

# Johne's Disease

## in BEEF and DAIRY herds

Revised by:

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### **Johne's (pronounced "yo-knees") disease is a chronic wasting disease in ruminants**

caused by the bacterium *Mycobacterium avium*, subspecies paratuberculosis. This bacterium is closely related to bacteria that cause tuberculosis in cattle and humans. H.A. Johne, a German veterinarian, first described this disease in 1895; his name is used as the common name for this disease, also known as paratuberculosis.

Johne's disease historically has been thought of as a "dairy" disease, but many beef herds also can have it. In dairy and beef cattle, Johne's is a slowly progressive disease that costs the producer through excessive culling, suboptimal milk production, decreased fertility and death loss. It also is a possible cause for litigation if knowingly infected breeding stock are sold as noninfected animals.

For every clinical case of Johne's in a herd, you can expect multiple animals to be infected with the disease but not show any clinical signs. The real problem is subclinical (below the surface). This "iceberg" effect of Johne's can wreck your production system or at least steal your profits.

### **Clinical Signs**

Johne's-affected cattle usually exhibit clinical signs between 2 and 5 years of age, but animals can be much older (10 to 15 years of age) and much younger (as young as 10 months).

Cows and bulls can be affected.

The animals may appear unthrifty, are often weak and typically do not have a fever. The bacteria attack the lining of the intestine and cause a thickening of the intestinal wall.

**This causes two things to occur:**

- Nutrients cannot be absorbed through the intestinal wall, so the animal starts to lose weight and get thin.
- The animal develops diarrhea because it cannot absorb nutrients and fluids.

Johne's is a slowly progressive disease that costs the producer through excessive culling, suboptimal milk production, decreased fertility and death loss.

No medication or dietary change will result in a long-term cure for Johne's.

Animals affected with Johne's disease eventually shed the organism in their manure, with the number of organisms increasing through time.

Due to the long incubation period, producers may not realize the herd is infected with Johne's until years later, if ever.

The diarrhea is mild at first, then becomes severe. Diarrhea may be intermittent at the onset of clinical signs.

The disease will not respond to antibiotics. No medication or dietary change will result in a long-term cure.

## Transmission

Johne's disease usually is contracted when the animal is very young (up to 30 days of age) and probably within the first 24 hours of life while the gut is "open" to absorb colostral antibodies. After the gut closes, infection becomes dose-dependent as the animal ages, and more bacteria are needed to cause infection.

Young calves ingest the organism from colostrum of infected cows, contaminated milk, sucking and nursing contaminated udders, or suckling or licking on any other contaminated surface. Johne's also can be transmitted in utero (while the calf is still inside the cow).

Specialized cells in the wall of the intestine take up the bacteria. Normally, an invading bacterium would be killed, priming the immune system to strengthen itself against future invasion. However, some of the organisms that cause Johne's disease are able to survive this process. As time passes, more and more specialized cells are recruited to try to kill the bacteria, causing the intestinal wall to thicken.

Animals affected with Johne's disease eventually shed the organism in their manure, with the number of organisms increasing through time. The Johne's organism can live for up to 18 months in soil or manure, depending on environmental conditions.

The bacteria also can be found in the semen of infected bulls. Transmission of Johne's via natural service theoretically is possible but has not been proven.

In general, artificial insemination (AI) is not believed to pose a large risk for the spread of Johne's in a typical production setting. Because most large AI centers routinely test bulls for Johne's disease, the use of semen from these centers should not present a risk for the introduction of the disease.

## Clinical Course

Animals that are infected early in their lives show no evidence of Johne's disease. The time from initial infection to onset of clinical signs (diarrhea and weight loss) is generally two to five years. This is radically different from other diseases; in those, the time from infection to time of illness is generally less than 14 days.

After this incubation period, infected animals may begin shedding the Johne's bacteria in manure at very low levels or intermittently, but in some clinically normal animals, large numbers of bacteria can be shed. In most cases, the number of bacteria shed increases with increasing age of the animal. At some point, the animal may develop clinical Johne's disease, with diarrhea and weight loss.

Due to the long incubation period, producers may not realize the herd is infected with Johne's until years later, if ever. Before animals reach the point of chronic diarrhea and weight loss, they already may have been culled for other reasons, including mastitis, poor production or reproductive failure (the "iceberg" effect).

## Diagnosis

Diagnostic tests for Johne's disease identify the bacterium that causes the disease, *Mycobacterium avium* ss. paratuberculosis (MAP), or antibody to the MAP infection in the blood or milk. Organism-based tests are by culture, a method that isolates the bacterium from manure, tissue or environmental samples, or polymerase chain reaction (PCR), which looks for the MAP DNA in similar types of samples.

Culture can take up to four months because MAP grows slowly. Samples from heavy-shedding animals can be detected more quickly, but the laboratory may require additional weeks of incubation before reporting a sample as negative. Manure samples can be pooled to reduce testing costs; however, any positive pools must be tested individually to find the shedding animal.

Due to sensitivity and rapid turn-around in the laboratory, direct and pooled PCR

has become the test of choice for organism detection. A direct PCR test looks for the MAP genetic material, usually in a manure sample. This is a much faster test and results are available in a matter of days.

While the PCR assay is quicker than culture, it may detect nonliving genetic material that does not represent a true infection, such as a pass-through infection. Due to the complexity of the disease, assistance from the lab and your veterinarian is recommended to interpret all Johne's disease test results.

Pooling samples for PCR testing is typically more cost effective and can be performed only at the laboratory; however, as with culture, any positive pools must be tested individually. The producer and veterinarian need to discuss whether pooling is appropriate for the herd in question.

Essentially, two types of tests look for antibodies in the blood of the animal: the enzyme-linked immunosorbent assay (ELISA) and the agar gel immunodiffusion assay (AGID). The ELISA test is best used as a herd test. It is a way to test large numbers of samples and keep costs down. This will give an indication of the incidence of infection in a herd.

ELISA results are numeric; generally, the higher the number generated by the test, the more likely the animal is truly infected and shedding. However, ELISA testing can produce false positives that are best confirmed by retesting in a few weeks or confirming with a fecal PCR. ELISA test kits are available for milk samples from individual cows as well.

In animals with clinical signs, PCR and ELISA tests are equally effective. As with all diagnostic tests, false positive and false negative results can occur; thus, whole-herd testing is strongly recommended if any animal in the herd has been diagnosed with Johne's disease.

When designing a diagnostic strategy for an animal or group of animals, the best procedure is to confer with the laboratory being used and your veterinarian. Many factors are involved in deciding which diagnostic plan is appropriate. This will optimize results and keep costs reasonable.

## Prevention

The best way to avoid introducing this disease into your herd is to be as certain as possible that animals brought into the herd are not infected. Second best is to work with a producer who knows the level of Johne's disease in his or her herd, follows good infection control practices and then purchases test-negative animals from test-negative dams.

Some states (including North Dakota) have voluntary Johne's control programs that can help defray the cost of testing. These programs establish the Johne's status of the participating herds. Ask prospective sellers if they participate in a Johne's control or testing program.

Remember that Johne's disease is a herd problem, and knowing the test status of numerous adults in the source herd will give you a much better sense of the risk of purchasing an infected animal than the one test result you might get on the single animal you wish to buy. A single test on an individual animal may not detect every infected animal.

A better option is to determine a herd's Johne's disease status by a whole-herd test of animals more than 2 years of age. Only buy from those herds in which all animals test negative. Again, involve your veterinarian in any discussion of laboratory results.

## Control

If Johne's is present in a herd, control requires a long-term commitment. The most effective method is a combination of identifying infected animals through systematic testing and management changes. This two-pronged attack centers on removing infected animals to decrease the amount of shedding in the herd and protecting the youngest, most susceptible animals.

Voluntary Johne's programs in most states are designed to help producers control Johne's and provide a wealth of expertise to help herd managers.

Johne's control programs will vary from herd to herd. Involve your veterinarian from the ground floor in your control program.

The best way to avoid introducing this disease into your herd is to be as certain as possible that animals brought into the herd are not infected.

The most effective control method is a combination of identifying infected animals through systematic testing and management changes.

## Conclusion

Control of Johne's disease can be attained only by halting the transmission of *Mycobacterium avium paratuberculosis* in the herd.

Because no effective treatment is available for an animal already infected, the control program must identify infected cows early so they can be removed from the herd.

Herd size, geographic location, type of enterprise, number of infected animals, herd management and herd size need to be taken into account. No one program will work for all operations, but some control measures will be universal:

- Use colostrum from cows known to be Johne's negative.
- Cull clinical or shedding Johne's cows immediately.
- Follow the Johne's control program outlined by your state or veterinarian.
- Maintain clean calving areas.
- Spread manure on nonpasture and nonhay land.
- Limit access to low-lying wet areas.
- Do not contaminate feed for young stock with manure.

## In Beef Herds

Johne's control relies primarily on testing to identify infected cows. Cull the positive cows and maintain clean calving/nursing pasture areas.

Early removal of the calf from the dam is not a viable option for most producers; however, in the case of an extremely valuable calf, it may be a wise decision. This assumes that no intrauterine transmission has occurred.

In cows that begin to exhibit clinical signs of Johne's disease, the probability of their last calf being infected during gestation is about 20 percent. To limit the possibility of transmission from these calves to other animals in your herd, these calves should be culled. Do not sell calves from Johne's-positive cows as replacement heifers.

## In Dairy Herds

Removal of the newborn calf from the cow and moving it to a Johne's-free environment and feeding noninfected colostrum and milk or substitute milk replacer is of primary importance. The goal is to produce a Johne's-free calf.

In cows that begin to exhibit clinical signs of Johne's disease, the probability of their last calf being infected during gestation is about 20 percent. To limit the possibility of transmission from these calves to other animals in your herd, these calves should be culled. Do not sell calves from Johne's-positive cows as replacement heifers.

All farm personnel, the herd veterinarian and others intimately involved in your operation must cooperate fully for your Johne's control program to be a success.

Because no effective treatment is available for an animal already infected, the control program must identify infected cows early so they can be removed from the herd.

For more information on the North Dakota Voluntary Johne's Control Program, contact the North Dakota Department of Agriculture - State Board of Animal Health by calling 701-328-2655.

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