

An Information Package for Cattle Producers



**Johne's Disease
in Alberta:
Beef and Dairy Cattle**

Developed by the
Alberta Johne's Working Group

and



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What is Johne's Disease?

Johne's disease (pronounced "yo-knees") is a chronic, progressive and debilitating disease of ruminants including cattle, sheep, goats, elk, deer and bison. The disease primarily affects the intestinal tract but the causative organism can be found in many tissues of the body.

Johne's disease is recognized worldwide. It was first reported in North America in 1908.

Clinically affected cattle are usually at least two or three years old and develop a non-responsive diarrhea that leads to loss of body condition despite a relatively good appetite. There is no cure for Johne's disease and all clinically affected animals will eventually die.

Johne's is a chronic disease with a long incubation period; as such, the disease should be considered a herd problem as well as an individual animal problem.

What causes Johne's Disease?

Johne's is caused by *Mycobacterium avium* subspecies *paratuberculosis* (Mptb). It is a close relative of the organisms that cause tuberculosis and leprosy. The organism is relatively hardy and may survive in the environment for years, especially in moist conditions, or in standing water. Mptb can survive freezing at -14°C for up to a year. It is susceptible to 10 minutes exposure to 5% formalin, 1:32 cresylic acid and 1:40 phenol. The organism does not survive well in dry conditions or when exposed to sunlight. It is a very slow-growing bacterium. In the laboratory, cultures must be held for up to 16 weeks before being declared negative.

What are the clinical signs of Johne's ?

Because of the slow progressive nature of this disease, cattle may be infected for years before they show any signs of the disease. When symptoms do occur, they are characterized by diarrhea and weight loss despite a relatively good appetite. Clinical signs often start after a stressful event such as calving. Clinical signs are usually seen in animals that are at least two or three years old but can occasionally be seen in animals as young as six months. Some animals will develop swelling under the jaw (bottle jaw) as the clinical signs progress.

The clinical signs are a result of the bacteria infecting specialized cells in the small intestine that are responsible for the absorption of nutrients. As the cow attempts to rid itself of these bacteria, the immune response causes a thickening of the intestinal lining, which prevents proper absorption of nutrients and results in the diarrhea.

Some animals will never show clinical signs in their normal productive lifetimes. Despite never observing a clinical case of Johne's in your herd, the disease may still be present in a subclinical form.

Transmission

Transmission of Mptb is primarily by oral ingestion of feed and/or water contaminated by feces of infected animals. Infected animals shed large numbers of bacteria in their feces, especially after beginning to show clinical signs. However, a significant factor in this disease is that infected animals can be shedding the bacterium in their feces for months or years before they show any signs of the disease. It is believed that young animals less than six months of age are more

easily infected than mature animals and that the most easily infected animals are less than one month of age.

It is an important feature of this disease that most animals become infected at a very early age yet do not show signs of the disease in

most cases until many years later, if they develop signs at all.

Other routes of infection

include the ingestion of colostrum or milk from infected cows, especially from those cows that are in the later stages of the disease.



Calves may also become infected while still in the uterus. This form of transmission is again more common in those cows that are in the more advanced stages of the disease.

Mptb has also been grown from the semen of infected bulls. However, it is not clear that this route of infection is significant.

Many researchers believe that most calves are infected when they nurse the manure-laden teats of their mothers. From this we can see that calves born from infected mothers are at high risk of becoming infected. This is supported by field observations and offers a control point to aid in reducing the prevalence of Johne's in cattle herds.

The Alberta Picture

A survey in 1999, completed by Alberta Agriculture, Food and Rural Development, estimated that 58% of Alberta dairy herds have Johne's infected cattle in them as

determined by use of the ELISA blood test. The same study also estimated that 14.2 % of the dairy cattle were infected with Johne's. The same study also used fecal culture to estimate prevalence and found that 24.5% of the herds cultured had one or more positives in the herd. This translated to an adjusted cow prevalence of 2.33-6.98%. Another survey completed in 2000 by Alberta Agriculture found that 4.4% of beef herds and 1.6% of beef cows were positive on fecal culture. These surveys are similar in their results to those completed recently in the United States.

Why is it important to control Johne's?

There are three main areas where losses due to Johne's disease may occur. These are:

- visible losses
- hidden losses
- potential losses

Visible losses include those associated with clinical disease (e.g., cows culled from the herd before their normal productive lifetime is over). Other visible losses include lost sales to trading partners attempting to protect their own herds.

Hidden losses occur when poor production results from subclinical infection. Infected cows (as determined by positive ELISA test results) may produce up to 15 % less milk than test-negative herd-mates. Infected animals may exhibit average days open as high as 28 days longer than test-negative animals. There is some work to show that infected animals have increased susceptibility to other diseases including mastitis.

Potential losses are those associated with consumer confidence in the



foods of ruminant origin. Some science advocates have suggested that Crohn's disease in humans is caused by Mptb. Crohn's disease most commonly affects people 15 to 35 years of age and resembles Johne's disease in many of its clinical signs. The cause of Crohn's disease is still unknown. If a causal association between Crohn's and Mptb is shown to exist, the economic consequences for cattle operations could be dramatic. This has the potential to be the greatest source of loss to the livestock industry. The livestock industry is based on the provision of healthy, wholesome products to its consumers; even the suspicion that these products may be linked in some way to Crohn's is something producers should take very seriously.

The evidence regarding a causal association between the two diseases is inconclusive at this point. Some researchers have found that a high proportion of Crohn's patients also tested positive for the DNA of Mptb. Other researchers have not been able to reproduce these results.

Some researchers have been able to culture Mptb from Crohn's patients while others have not. When inoculated into goats, the microbe that was cultured from the Crohn's patients did cause Johne's-like disease in some of the animals.

Members of the medical community are not in agreement as to the significance of the associations found to date. No epidemiological studies have yet been published that examine any connection between contact with animals with Johne's

disease and humans who have developed Crohn's disease.

Diagnostic Tests

The availability of consistently reliable tests, for use in determining the infection status of animals (especially those in early stages of infection), is presently a limiting factor in the control of this disease.

Fecal culture is the presently considered the "gold standard" test for Johne's. In this test, a small quantity of feces is cultured



in a special media for up to 16 weeks. The media is enhanced to promote the growth of the mycobacterium while inhibiting the growth of other bacteria and fungi. When done in controlled laboratory conditions, this test is said to be very specific, but not very sensitive.

The **specificity** of a test refers to the ability of the test to avoid false positives. In this case, fecal culture has a specificity approaching 100%. Thus, when we see a positive culture result, we can be almost 100% sure that the animal is truly infected.

The **sensitivity** of a test refers to the ability of the test to detect infected animals (i.e., avoid giving false negative results). In this case, fecal culture has a sensitivity of about 45%. Thus, when we see a negative result, it may be wrong up to 55% of the time. The actual test sensitivity may vary as a function of factors such as: the age of the animal, the duration of the infection, and the presence or absence of clinical signs.

Johne's disease progresses very slowly through a continuum of stages including:

- ① Infected but not shedding any bacteria
- ② Infected and shedding only small numbers of bacteria
- ③ Infected and shedding large numbers of bacteria
- ④ Infected and shedding large numbers of bacteria and showing clinical signs

Because of this progression of disease, we can say that fecal culture is not very sensitive for infected animals under two years of age but is more sensitive in older animals or those showing clinical signs where its sensitivity can, in fact, approach 100%.

Another major limitation of this test is the fact that it may take up to 16 weeks to complete because of the slow growth of the bacterium. It is also a relatively expensive test to run because of the media involved and the large amount of time, storage space for cultures, and manpower involved. In addition, it is critical when culturing feces that the samples reach the lab in very short order and that they are properly cooled during shipment to avoid fungal overgrowth. When performing herd fecal culture tests, some laboratories will pool samples, with five to ten cattle per grouping, in order to save on space and expense. There is a great deal of on-going research directed at improving the culture technique by concentrating the bacteria on special glass beads prior to culture. Other tests, based on DNA sequences of the bacterium and applied directly to the glass beads, are being developed to cut down on time and expense while improving on the sensitivity of the test.

A second test that is widely employed is the ELISA blood test. For this test, a blood sample is taken and analyzed for the presence of antibodies to Mptb. The test has the advantage of being fast and relatively inexpensive as well as not having the time constraints associated with getting the samples to the laboratory in short order. The ELISA test sensitivity (45%) is similar to that of fecal culture. In other words, it is prone to giving false negatives, especially when the tested animals are in the early stages of the disease. The lack of sensitivity occurs because infected animals do not produce antibodies to Mptb until quite late in the progression of the disease. As a result, this test is also typically suited to only those animals over two years of age. In addition, antibody levels in the blood appear to rise and fall in the early stages of disease, often making detection a "hit or miss" affair.

The ELISA test is not as specific as the fecal culture with specificity reported to range from 93% to 99%. This means that this test will occasionally give false positive results. This has an important impact on how results are interpreted, especially when the results are interpreted at the herd level. Consultation with your herd veterinarian is of paramount importance when interpreting any Johne's test results.

What can I do if I have Johne's in my herd?

Johne's can be controlled and essentially eliminated from the farm or ranch by utilizing testing and critical management practices that are based on limiting contact with infected manure.

It is important to remember that any control program may take five years or more to succeed, and will then need to be followed by a comprehensive prevention program.

In any control program, attention to detail is important, and this is particularly true for Johne's. The goal for any control program should be to reduce the numbers of infected animals to very low levels. It may not be possible in some herds to entirely eliminate the disease using the presently-available tests.

Because the basis of any Johne's control program involves limiting contact with manure, especially for the young stock, instituting a Johne's control program results in better control of other diseases as well. These include calf scours whether caused by viruses or bacteria, salmonellosis, coccidiosis, cryptosporidiosis and intestinal parasitism.

What are some of the important control points that one might consider?

① Culling of infected animals

Because many of these animals are shedding bacteria in large numbers, it is imperative to cull them as soon as they are detected, or at least remove them to an area where they have no contact with uninfected animals. There are some researchers suggesting that producers cull the offspring of infected animals, especially those with clinical signs, because of the high probability that they too will be infected.



② Clean, dry calving areas

Because the young calf is the most susceptible to infection, reducing their

exposure to manure is critical. One "rule of thumb" suggests that you should be able to kneel down on the bedding in the calving area and not get wet knees. In dairy herds, cows should not calve in the same area where the dry cows are being held. In beef herds, calving areas should be separate from wintering areas. Maternity pens should be cleaned between calvings. There is some research that shows that use of lime in the pens will help eliminate the organism. Do not use the calving area as the hospital pen.

③ Segregation of calves

In Johne's-infected dairy herds, it is important to remove calves from their dam as soon as possible after birth to prevent nursing. Producers then should feed high quality colostrum from test-negative cows or else pasteurize the colostrum. All calves then should be raised separately from mature animals until they calve. If possible, feed only high quality milk-replacer, milk from test-negative cows, or pasteurized milk.

Make sure that you are not carrying the disease from the adult cow areas to the calf-rearing areas! Calves have been known to lick work clothes covered with dirt and manure acquired from the adult cow areas of the farm.

④ Environmental cleanup

Clean corrals and sheds frequently and spread manure on crop land, avoiding hay land or pasture if possible. Drainage from the corrals and holding pens should not be allowed to contaminate hay or pasture land or drinking water sources such as dugouts. All dugouts should be fenced off and water piped to drinking fountains or tanks. Sloughs or areas where water will stand should be drained or fenced off to avoid consumption of manure-laden water.

⑤ Provide clean feed

Do not use the same equipment to feed as is used to clean the manure from pens. This is often one of the most important sources of Johne's-contaminated material being fed to young dairy heifers! Do not allow manure from pens to contaminate feed storage areas.

Avoid ground feeding and use troughs whenever possible.



⑥ Develop a testing plan

With the help of your veterinarian, develop a testing plan for your herd that will help maximize the effectiveness of the above control points. Make sure that all employees have a working knowledge of the plan and how it is to be carried out.

What can I do to prevent the infection from entering my herd?

The easiest means of preventing herd infection is to avoid buying replacements. Maintaining a closed herd is the surest way to avoid bringing the disease in.

If you must purchase replacements, it is best to purchase from herds that have had more than one negative herd test or are following a monitored Johne's control program. The goal should be to purchase animals that have as low a risk of being infected as possible. With the help of your veterinarian, you can develop a testing plan for the new additions that will identify positive animals as soon as possible. The management plan might also include implementing a quarantine period (segregated housing and milking) for the new additions.

If your herd is considered free of Johne's or of low probability of having Johne's, it is still important to implement the Johne's control points listed above. This will help minimize the spread if the bacterium is introduced and will have the added benefit of helping control other diseases.

The Alberta Voluntary Johne's Cattle Herd Status Program

This multi-level voluntary program offers interested **cattle** producers the opportunity to test herds using a pre-set protocol. By doing so, herd owners can state with increasing levels of confidence that Johne's disease is not present in their herds.

There are four levels of certification that will provide increasing levels of confidence to purchasers of replacement stock. Improved biosecurity measures in the future would suggest that producers purchase animals from herds with the same or higher levels of herd status certification.

If you would like more information on this program, please contact your veterinarian or the Alberta Johne's Working Group at the address below:

**Alberta Agriculture, Food and Rural Development
Food Safety Division (Johne's Control Program)
O. S. Longman Building
6909 116 Street
Edmonton AB T6H 4P2**



Yes, please send me more information on the following aspects of Johne's Control in Alberta:

- The specific criteria and details of the Alberta Johne's Disease Herd Status Program.
- Sampling protocol, rules and regulations, and the scientific theory behind the herd status classification system.
- Extra copies of this pamphlet.

- I wish to be kept informed of future developments in Johne's Disease Control:

Name: _____

Address: _____

Phone #: (optional) _____

E-mail: (optional) _____