Johne's disease leaflet series

ANIMAL HEALTH IRELAND
Contributing to a profitable and sustainable farming and agri-food sector through improved animal health

A Guide to Johne's disease

for Irish farmers, advisors and vets

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IRISH JOHNE'S CONTROL PROGRAMME
Animal Health Ireland, 4-5 The Archways, Carrick-on-Shannon, Co. Leitrim, N41 WN27

Johne's Control
Animal Health Ireland.ie

AHI gratefully acknowledges the financial and other contributions of our other stakeholders to the Johne's Disease Control Programme.

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Johne's disease: The facts

Johne's disease (JD) in cattle is caused by a bacterial infection. The name of the bacterium is *'Mycobacterium avium* sub-species *paratuberculosis',* which is more commonly referred to as *'MAP'*.

Initially, the bacteria live in the gut of infected cattle where they grow and slowly cause damage. As the disease progresses, the bacteria spread to other parts of the body including the udder, womb and lymph nodes.

Importantly, *MAP* does not always infect an animal after exposure. When infection does occur, the clinical signs of disease do not occur immediately.

Which animals are susceptible?

Young animals (especially in the first months of life) are most susceptible to *MAP* infection when exposed. Older animals are less likely to become infected, but it is not known whether they are ever completely resistant.

How long does it take for clinical signs to develop?

The time required before an infected animal will show signs of disease is very variable, but usually it takes several years. Disease can occur more quickly (within months) when an animal is infected with a large amount of bacteria.

An infected animal can shed the bacteria to infect others before developing signs of disease.

Signs of Johne's disease

Signs of Johne's disease are typically seen in animals that are between **3 and 5 years old** but can occasionally be seen in animals that are younger than two years of age.

Typical signs include:

- reduced production (lower milk yield and lower feed conversion)
- weight-loss despite a good appetite
- scour (not bloody)
- soft swelling of the jaw (bottle jaw) or brisket
- death.

As the animal gets older, the signs become more obvious. An infected animal may also suffer reduced production, reduced fertility performance and increased susceptibility to other diseases before the obvious signs occur.

If animals are culled because of reduced performance, infertility or other disease, an infected herd may never have cows with the more obvious signs of Johne's disease.

There is no effective treatment for Johne's disease. Vaccination is not licensed or available in either the Republic of Ireland or Northern Ireland.

Johne's disease in an individual animal

MAP bacteria slowly damage the intestines of infected animals. The signs get worse with time because the gut becomes increasingly damaged.

This progression is irreversible and can be described in 3 steps from the moment of infection. As the disease progresses, the level of shedding and reliability of diagnostic tests typically both **increase.**

Figure 1 Johne's disease progression steps

01 INFECTED
Exposed to *MAP* and becomes infected

The animal appears healthy because there is so little damage to the gut.

- No shedding of *MAP* bacteria
- Minimal gut damage
- **Antibody response very uncommon**

02 INFECTIOUS
Shedding *MAP* to infect other animals

The animal starts to shed *MAP* bacteria that infect other animals.

- *MAP* bacteria are increasingly shed in dung, colostrum, milk and potentially across the womb to unborn calves
- Moderate gut damage
- **Antibody response uncommon**

03 AFFECTED
Clinical signs and high *MAP* shedding

The animal's performance is reduced and it develops the signs of Johne's disease.

- Very high shedding of *MAP* in dung, colostrum, milk and increased spread to unborn calves (around 40% of cases)
- Extensive gut damage
- Increasing antibody response

Young animals (in the first months of life) are at greatest risk of becoming ***infected (1).***

Animals may become ***infectious (2)*** before two years of age and undetected shedding from an infectious animal can continue for a long time.

Affected (3) animals are usually at least two years of age and are often much older.

Economic impact

The economic impact of having Johne's disease in a herd depends on how many animals are **infectious** or **affected**. In herds with a very low prevalence it can be difficult to identify any economic loss. However, as the disease advances in individual animals and spreads to more animals in a herd the economic impact will increase.

Some information is available about the impact of Johne's disease in Ireland, based on case study data collected from one infected herd over a ten year period. The annual average gross margin was observed to decline from €155 per cow above the farmers' peer group in the first five years following introduction to €130 per cow less than the farmers' peer group between five and ten years after introduction.

Spread of Johne's disease on an infected farm

Johne's disease typically spreads on a farm when *MAP* bacteria are passed from **infectious or affected animals to young calves and other susceptible animals.**

Older animals are likely to be the highest shedders and young animals (in the first months of life) are most susceptible to infection. This spread can occur for years before any animal develops noticeable signs of Johne's disease.

Animals can become infected in two ways:

1. **from dung, colostrum and milk:** animals can be infected by swallowing *MAP* bacteria in dung, colostrum or milk, e.g. from dung-contaminated teats or bedding
2. **in the womb:** calves can be infected in the womb if the dam is infected. This becomes increasingly common as the disease progresses in the dam.

Once *MAP* bacteria have been shed they can remain infective (e.g. in slurry or the farm environment) for many months and sometimes for over a year.

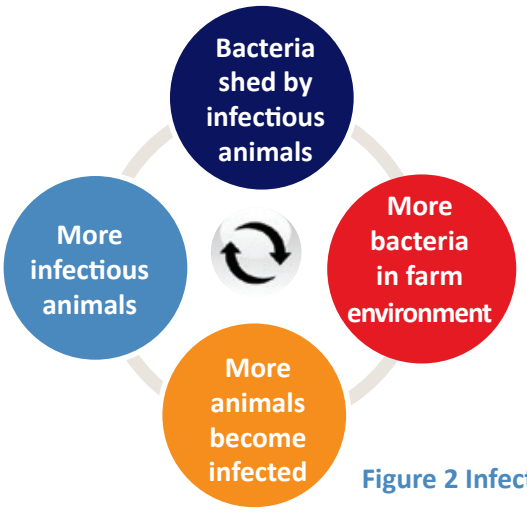

Figure 2 Infection cycle on farm

There may be considerable spread of disease on a farm before an animal develops noticeable signs.

'Unseen spread' means that **by the time the first animal develops signs on a farm:**

1. there may be many more unidentified infected animals in the herd
2. young and other susceptible animals are at high risk of becoming infected.

Management practices that can increase unseen spread

Some common management practices can dramatically increase the rate of spread of Johne's disease **on an infected farm**. This occurs **when a single infected cow feeds or is in contact with several calves.**

- Feeding pooled colostrum or milk to calves.
- Having group calving accommodation.
- Inadequately cleaning pens between calvings.
- Having adult cows share accommodation with several calves / young animals.
- Spreading slurry from adults onto land grazed by calves / young animals.

These activities present an **increased risk of rapid spread of Johne's disease** on a farm.

Johne's disease spreading between farms

Johne's disease is known to spread **between different farms** in two ways:

1. when an infected animal is introduced.
2. when the colostrum, milk or dung from an infected farm contacts susceptible animals (especially calves) on another farm.

1. Spread between herds by an infected animal

This is the most common way for Johne's disease to move between farms.

Apparently healthy *MAP* carriers can shed the bacteria in colostrum, milk and dung and also pass it to their unborn calves. As they have no signs of ill-health, these animals are frequently bought and sold between farms without any knowledge that they are infected with and may be shedding *MAP* bacteria.

When they arrive on a new farm, 'unseen spread' can infect many replacement calves before the signs of Johne's disease are detected.

Infected animals will rarely test positive until they have been infected for many years. **Young breeding animals that test negative must not be assumed to be free from infection.**

2. Spread between herds in colostrum, milk and dung

This is the **second most common** way that Johne's disease spreads between farms. When the **colostrum, milk and dung** from an infected farm comes in contact with young and susceptible animals on another farm, there is a risk that *MAP* will spread.

Common management practices that facilitate spread between farms in this way can be ranked as higher, moderate and lower risk for introduction of Johne's disease.

Refer to the ***'Johne's Disease Frequently Asked Questions'*** leaflet for further information on colostrum management for emergencies**.**

Bringing in colostrum from another farm of unknown Johne's status is high risk. Freeze your own colostrum for emergencies.

Risks of Johne's disease spread between farms

HIGHEST RISK

- Bringing in **infected animals** from another farm. These animals may appear quite normal, with a **negative test result**, especially early in the disease process.

HIGHER RISKS

- Bringing in **colostrum** from **another farm** to feed to calves
- Bringing in **milk** from **another farm** to feed to calves
- Spreading slurry from **another farm** onto land grazed by **young animals**
- **Sending heifers** to be reared on a unit that does any of the above

MODERATE RISKS

- Using **dirty equipment** (trailers, crush etc) that is **shared between several farms** when working with young animals
- Farm visitors with dirty outer clothing working directly with **young** animals

LOWER RISKS

- Using dirty equipment (trailers, crush etc) that is **shared between several farms** when working with adult stock
- Farm visitors with dirty outer clothing working with **older** stock

There are other potential ways for *MAP* to move between farms though they are not as common.
See the ***'Johne's Disease Frequently Asked Questions'*** on **www.animalhealthireland.ie** for more details.

What should I do about Johne's disease?

If you are worried about the presence or extent of Johne's disease in your herd, you can assess the risk to your stock by answering the following three questions:

1. Am I likely to have Johne's disease in my herd?

After accounting for test limitations, it is estimated that currently around 20% of dairy herds and 6% of beef herds in Ireland are infected with Johne's disease.

The following two steps can help you decide if your herd is likely to be infected:

A farm risk assessment

Conducted by your local vet, a farm risk assessment will help to determine the risk of infection, after considering:

- ***Stock Purchases***
  The more animals you have introduced into your herd in past years, the more likely you are to have brought Johne's disease into the herd. Repopulation and rapid increase in cow numbers may pose particular risks.
- ***Clinical Cases***
  If you have had adult animals with signs suggestive of Johne's disease, your herd is at high risk of being infected. However, even without signs of Johne's disease, the herd may still be infected with animals in the earlier stages (see steps 1 and 2, Figure 1).
- ***Introduction of Colostrum, Milk and Dung***
  The more colostrum, milk and dung that has come onto your farm from outside farms in recent years, the more likely you are to have brought in Johne's disease. Use Figure 3 on page 5 to alert you to activities that might bring *MAP* into your herd in colostrum, milk and dung.

Herd testing

Individual testing of all animals over 2 years of age will give an initial indication of the herd status. Note that while a negative herd test is an encouraging start, it is not conclusive evidence that the herd is free from infection (due to the limitations with the tests as discussed in this leaflet). Repeated negative tests, along with management practices to stop entry of infection (see below) give increasing confidence in the Johne's free status of such herds. See the Animal Health Ireland website (**www.animalhealthireland.ie**) for details of herd testing programmes, which are expected to be available in late 2012.

2. Am I at continued risk of bringing Johne's disease into my herd?

This will be determined by your local vet as part of a farm risk assessment. If you are purchasing stock regularly you remain at higher risk of bringing Johne's disease into your herd. Remember a negative pre-purchase test result does not give reliable information about the potential carrier status of incoming stock. If you are carrying out any of the other management activities listed on page 5 you are at continued risk of bringing Johne's disease into your herd in colostrum, milk and dung.

3. Does my herd management allow rapid spread of Johne's disease?

MAP spreads from infectious and affected animals to young and susceptible animals in dung, colostrum, milk and to the unborn calf. Any management practices that allow a single adult to contact or feed several calves can increase the rate of spread.

See the list at the bottom of page 4 for the types of management practices that are likely to increase spread of Johne's disease on your farm. Remember that this list is not exhaustive, and you should review your calving and calf rearing practices in detail to identify practices that might increase the rate of spread. Your local vet can help you to conduct a risk assessment for likelihood of allowing rapid spread of Johne's disease on your farm.

A farm risk assessment will help you determine the likelihood that Johne's disease is present in your herd.

The limitations of Johne's disease testing

There are two basic rules for all Johne's disease tests:

- it is common for an infected animal to have a negative test result (e.g. an incorrect test result) especially early in the disease process. A single negative result **does not** mean that an animal is not infected, and
- test results need to be interpreted in the light of results from a farm risk assessment.

Reliability of Johne's Tests

When a test gives the wrong result it can happen either:

- *By giving a negative result when testing an infected animal.* This is called a **'False Negative'** result and happens **very frequently** with Johne's disease tests. A **'Sensitivity'** score (0-100%) indicates how often the test gives a positive result when testing infected animals.
- *By giving a positive result when testing a non-infected animal.* This is called a **'False Positive'** and happens **only occasionally** with Johne's disease tests. A **'Specificity'** score (0-100%) indicates how often the test gives a negative results when testing non-infected animals.

Sensitivity scores can be very poor for Johne's disease tests. *Sensitivity* scores improve as Johne's disease progresses from Step 1 (infected) to Step 2 (infectious) to Step 3 (affected). The following table gives relative scores for commonly used Johne's disease tests.

Table 1 Testing Reliability

	NO SIGNS	WITH SIGNS
FAECAL CULTURE		
False Positive	**Very Rare** Specificity is almost 100%	**Very Rare** Specificity is almost 100%
False Negative	**Very Common** Sensitivity 16-30%	**Common** Sensitivity 60-70%
INDIVIDUAL BLOOD ELISA		
False Positive	**Occasional** Specificity 95-100%	**Occasional** Specificity 95-100%
False Negative	**Very Common** Sensitivity 7-22%	**Common** Sensitivity greater than 22%
INDIVIDUAL MILK ELISA		
False Positive	**Occasional** Specificity 95-100%	**Occasional** Specificity 95-100%
False Negative	**Very Common** Sensitivity 6-18%	**Common** Sensitivity greater than 18%

Only three Johne's disease tests are currently recommended by Animal Health Ireland, each based on samples collected from individual animals: the serum ELISA, the milk ELISA and faecal culture.

Bulk tank milk testing is not reliable

A bulk milk test is not a reliable way to test a herd. Although a positive result indicates a high risk of infection, it is misleading to assume that your herd is not infected with Johne's disease based on negative bulk milk antibody results.

False negative results are common, and repeated negative tests of individual animals in the herd coupled with low risk management practices are the only way to build confidence that animals are not infected with Johne's disease.

How do I stop Johne's disease coming into my farm?

To stop Johne's disease coming into your farm, reducing the risk from purchased stock should be the first priority. The only way to prevent this risk is **to not buy in any stock** (including purchasing / hiring bulls).

Reducing the risk of introducing Johne's disease with purchased stock is very difficult because:

1. pre-introduction testing does not reliably identify carrier animals
2. there are very few known disease free herds from which to buy stock.

Infected animals will rarely test positive until they have been infected for many years. Young breeding animals that test negative **must not be assumed to be free from infection.**

If a herd can be found that either demonstrates a high confidence of being free of, or a low risk of being infected with Johne's, then purchasing stock from this herd would be a lower risk.

The risk of bringing Johne's disease into your herd in dung, colostrum and milk from an outside farm must be considered next. The 'Frequently Asked Questions' on **www.animalhealthireland.ie** has more details on how to reduce these risks.

Start controlling Johne's disease on your farm

If Johne's disease is in your herd then on-farm control measures should be started. **Control of Johne's disease in a herd requires a long-term commitment as prevalence of infection cannot be reduced, or disease eradicated quickly.**

The principles of control are to:

- **reduce new cases** by protecting young animals from exposure to potentially infected dung, colostrum and milk
- **reduce shedding** into the farm environment by finding and removing infectious animals by repeated individual animal testing
- **prevent** *MAP* **bacteria coming into the herd from other farms** as detailed above.

These three principles must all be achieved together to reduce the spread of Johne's disease in a herd.

Reducing new cases may require changing calving, calf rearing, animal housing and slurry management practices to prevent rapid spread. Identifying infectious cows will require repeated individual animal testing over a long period of time.

Specific control options are varied and different options will suit different farms. Work with your local vet to conduct a risk assessment and then identify control options that suit you.

Check the Animal Health Ireland website **(www.animalhealthireland.ie)** for up to date advice on controlling Johne's disease in your herd.

NOTES

TECHNICAL WORKING GROUP: Prof Simon More (Chair) - UCD CVERA, Damien Barrett - Regional Veterinary Laboratory Sligo, DAFM, Bill Cashman - Veterinary Practitioner Cork, Jim Buckley - Cork County Council, Richard Fallon, Dr Margaret Good - DAFM, Dr David Graham - AHI, Kevin Kenny - Central Veterinary Research Laboratory, DAFM, Dr John Mee - Teagasc Moorepark, Ciaran Mellett - Vet Practitioner Meath, Peter Mullowney - DAFM, Dr Sam Strain - AFBI, Dr Paul Whyte - UCD School of Agriculture, Food Science and Veterinary Medicine

TWG RAPPORTEUR: Fionnuala Malone, AHI.

LEAFLET COMPILED BY: Tim Geraghty - Scottish Centre for Production Animal Health and Food Safety, School of Veterinary Medicine, University of Glasgow.

PEER REVIEW BY: George Caldow, BVM&S, MSc, CertCHP, DipECBHM, MRCVS, Veterinary Services, Scottish Agricultural College and Keith Cutler, BSc BVSc Dip.ECBHM MRCVS, Endell Veterinary Group, United Kingdom.

Animal Health Ireland, Main Street, Carrick-on-Shannon, Co. Leitrim
Phone 071 9671928
Email admin@animalhealthireland.ie
Web www.animalhealthireland.ie