Johne's Disease

Management for New Zealand dairy herds

JOHNE'S DISEASE RESEARCH CONSORTIUM

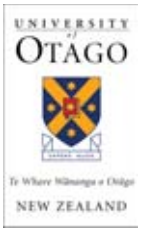
DairyNZ

The Johne's Disease Research Consortium is an Unincorporated Joint Venture established in 2008 with a mandate to reduce the impact of Johne's Disease on farm in New Zealand.

It has as its participants Beef + Lamb NZ Ltd, DairyNZ Inc, DEEResearch Ltd, Massey University, University of Otago, AgResearch Ltd and Livestock Improvement Corporation.

The Meat Industry Association and Dairy Companies Association of New Zealand are associate participants and Landcorp Farming Limited, Johne's Management Ltd and The New Zealand Merino Company Ltd contribute to the research programme.

JDRC receives funding from the Ministry of Business, Innovation and Employment via the Research Partnership scheme.



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Introduction

Johne's Disease (also known as paratuberculosis or JD) is caused by a bacterial infection of the gut in cattle and other ruminants with *Mycobacterium avium paratuberculosis* (Johne's bacteria or MAP). Gradual thickening and inflammation of the intestinal wall eventually prevents uptake of nutrients. Clinical Johne's Disease is characterised by ill-thrift, progressive weight loss and profuse diarrhoea. No cure is available and the condition is eventually fatal.

Calves and young stock are particularly susceptible to infection. However, the disease has a very long 'incubation period' so that clinical signs of Johne's Disease typically appear several years later in the adult cow. Shedding of Johne's bacteria (primarily in faeces) also increases with age and advanced stage of infection.

Johne's Disease was first discovered in New Zealand over 100 years ago in a Taranaki Jersey cow.

The disease is named after the German veterinarian who discovered it in 1905.

Since the Taranaki diagnosis in 1912, Johne's Disease has been found in farmed ruminants throughout New Zealand. It is widespread in dairy cattle and most herds probably harbour some Johne's infection. While disease incidence is very low in many herds, Johne's Disease causes significant animal health problems and production losses in some herds.

Top control priority: Reduce calf and heifer exposure to adult faecal matter.

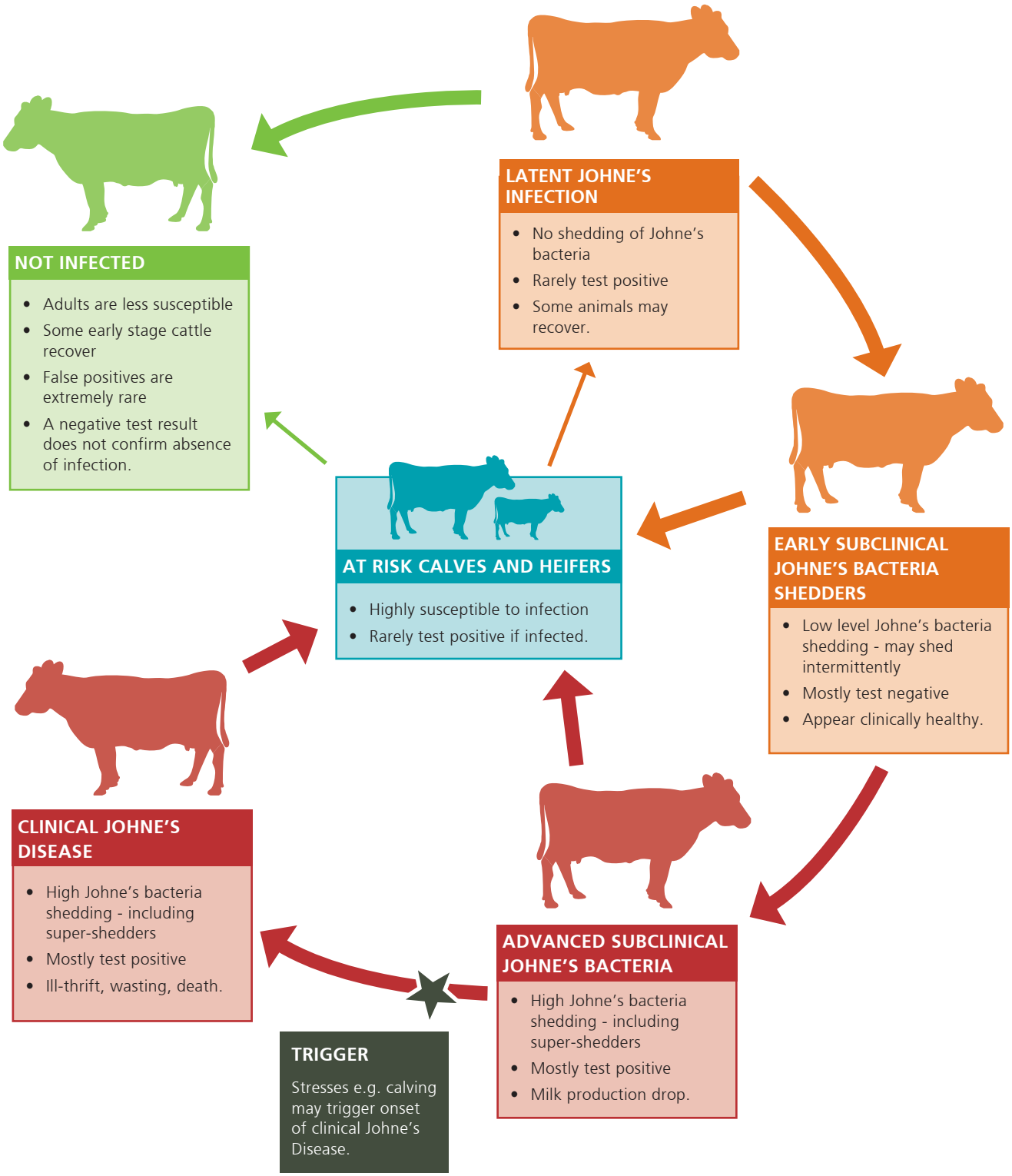
Although the epidemiology of Johne's Disease is not fully understood, it is clear that specific risk factors around transmission of Johne's bacteria result in a higher incidence and severity of clinical disease in some herds. Some farming practices, such as method of effluent management, may inadvertently lead to a gradual build-up of Johne's bacteria in the environment and increased Johne's Disease. Once a threshold level of herd infection and Johne's bacteria shedding is reached, a sustained transmission cycle may ensue. At this point, specific interventions are necessary to bring Johne's bacterial infection in the herd under control.

The impact of Johne's Disease can be minimised

An intervention such as test-and-cull may produce some quick benefits by limiting production losses due to the clinical disease. However, the full advantage of changed management practices that reduce transmission will only be seen after several years because of the protracted nature of subclinical stages of Johne's infection.

While *Mycobacterium avium paratuberculosis* or MAP are the technically correct names for the bacteria, New Zealand farmers are more familiar with the term 'Johne's' for the disease. To improve understanding 'Johne's' is used in this guide when referring to the bacteria, infection and disease. Hence the guide refers to Johne's bacteria, Johne's infection and Johne's Disease.

The Johne's bacteria lifecycle in the herd



This Toolbox

The purpose of this guide is to provide New Zealand dairy farmers with risk management tools to combat Johne's Disease and protect against the spread of Johne's infection in the herd.

Johne's Disease eradication from commercial dairy herds in New Zealand is not feasible with today's technologies, thus control measures are aimed at risk reduction. A series of management strategies have been developed to minimise transmission of Johne's bacteria to new and young stock and to limit the impact of Johne's Disease in the herd.

This toolbox provides specific and targeted interventions for dairy farmers struggling to cope with high annual losses arising from clinical Johne's Disease, while also being relevant to all dairy farmers and rearers wishing to guard against spread of the disease. Therefore, this guide provides management tools without being proscriptive. Not all tools, especially the higher input measures, will suit all herds. But herds with severe Johne's Disease and incurring considerable financial losses should benefit from applying one or more of the management interventions. With the help of their veterinary advisors, farmers should select the most appropriate and practical interventions from the toolbox for their herd.

To help decision making, the management practices for each of the five strategies are presented in three categories:

BEST PRACTICE

Control actions target Johne's bacteria transmission to the calf. They are intended to be practical, but individual affected herds may consider some too difficult or costly to implement.

ALTERNATIVE OPTIONS

If implementing best practice is not practical, alternatives can help to mitigate risks.

HIGH-RISK ACTIVITIES – SO AVOID THEM

All herds, including low risk Johne's Disease herds, should aim to eliminate these high risk practices.

Getting started

1. **Get professional veterinary help**
   The dynamics of Johne's Disease are complex, but progress is possible with the right approach.

2. **Assess your herd's Johne's Disease status**
   Knowing your Johne's Disease status will help determine priorities in the approach to risk reduction.

3. **Assess the risks of Johne's bacteria transmission within the herd**
   Use the management strategies to identify possible gaps.

4. **Set out a risk management plan with key interventions**
   Select and focus on the practical components that are achievable. Start with a few simple improvements and add others or refine later.

5. **Implement plans and review them annually**
   Risk reduction for Johne's Disease requires a long term commitment. From the initial infection of the calf to clinical Johne's Disease can take a few years. To reap the full benefits of calf protection will, therefore, require several years of Johne's Disease control.

Key Johne's Disease facts

Calves and young stock

- Most susceptible to infection.
- Calves under 6 months are most at risk, but older calves remain vulnerable to infection.
- Repeated ingestion of high doses of Johne's bacteria increases the progression and severity of the disease.
- Tests are not able to identify infected calves accurately.
- Shedding is rare by young stock.

Adults

- The major source of Johne's bacteria.
- Cows begin to shed Johne's bacteria before clinical signs appear.
- Clinical signs of Johne's Disease often appear after many years with highest incidence usually amongst 5-7 year old cows.
- Tests are good at identifying cows with advanced infection, especially high Johne's bacteria shedders and early clinical Johne's Disease.
- Johne's bacteria are excreted primarily in faeces but cows in advanced stages can transfer Johne's bacteria during pregnancy and in colostrum or milk.
- Super-shedders excrete huge numbers of bacteria – up to a million per gram of faeces.

Johne's bacteria

- Can survive for several months in effluent, water or on pasture.
- Dark, damp and cool conditions promote survival.
- Johne's bacteria invade the intestinal wall and lymph nodes where it replicates and gradually causes increasingly severe damage.

Other ruminant species

- All ruminants are susceptible to Johne's infection and Johne's Disease.
- Close contact or co-grazing may lead to cross-species transmission of Johne's bacteria.
- Wildlife may be infected but their role is unclear. They are unlikely to be a significant Johne's Disease risk to replacement heifers.

The management strategies and tools

Johne's Disease risk management primarily revolves around protecting the calf from Jinfection by Johne's bacteria. The interventions in this toolbox have been grouped into five strategies:

1. **Test-and-cull high-risk cattle**

   To eliminate a major source of Johne's bacteria before calving and reduce losses from clinical Johne's Disease

   Cows with clinical Johne's Disease are an obvious source of Johne's bacteria and need to be removed from the herd as soon as possible. However, faecal shedding may start several years before signs of disease appear. Some cows become super-shedders before disease develops with the potential to infect many calves with a large dose of Johne's bacteria. Fortunately, Johne's Disease tests are good at identifying cows with advanced infection, so they can be culled before calving.

2. **Calving and colostrum management**

   To minimise calf exposure to Johne's bacteria before birth and dams' faeces or colostrum

   Calves that ingest high doses of Johne's bacteria are more likely to develop Johne's Disease earlier in life. While it is impossible to prevent all contact with faeces and other sources of Johne's bacteria from the dams, it is important to try to limit exposure.

3. **Calf management pre-weaning**

   To avoid contact with infected adults and reduce the risk of exposure to Johne's bacteria

   Repeated ingestion of Johne's bacteria can hasten the progression of the disease. For convenience the calf rearing shed is usually situated close to the milking shed. Calves should not contact cows and be protected from effluent.

4. **Replacement heifer management**

   To protect susceptible heifers from Johne's bacteria

   Whereas adult cattle are less prone to a new infection than the young, calves and heifers remain highly susceptible at least for the first year. Ideally replacement calves should be removed from the dairy platform as soon as possible and managed at a rearing unit without adult stock (including other ruminant species).

5. **Biosecurity and purchasing stock**

   To avoid importing Johne's bacteria into the herd from high risk sources.

Clinical Johne's Disease

Clinical Johne's Disease:

- Usually occurs in adults, particularly cows 4 years or older (3rd lactation onwards).
- Some infected cows do not develop clinical Johne's Disease and may even clear the infection.
- Clinical Johne's Disease in young cattle (2-year-olds) is an indication that the herd infection levels and transmission may be out of control.

Signs of clinical Johne's Disease

Clinical Johne's Disease is the end stage of Johne's infection. Thickening of the gut wall prevents uptake of nutrients and finally results in leakage of proteins. The animal essentially starves to death.

- Cows will often experience a drop in milk production before clinical signs appear.
- Initial signs include loss of body condition and ill-thrift in spite of normal appetite.
- Profuse diarrhoea results in muscle wasting.
- Bottle jaw (swelling under the jaw).
- No effective treatment.
- Death.

Factors that hasten the course of infection and severity of disease in individuals include:

- High infection exposure (number of Johne's bacteria).
- Repeated exposure to Johne's bacteria.
- Age when infected – younger calves.
- Johne's bacteria strains may differ in virulence – several strains of Johne's bacteria exist in New Zealand.
- Breed – some evidence suggests Jerseys are more prone to Johne's Disease.
- Animal genetics – ongoing research to discover genes that may confer resistance.
- Stress can trigger onset of clinical Johne's Disease.

Assessing the herd's Johne's Disease status

- Monitor the herd for clinical signs of Johne's Disease and use blood (ELISA) or faecal (PCR) tests to confirm the diagnosis.
- Test thin or older cull cows (4 years +), especially emergency culls or deaths.
- Record all Johne's Disease losses or diagnoses to determine the annual impact.
- Use whole-herd screening by the lab milk test.
- If 2-year old heifers develop clinical Johne's Disease, it indicates the calves or heifers were exposed to a massive load of Johne's bacteria.
- Faeces or slurry tests may be useful to assess the amount of Johne's bacteria shed by cows and deposited into the farm environment.
- It is not possible to demonstrate freedom from Johne's Disease for a herd. However, whole-herd milk or blood testing with negative results suggests that the prevalence of Johne's bacteria in the herd is low.

Johne's Disease testing options

Laboratory tests may be used to 1) confirm Johne's Disease, 2) help reduce exposure to Johne's bacteria and/or 3) select cows to cull before clinical Johne's Disease develops.

1. Herd-test milk Johne's Disease ELISA testing

Herd-testing provides a convenient opportunity to screen the whole herd and cull high-risk Johne's Disease cows before calving to limit exposure of replacement heifers and reduce losses of milking cows due to clinical Johne's Disease in the following season. Ideally the screening should be done in mid to late lactation to help decision making prior to end-of-season culling.

Test results will be ranked into (weaker) Positive versus High Positive categories. Overall, shedding of Johne's bacteria is heaviest amongst the high test-positive cows. The lab reports include a more detailed interpretation. Formulate a management and culling plan with your veterinarian.

Note: Negative test results are reported as "Not detected" because in early stages most Johne's infected cows are negative and a few Johne's Disease cows will remain test-negative throughout life. Annual screening will identify new Johne's cases as infection progresses.

2. Blood/serum Johne's Disease ELISA testing

The blood/serum test may be used to confirm the diagnosis of suspected Johne's Disease in cows and bulls. It can also check milk-test positive cows to rule out cross-contamination.

Farms that experience severe losses from Johne's Disease and clinical Johne's Disease amongst first-calf heifers, should consider this test for their rising 2-year-olds before they calve. Any test-positive individuals can be managed separately at calving and not rebred but culled as soon as practical.

3. Faecal Johne's bacteria PCR testing

Real-time PCR tests detect Johne's bacteria and can give a more accurate estimate of the number of bacteria being shed in faeces by the cow. This requires quantitative interpretation by the laboratory or veterinarian and allows the highest risk cows - heavy and super-shedders - to be identified.

Herds which are unable to cull all milk or blood/serum test-positive cows, may find this confirmation test useful to prioritise culling and management of high-risk cows.

Points to note

- Testing alone will not control Johne's Disease.
- Use tests as a risk management tool.
- Ask your veterinarian for advice before you start testing and devise a Johne's control plan with your vet.
- Your vet and laboratory will help with test interpretation.

Frequently asked questions

What is the difference between Johne's Disease and Johne's bacterial infection?

Johne's Disease (or paratuberculosis) refers to the clinical disease caused by Johne's bacteria *(Mycobacterium avium paratuberculosis)*. The disease, often observed as diarrhoea and wasting, occurs several years after the initial infection with Johne's bacteria. Up to this point 'Johne's infection' is considered to be subclinical.

How do I know if I have a Johne's Disease or a Johne's infection problem in my herd?

Look for clinical signs and have your veterinarian confirm the diagnosis by a blood test, faecal PCR or post-mortem.

While clinical signs of Johne's Disease such as diarrhoea and wasting can be severe and lead to death of the individual, a large part of the disease complex remains hidden during the subclinical phase and may be missed. In a herd with no more than 1% culling losses of deaths due Johne's Disease annually, many more cows are likely to be infected.

A veterinary diagnosis is important to confirm Johne's Disease and rule out other causes of diarrhoea or ill-thrift. To prevent Johne's infection building up in the herd, keep a look out for Johne's Disease and test cows with suspected clinical signs.

Clinical Johne's Disease amongst two year old heifers in the herd indicates a very high exposure of the replacements to Johne's bacteria. Intervention options should be urgently investigated and implemented, based on a risk assessment with your veterinary advisor.

Can I vaccinate to protect my herd against Johne's Disease?

Available vaccines interfere with TB diagnostics and, therefore, are not used in New Zealand cattle herds.

Lamb vaccination (Gudair™) is a useful Johne's Disease control tool for sheep farmers. Research suggests that one vaccine (Silirum™) can reduce the impact of Johne's Disease in cattle herds and deer. In New Zealand, Silirum™ is occasionally used amongst finishing deer going direct to slaughter, but severe restrictions have been placed on the use of the vaccine for breeding stock as well as cattle. The problem:

- Vaccination causes false positive reactors with the TB skin test, requiring a blood test. More than 10% of vaccinated heifers may give false positive TB tests even two years after vaccination.
- In some TB infected cattle, vaccination results in false negative TB results.

How about test-and-cull to eradicate Johne's Disease from the herd?

Laboratory tests are fairly good at identifying cows with advanced Johne's infection but the typically long subclinical incubation period, with poor test performance in the early stages, renders test-and-cull programmes expensive and ineffective. Instead, tests should be used as one tool in a wider management programme to reduce risks so that the impact of Johne's Disease can be minimised. Some infected cows remain test-negative. Culling of any test-positive cattle will remove many high shedders to reduce calf exposure.

Does Johne's Disease run in families?

A calf's parentage may affect its chances of developing Johne's Disease in two ways:

Transmission

A dam with advanced Johne's infection or clinical Johne's Disease is clearly one of the most important sources of transmission to her offspring. Not only is the calf exposed directly to Johne's bacteria in the dam's faeces (and via colostrum) after calving, but during the pregnancy Johne's bacteria may be transmitted to the foetus in 10-40% of cows with advanced Johne's infection or clinical Johne's Disease. The risk of repeated exposure to high levels of Johne's bacteria very early in life means these calves have a poor outlook and are more likely to develop clinical Johne's Disease than their herd mates.

Genetics

Besides apparent breed predispositions, various studies point to genetic differences in susceptibility versus resistance to infection. Genes may influence the likelihood of exposure leading to Johne's infection, or the progression and spread of the infection in the animal, or the development of clinical Johne's Disease. Genes may affect the susceptibility to initial infection, development and spread of the infection or expression of clinical signs. Research (including JDRC funded work) aimed at gene discovery for Johne's Disease resistance, has identified some candidates. It may soon be possible to select sires to breed less susceptible dairy cows and possibly use genome screening within the herd.

What is the difference between cattle and sheep strains of Johne's bacteria?

Johne's bacteria are often classed into two major strains (and many sub-strains). As a rule, type I (or S strain) is found in sheep while type II (or C strain) is found in cattle and deer. The significance of this is not clear – some researchers have postulated that type I may be less virulent in deer and possibly cattle. A recent, JDRC funded, study confirmed that type II is the predominant strain in New Zealand dairy cattle herds but that a number of herds also harbour type I Johne's bacteria and suffer clinical Johne's Disease.

Can I graze other livestock with dairy calves and heifers?

It is best to avoid contact or common grazing, especially if the Johne's Disease status is unknown.

Beef cattle, deer and goats may be infected and shed Johne's bacteria in their faeces. Therefore, the co-grazing of dairy calves and replacement heifers with adult beef or dairy cattle or goats or deer of any age is a high risk practice. The same principle applies to other ruminants, such as llamas and alpacas. Sheep may be an important risk to heifers. Certainly the type I strain (normally associated with sheep) appears to be widespread amongst some dairy herds. However, sheep tend to graze pastures to a low residual which may decrease Johne's bacteria survival in the pasture sward. Non-ruminant species such as horses and pigs do not pose a risk to replacement heifers.

Are rabbits and other wildlife a Johne's Disease risk to dairy calves and heifers?

Johne's bacteria can infect a wide range of animals and have been isolated from several feral species in New Zealand including rabbits, hares, hedgehogs, possums and others. Overseas research has shown some association between high Johne's Disease incidence in the herd and Johne's bacteria in rabbit pellets. Johne's bacteria may be ingested by rabbits on pasture and excreted in a different paddock. It is unclear if infected rabbits or other non-ruminant wildlife shed sufficient Johne's bacteria to play a significant active role in transmission in New Zealand.

Can Johne's bacteria be transmitted by AI or embryo transfer?

This is highly unlikely. Small amounts of Johne's bacteria have been found in semen from bulls with advanced infection/ clinical Johne's Disease. However, the risk of Johne's bacteria transmission by AI is purely theoretical and has not been demonstrated. Similarly, Johne's bacteria has been recovered from uterine washes during embryo transfer but standard ET procedures ensure that most pathogens are eliminated before implantation.

Natural mating bulls are a potential source of Johne's bacteria via faecal shedding. This risk can be mitigated with little effort by adding a Johne's Disease test to the pre-purchase BVD and EBL screen used for bulls.

Do Johne's bacteria grow in the environment?

Probably not but they may survive outside the animal for a long time. Clear evidence of multiplication has not been found.

It is important to remember that Johne's bacteria in the environment stem from infected animals:

Johne's bacteria are very resilient and may survive for many months under ideal conditions, moist, shady, cool and neutral pH environments. Unless conditions are optimal, Johne's bacteria numbers will decline rapidly although residual contamination may remain for long periods in favourable spots.

Pasture

It is difficult to eliminate Johne's bacteria completely from pasture so the focus should be on reducing risks. Do not introduce heifers to pastures recently grazed by adults. Shared grazing with the adult herd (e.g. set-stocking calves on the home farm) or immediately after the herd will result in the highest exposure and needs to be prevented at all cost. Accurate data regarding the exposure risk (likely bacterial dose) over time are lacking, but it is reasonable to expect risks to reduce significantly after each rotation, especially in the first few weeks.

Water

Under experimental conditions, Johne's bacteria has been shown to survive in water for six months or more. Provide clean drinking water (e.g. bore water) and avoid access to stagnant water, particularly if it may be contaminated by adult cattle or other stock.

Effluent

Johne's bacteria will survive for long periods in faeces and the effluent pond or storage tank. Any pastures irrigated with effluent should never be used for young stock. Wind drift during effluent spraying may spread Johne's bacteria to neighbouring paddocks and might present a significant risk to calves.

Silage or Hay

Low pH, high temperatures and drying reduce Johne's bacteria survival. In one study, researchers failed to recover Johne's bacteria from good silage two weeks after it was made.

Milk

Souring or culture of pooled milk is not effective against Johne's bacteria. Good pasteurisation will kill off most Johne's bacteria in the milk. On-farm pasteurisers are available but may be impractical for seasonal dairy herds with a compact calving season.

Acknowledgements

This resource was produced by the Johne's Disease Research Consortium and DairyNZ through research undertaken by Livestock Improvement Corporation. The JDRC wishes to thank all those who have contributed to the production of the toolbox at LIC, Cognosco, Fonterra and Landcorp and would particularly thank all of the farmers and veterinarians who participated in the farm-based study used to develop the toolbox.

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1

JOHNE'S DISEASE MANAGEMENT

Test-and-cull high risk cattle

OBJECTIVE:

To eliminate a major source of Johne's bacteria before calving and reduce losses from clinical JD.

BEST PRACTICE

- ☐ Cull any cows with early signs of JD ASAP (first confirm JD by test)
- ☐ Screen all cows every year for JD by laboratory test before calving
- ☐ Cull all test-positive cows ASAP
- ☐ Cull current season's calf from clinical Johne's cases or high test-positive cows

ALTERNATIVE OPTIONS

- ☐ Identify all high test-positive cows and cull by end of season
- ☐ Identify remaining test positive and suspect cows, and calve separately from main herd
- ☐ Cull calves from high-risk or test-positive cows
- ☐ Do not feed colostrum or milk from high-risk cows

HIGH-RISK ACTIVITIES – SO AVOID THEM

- ☐ Retaining cows with clinical JD – there is no cure and they spread Johne's bacteria
- ☐ Calving test-positive cows in the main herd
- ☐ Feeding colostrum and feeding milk from untested cows
- ☐ Rearing calves from clinical JD or test-positive cows.

NOTES

1

JOHNE'S DISEASE RISK INFORMATION

Test-and-cull high risk cattle

Johne's Disease (JD) eradication is not feasible but it is possible to reduce the level and impact of JD. Test-and-cull alone will not control JD – use it as one management tool with other interventions. Identify any cow with suspected or JD and cull ASAP. Her calf is probably infected too.

Test-and-cull to lower infection level and avoid losses

Tests are good at detecting cows with advanced Johne's infection or disease. As test performance is correlated with stage of infection: very few early stage JD heifers and cows with intermitent or no Johne's bacteria shedding will give a positive test result. As bacterial shedding increases and clinical JD develops, test performance improves dramatically and can indentify up to 80-90% of advanced JD cows. Annual herd screening allows:

- Culling of most cows before they progress to clinical disease
- Reduction of production losses and ineffective treatment costs (JD-positive cows produce 15% less milk than JD-negative cows)
- Reduction of environmental contamination
- Protection of young stock from high exposure to Johne's bacteria.

Herd-test milk sample screening option

Milk samples offer a convenient option for whole herd testing with minimal fuss. To reduce test costs, an intermediate pooling step is used in the lab. By testing annually late in the season, high risk cows can be removed before calving to reduce exposure. Results are ranked to focus on strongly positive cows that present the highest risk of shedding and clinical JD.

Cows with a high-positive test result:

- Confirmation blood test usually not required
- Cull all high-positive cows to eliminate super-shedders
- If unable to cull, manage as highly contagious
- Consider culling current season calf or tag as high-risk of JD. (Up to 10-40% of calves from dams with advanced infection or clinical JD are infected before birth.)

Other test positive cows (weaker test result):

- Confirm JD status using a blood test
- Cull if possible or prioritise on culling list
- Manage separately at calving to reduce risks. Cull the calf.

Recognise clinical signs of Johne's Disease early

- Clinical JD is often preceded by a drop in milk production
- Stress may trigger clinical disease, especially at calving (remove affected cows and cull ASAP to protect calves. Discard all colostrum and milk)
- Body condition/weight loss or unable to gain weight despite good appetite
- Persistent diarrhoea – does not respond to treatment
- Bottle jaw – fluid accumulates under jaw due to protein loss
- Muscle wasting.

Cattle with clinical JD are not fit for the food chain!

Blood samples and JD testing

- It is good practice to test suspected JD cows before culling to confirm diagnosis and monitor herd status.
- In herds with very high bacterial challenge, clinical JD may be seen in 2-year-old heifers. Consider test-and-cull of heifers before calving to help break the cycle and reduce calf exposure to Johne's bacteria.

2

JOHNE'S DISEASE MANAGEMENT

Calving and colostrum management

OBJECTIVE:

To minimise calf exposure to Johne's bacteria before birth and from dams' faeces and colostrum.

BEST PRACTICE

- ☐ Calve only JD test-negative cows free of any signs of JD
- ☐ Move springer mob regularly to clean pasture
- ☐ Remove newborns from the calving mob at least twice a day
- ☐ Use fresh colostrum from test-negative cows only

ALTERNATIVE OPTIONS

- ☐ Manage high-risk (JD test-positive) cows separately at calving
- ☐ Cull heifer calves from high-risk or JD positive cows
- ☐ Collect colostrum only from young cows (2-4 years) to feed calves

HIGH-RISK ACTIVITIES – SO AVOID THEM

- ☐ Ill-thrifty cows and dirty calving environment
- ☐ Leaving calves with dams longer (increases the exposure risk)
- ☐ Fresh pooled colostrum sourced from untested older cows

NOTES

2

JOHNE'S DISEASE RISK INFORMATION

Calving and colostrum management

Calves and heifers are the groups most susceptible to new infection; while signs of clinical JD usually appear years later. Progression of infection to shedding of Johne's bacteria and clinical disease is also highly dose dependent.

Lowering the amount of Johne's bacteria ingested by young stock will reduce the impact of JD.

Manage suspected and test-positive cows at calving

JD test-positive cows are a major source of infection not only for their own offspring but all other calves that may be exposed to the cows' faeces, colostrum or milk. In particular, test high-positive cows are likely to be in advanced stages of the disease and may be super-shedders of Johne's bacteria:

- Cull all JD test-positive cows if possible well before calving to reduce contamination of the calving environment. If necessary, focus on getting rid of high-positive cows.

Any remaining test-positive cows that cannot be culled should be clearly marked as high-risk JD cows:

- Manage separately at calving to reduce contamination
- Do not rear the calf as a replacement
- Discard colostrum from these cows and do not feed to calves. 10-40% of calves from cows with advanced clinical JD may be infected.

Minimise exposure after birth

Contact with adult cows and faeces is unavoidable, but an effort should be made to keep exposure to a minimum:

- Move the calving mob to a clean break regularly
- Do not leave newborns with the calving mob unnecessarily and separate at least twice a day
- Herds with high JD losses should consider snatching calves before suckling if possible and sourcing all colostrum from test-negative cows or use a commercial colostrum replacer.

Use pooled colostrum from low-risk cows

Feeding all newborn calves with fresh pooled colostrum is good calf management to ensure optimal maternal antibody protection. However, cows with advanced infection shed huge amounts of Johne's bacteria and are a major risk to all calves. Mitigate this risk by:

- Pooling colostrum only from JD test-negative cows
- Alternatively, collecting pooled colostrum only from younger cows – four years old or less. Older cows are much more likely to be shedders and become clinical JD cows
- Ensuring that udders and teats are free of faecal matter.

3

JOHNE'S DISEASE MANAGEMENT

Calf management pre-weaning

OBJECTIVE:

To avoid contact with infected adults and reduce the risk of exposure to Johne's bacteria.

BEST PRACTICE

- ☐ Feed milk replacer to replacements
- ☐ Prevent any contamination of calf pens/runs by adults or effluent
- ☐ Provide clean drinking water and fence off open water
- ☐ Monitor herd for early signs of JD; avoid milk and calf from suspect cows

ALTERNATIVE OPTIONS

- ☐ Feed colostrum and milk only from healthy, test-negative or young cows
- ☐ Cull calves from high-risk or suspect cows, do not rear
- ☐ Prevent any contact of calves with effluent
- ☐ Use dedicated calf runs with no access for adults

HIGH-RISK ACTIVITIES – SO AVOID THEM

- ☐ Feeding colostrum and milk from treated and sick cows to calves
- ☐ Contact with adults, especially in a hospital paddock, or cull cows
- ☐ Exposure to effluent pond or spraying effluent in vicinity (wind drift)
- ☐ Access to open water sources and ponds

NOTES

3

JOHNE'S DISEASE RISK INFORMATION

Calf management pre-weaning

Calves and heifers are the groups most susceptible to infection; clinical JD usually develops years later. Repeated exposure to Johne's bacteria and ingesting a high number of bacteria increases the severity of the disease. Protect calves from Johne's bacteria in faeces, effluent, milk and on pasture while on the home farm.

Rearing shed and pasture run

Apply best practices in hygiene with regular disinfection of calf pens to ensure good health and growth. To limit Johne's exposure:

- Ensure calves do not have access to any effluent
- Do not use calf areas as a hospital paddock
- Locate calves away from the race to the milking shed
- Use dedicated paddocks for calves or spell pasture
- Do not spray effluent near calf pens. Avoid excessive effluent aerosols. Beware of wind drift
- Use a clean source of drinking water (ideally bore water).

JD risk management: it is all about proper calf rearing

The majority of measures aimed at reducing the level of infection and desease are best-practice calf and heifer rearing:

- Keep healthy animals in a clean calving environment
- Ensure adequate high-quality colostrum intake
- Only use a 'pathogen-free' source of milk or replacer for feeding
- Prevent faecal contamination and ingestion
- Apply dedicated replacement heifer management.

All herds should aim to adhere to the basic principles for rearing healthy replacement heifers, so that JD does not become a problem.

Do not feed pooled milk from high-risk cows

Herds with a significant JD problem should consider feeding only commercial milk replacer to replacement heifers.

If feeding pooled milk, reduce risks by:

- Discarding milk from sick cows because pathogens, including Johne's bacteria, are a threat to maintaining good health in all calves.
- Mark JD test-positive cows and avoid using milk from them.
- Johne's bacteria can survive fermentation. An extended storage period below pH 4 is required to reduce the number of Johne's bacteria. The bacteria can be killed by drying or pasteurisation. On-farm pasteurisation options are available but this requires a large capacity to cater for the concentrated calving season.

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JOHNE'S DISEASE MANAGEMENT

Replacement heifer management

OBJECTIVE:

To protect susceptible heifers from Johne's bacteria.

BEST PRACTICE

- ☐ Transfer calves ASAP to rearing unit for young stock only
- ☐ Use dedicated grazing for calves and replacement heifers
- ☐ Never spray effluent on calf paddocks; beware of wind drift
- ☐ Provide clean drinking water and fence off open water

ALTERNATIVE OPTIONS

- ☐ Use separate paddocks on home farm away from milking platform
- ☐ Avoid paddocks for at least three months after grazing by adult stock
- ☐ Keep heifers separate from other species and adults at runoff/grazier

HIGH-RISK ACTIVITIES – SO AVOID THEM

- ☐ Set-stock calves on the dairy platform or shared grazing with adults
- ☐ Contact with adults e.g. cull cows, carry-overs or wintering on run-off
- ☐ Pasture recently irrigated with effluent or access to effluent pond/overflow
- ☐ Access to open water sources with possible faecal contamination

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JOHNE'S DISEASE RISK INFORMATION

Replacement heifer management

JD control requires dairy heifers to be separated from infected adults – keep them off the dairy platform. Never allow replacement heifers to share grazing with adults or follow adult stock in a rotation.

Avoid contact with other ruminants and other animal species which may harbour Johne's bacteria.

Prevent contact with adults and do not share pasture

Calves should be moved off the dairy platform to a dedicated rearing facility as soon as possible. If calves remain on the farm (or a run-off used for other stock e.g. over wintering and carry-over cows) make sure that:

- Replacements are grazed on dedicated young stock pasture. Or,
- Pastures are spelled after cows for at least one month, preferably 3+ months
- Clean drinking water is provided and fence off open water-ways.

Other animal species carry Johne's bacteria and may spread disease. Deer are highly susceptible to infection and Johne's bacteria may pass between species. Cattle are susceptible to sheep strains of Johne's bacteria .

Good and bad

- Test carry-over cows. Keep them and wintering stock or other species separate from heifers at the run-off.
- Make hay before grazing heifers on adult cow pastures to help reduce the potential Johne's bacteria loading.
- Persevere. To bring JD under control requires breaking the cow-calf infection cycle for several years.
- Test-and-cull can be effective in reducing risks but risk management is the crux to reducing JD.
- Clearly and permanently mark high-risk or test-positive stock – it is too easy to lose track of them on a day-to-day basis.
- Never graze adult cows and young stock together in the same paddock. Set stocking calves across the dairy farm may expose calves to massive Johne's bacteria loads repeatedly. Over time the infection level will rise with clinical JD occurring in younger cows. This infects the next generation.

Johne's bacteria can survive for months in the environment

Direct contact with faeces or effluent presents the highest risk of infection to calves and heifers but Johne's bacteria can persist:

- **On pasture**, especially in soil and damp or shaded areas. Sun and drying will inactivate bacteria. Spelling pastures for three months or more ensures that Johne's bacteria exposure is minimised.
- **In water**, including open water courses and run-off. Johne's bacteria may concentrate in soil and pastures at the bottom of hill paddocks.
- **In effluent ponds or tanks** for many months, so keep young stock out of sprayed paddockas and be aware of aerosol spread.

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JOHNE'S DISEASE MANAGEMENT

Biosecurity and purchasing stock

OBJECTIVE:

To avoid importing Johne's bacteria into the herd from high risk sources.

BEST PRACTICE

- ☐ Maintain a closed herd with good boundary fencing at all locations
- ☐ Purchase and lease only JD test-negative replacement stock
- ☐ Use AI and buy JD test-negative bulls
- ☐ Verify herd-of-origin and establish JD history

ALTERNATIVE OPTIONS

- ☐ Purchase heifers or young cows only
- ☐ Isolate and test new animals
- ☐ Do not graze adult stock on a heifer rearing run-off
- ☐ Ensure boundaries and fences are secure

HIGH-RISK ACTIVITIES – SO AVOID THEM

- ☐ Purchasing untested empties or cull cows to carry over
- ☐ Buying cows with signs of diarrhoea or poor body condition
- ☐ Poorly maintained boundaries on any run-off

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JOHNE'S DISEASE RISK INFORMATION

Biosecurity and purchasing stock

Establishing the true JD status of a herd is difficult – JD is widespread but look for low risk herds. Buy only from a trusted source and get to know the herd-of-origin of bulls for natural mating.

Minimise the chances of bringing Johne's Disease into the herd

The best method to keep diseases out is a closed herd behind secure boundaries. Purchase healthy young stock only from known sources. Try to establish herd JD status:

- Ask about JD incidence or clinical signs and rearing practices
- Inspect the farm, the whole herd and not just the animals to be purchased
- Test adult stock before purchase to evaluate the hered and exclude highest risk animals.

In calves and yearlings test performance is poor. It is better to test dams. If any any rising-two or first calf heifers are positive, this is a high risk herd. Avoid!

Artificial insemination and embryo transfers are safe

AI keeps one primary source of Johne's infection – faeces – off the farm. Johne's bacteria in semen are rare (if a bull has advanced JD, some bacteria are possible, but a very low risk). Embryo transfer is a good option for pedigree herds and stock suppliers.

Natural mating bulls

Screen bulls for JD at the same time (before purchase) as BVD and EBL tests.

Keep the heifer rearing block clean

Ensure that boundary fencing is secure.

Do not graze adult stock on the heifer block.

Running water from neighbouring grazing property is a potential source of Johne's bacteria so fence-off water ways.

Cull cows from sale yards are a high risk for Johne's bacteria

Buying cattle at a sale yard can be particularly risky particularly if

- They come from multiple and unknown sources
- Cull cows are in poor condition
- They are older cows or empties.

Transport

Do not move any animals in shared or uncleaned transport.

Avoid any other stock contact.

Purchase stock only from a reputable source and known herd-of origin.