signs is only a portion of the total number infected.

In the initial stages, the animal will not be affected at all and will not be shedding a significant amount of MAP. As they progress through the stages, the level of MAP shed in the faeces will increase and clinical signs will begin to develop. An animal can be shedding MAP for up to 18 months before they develop clinical signs. The timeline from the development of clinical signs until death varies, and commonly ranges from 1 to 6 months. The typical signs seen in a diseased animal include:

- body condition loss, due to protein loss and decreased nutrient uptake
- extremely watery diarrhea, which may contain bubbles. This is often referred to as ‘hose pipe’ diarrhoea due to the way it exits the cow as a continuous stream, without any obvious effort by the cow
- submandibular oedema, commonly called ‘bottle jaw’. This is caused by fluid leaking out of blood vessels, due to the lack of protein in the blood, and pooling under the jaw
- decreased volume of milk production.
- Affected animals should be otherwise healthy, with no fever, no decrease in appetite, and no depression of mental state/dullness.

Spread of the disease

As mentioned before, the disease process begins when young stock are infected. The transfer of JD can occur directly from infected animals, as well as being picked up from contaminated environments.

- Johne’s is mainly spread via the faecal-oral route. This is because MAP is mainly shed in the faeces, and can be ingested by young animals in a variety of ways. Importantly, the faecal-oral route always involves environmental contamination with MAP. The most

obvious route is calves eating pasture that an infected animal has defecated on. Less obvious is when new-born calves suckle on teats that have been covered by MAP, or calves drinking water that has been contaminated by MAP, such as puddles or streams that have had some degree of faecal contamination. Survival times for MAP in the environment are very long and while total numbers will have decreased, some MAP can be detected up to 11 months later.

- Another important route is direct transfer by drinking colostrum or milk that contains MAP. About 10-35% of infected cows will be shedding into their milk, with rates of shedding being much higher in animals that are further through the disease process. The common practice of pooling colostrum/milk means one infected cow can have its milk feed to multiple calves, possibly infecting several at once.
- The final route is infection occurring across the placenta. Just like shedding into milk, trans-placental transfer increases as the disease progresses, and can infect up to 50% of calves born from animals in end-stage JD.

Controlling Johne's disease

The first thing to note is that there is no quick fix to Johne's, and minimisation is the goal. With no cure, and cattle vaccines not being used in NZ (due to injection site reactions and interference with TB testing), we must rely on preventing the spread to calves to achieve control. Changing the management practices in a few key areas on farm will achieve this. It is important to remember that not all of the following recommendations can be achieved on every farm, though with a bit of understanding of the disease, you should be able to fit parts of the recommendations to into your system.

Management at calving

- Calve in paddocks only used by healthy animals (don't calve in paddocks used by sick cows). The sick mob is more likely to contain Johne's positive cows, leading to higher levels of contamination in these paddocks.

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- Do not calve on effluent paddocks. Besides the milk fever risk, calving on effluent paddocks is not recommended as they will have higher levels of MAP spread on them, which will increase contamination of the cow's teats.
- Remove ill-thrifty cattle from the springer mob as soon as possible and calve them in a separate paddock.
- Move the springer mob regularly. This will decrease contamination of teats as the ground the cows lie on should be cleaner.
- Pick up calves twice a day. This minimises the calves' exposure to faeces as they will have less time to suckle from contaminated teats.
- It is important that we identify the parentage accurately and don't keep calves from visibly affected cows.

Colostrum and milk management

- It is very important to avoid feeding colostrum from infected cows to replacement stock. The MAP dose in colostrum can be high as it is not diluted by other animals and it is then fed to multiple calves, all of whom have 'open' gut linings to allow for larger molecules such as antibodies to cross into the body. It is fine to feed this colostrum to bobbies, bulls, and beef finishers as they will be killed before Johne's can be a problem.
- Selecting 'safe' colostrum is easier if the whole herd has been screened for Johne's. If this hasn't happened on your farm there are still options. The bulk of your colostrum should come from young cows i.e. 1st and 2nd calvers, as they are less likely to be shedding. If you need more colostrum, you should collect from older cows that are healthy and in good condition. Highly infected farms could consider using a commercial colostrum replacer as a sole source of colostrum or to supplement the colostrum collected from the 1st and 2nd calvers.
- Milk fed after the colostrum period is still important. On farms with a low level of infection, the dilution from uninfected cows may be enough to make the milk safe to feed, especially if clinically affected animals have their milk discarded. On highly infected farms, it is good idea to feed milk powder instead of collected out of the vat, as the powdering process should kill the Johne's bacteria.
- Feeding milk from the sick mob is often high risk as this is a small mob with a high chance of having a Johne's affected animal in it. Therefore, the dilution effect of the other cows will be minimised.

After the calf pens

- Ideally, calves would never graze pasture that has had adult animals on it within the last three months. This can be achieved by sending the calves to the runoff or grazing blocks as soon as they leave the calf pens. Most farms will graze calves on the dairy platform for some degree of time, so the following recommendations should be implemented:
 - Never graze calves on effluent blocks.
 - Have dedicated calf paddocks in the spring, and later on these should only be grazed by healthy stock.
 - Grazing paddocks after supplementary feed has been made, and grazing new grass paddocks, are good ideas in terms of Johne's risk.
 - If you need to graze calf paddocks with adult stock within three months of calves going into them, you should graze them with young cows i.e. 1st and 2nd calvers.
- Source water from a bore where possible and fence off waterways. This will ensure drinking water is free from MAP contamination.
- Consider the other stock at run-offs and grazing blocks. Many other species can get Johne's and spread it to dairy calves. Adult beef cattle are an obvious risk, but deer, llamas, alpacas, and goats can be a risk as well. Sheep Johne's is managed as a different disease in Australasia.

Biosecurity

- Ideally, maintain a closed herd with good boundary fences.
- If purchasing/leasing stock, it is important to establish if JD is present on the farm of origin. Adult cattle can be tested before bringing them on farm, or isolated until test results are received.
- Bulls can be tested for JD, but are a lower risk group as they are used for mating when young.

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Testing and culling

By testing cattle for Johne's disease, we can remove animals that are shedding large numbers of MAP, and we can get a cull price for cattle that may otherwise die. Tests that are routinely used are:

- Antibody ELISA. With this test we can measure the amount of JD antibodies that a cow is producing. As the disease progresses, this level increases and once a threshold has been reached, the animal is called positive. This threshold has been set at a level where a positive means we can be very certain that the animal has the disease. This does mean that some animals will be called negative that are infected, but have not produced enough antibodies yet.
- For individual animals, a bloods test is the best option. All cows that you suspect have JD should be tested, allowing culling to occur before the disease progresses too far.
- Whole herd screening can be done on the milk collected at herd testing. This will detect the animals where the disease has progressed, though testing needs to be done annually as JD will have progressed in other animals as they age.
- Faecal PCR. A newer test that detects MAP in the faeces, requiring the cow to be shedding at the time of sampling. At this stage, this test is expensive and I would use it as a back-up test where an un-expected result has come from standard testing, and the cow is deemed too valuable to cull straight away.

Benefit of whole herd screening

The screening process allows identification of highly infected cattle prior to the onset of visible signs. The testing is performed on individual samples from one of your herd tests. The timing should be mid-late season, so the results can be used to inform culling decisions. The exact price of the testing will depend on your vet clinic and breeding company. A rough guide is that a 500 cow herd will spend about \$2500 incl. GST on testing. The benefits of the screening are:

- You gain money from culling cows that would have otherwise died. If you have 5 out of 500 cows die per year from JD, you will probably pay for the test by culling them before they have had the chance to die.
- You save the cost of wintering these animals (a large number of JD infected cows die in spring anyway).
- You slightly decrease the costs of production (highly infected Johne's cows are inefficient at turning their food into milk).
- You decrease environmental contamination with MAP.
- The remaining cows will provide you with safer colostrum/milk for rearing calves.

Conclusion

While Johne's control has its difficulties due to the nature of the infection, there are plenty of options to help minimise its impact on your herd and finances. The most important step in Johne's control is understanding the disease and how it is spread, informing effective on-farm policies. Farms with a JD problem can use whole herd screening to make the process faster and easier.

References

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- Parkinson T J, Vermunt J J and Malmo J. 2010. Diseases causing diarrhoea, in *Diseases of Cattle in Australasia*. The New Zealand Veterinary Association Foundation for Continuing Education.

Resources

Johne's Disease Management for New Zealand Dairy herds. Available at <http://www.dairynz.co.nz/media/1734118/animal-johnes-disease-management.pdf>

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