Johne's Disease in the Beef Herd

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Johne's (pronounced yo-knees) disease is a slowly progressive disease of ruminants, including cattle. All beef producers need to be concerned about Johne's disease. Johne's costs the commercial beef producer through excessive culling, death loss, and suboptimal herd performance. Producers who sell Johne's infected breeding stock have been involved in litigation for selling diseased animals.

Johne's is caused by the bacteria *Mycobacterium paratuberculosis*. *M. paratuberculosis* is slow growing and resistant to all common antibiotics. In contrast to most common bacteria, the Johne's organism persists in the environment for long periods of time, especially in areas associated with water. The organism survives for nine months in manure slurry, 11 months in soil and 17 months in water. Direct sunlight for 100 hours or boiling for two minutes can kill the organism.

Johne's disease has traditionally been viewed as a “dairy” disease. In Wisconsin, 34 percent of dairy herds are thought to have at least one cow with Johne's disease.

Few studies have documented the prevalence of Johne's disease in beef cattle, but recent experience suggests that Johne's is present in beef herds.

Clinical Signs

Johne's affects cattle primarily between two and five years old, although older animals (10 years of age) and animals as young as 10 months may be affected. Both cows and bulls are affected. *M. paratuberculosis* attacks the lining of the gut and causes a thickening of the gut wall. As a result, nutrients cannot be absorbed. The primary signs of Johne's disease in cattle include:

- Diarrhea. The diarrhea often appears as “pea soup” with no blood or mucus. Cattle continue to eat, and do not have a fever. The diarrhea may be intermittent at first, but it is continuous as the disease progresses.

- Weight loss. Cattle may appear to quickly lose weight.

- Submandibular edema or “bottle jaw.” Accumulation of fluid under the jaw can occur as a result of diarrhea and protein loss.

- No response to treatment. No medication or dietary change will result in a long term cure. Many antibiotic treatments have been tried, but none have been found effective.

Johne's needs to be differentiated from other causes of diarrhea in adult cattle, including:

- Indigestion (rumen upset).
- Internal parasites.
- Salmonella infections.
- BVD (bovine viral diarrhea).
- Other sporadic conditions.

Transmission

Johne's disease usually begins when young, susceptible calves are infected with *M. paratuberculosis*. This occurs primarily through oral ingestion of the organism. The time from initial infection to onset of clinical signs (diarrhea and weight loss) is generally two to five years. This is radically different than most diseases where the time from infection (contact with the virus or bacteria) to the time of illness is generally less than 14 days. Calves are the most susceptible to infection with the Johne's organism, espe-
cially in the first few weeks of life. Animals greater than one year old may acquire *M. paratuberculosis* infection but are more resistant to infection than young calves. Most cattle with Johne's disease are believed to have acquired *M. paratuberculosis* infection early in life.

Animals infected with *M. paratuberculosis* eventually shed the organism in the manure, with the number of organisms increasing with time. Cattle showing clinical signs of Johne's (diarrhea), shed a tremendous number of organisms into the manure, resulting in heavy environmental contamination. The exact number of *M. paratuberculosis* organisms required to establish Johne's infection in calves is not known, but infection probably requires very few organisms. For example, newborn lambs can be infected with *M. paratuberculosis* with as few as 100 bacteria given once weekly for 10 weeks.

*M. paratuberculosis* organisms can be found in colostrum and milk of infected cows. This is particularly true of cows in the advanced clinical stages of Johne's. Additionally, *M. paratuberculosis* may be passed to the calf while still in the uterus. Estimates are that 8-40 percent of calves born to Johne's-positive cows may be infected.

*M. paratuberculosis* can be found in the semen and feces of infected bulls. This has raised concerns that herds using artificial insemination may introduce Johne's disease if the semen comes from Johne's positive bulls. In general, semen is not believed to pose a large risk for spread of Johne's in typical production settings. Additionally, since most large AI centers routinely test bulls for Johne's disease, use of semen from these centers should not present a risk for introduction of Johne's.

All ruminants can be affected with Johne's, but diarrhea is not a pronounced sign in sheep and goats. Wild ruminants (deer) can be infected, but they are not thought to be an important source for *M. paratuberculosis* transmission to cattle.

**Diagnosis / Clinical Course**

If infected near birth, calves show no evidence of Johne's disease, although the bacteria are slowly multiplying in the intestine and related tissues. After a period of time (often two or more years) infected animals may begin shedding *M. paratuberculosis* in manure at very low levels. In most cases, the number of bacteria that are shed gradually increase over time. At some point, the animal may develop clinical Johne's disease, with diarrhea and weight loss. At that time, the animal is shedding large numbers of bacteria in the manure. Over the next several weeks to months, the animal will lose weight and either be culled or die.

There are several ways to diagnose Johne's disease in an animal.

**Culturing the organism from manure** is the most common way to definitively diagnose Johne's. Young animals, even if infected with *M. paratuberculosis*, often do not shed or shed undetectably low numbers of organisms in the manure. In fact, *M. paratuberculosis* may not be shed in detectable numbers until shortly (i.e. months) before the animal develops diarrhea. Therefore, many young animals (i.e. yearlings) may be infected but may not be classified as positive on a fecal culture test. In addition, since Johne's is a slow-growing organism, it may take up to 16 weeks of incubation in the lab before a final result can be given. This is in contrast to the one- to three-day growth period of other common bacteria (E. coli, Pasteurella, etc.).

**Enzyme Linked ImmunoSorbant Assay (ELISA) blood test** is a commonly used Johne's test that's inexpensive to run and the results are available within a day. It detects antibodies in blood to *M. paratuberculosis*. This test performs similarly as fecal culture—it will not detect Johne's infected animals in early life. At about the same time in the course of disease that the fecal test will be positive, so will the ELISA blood test.

The ELISA blood test has one important limitation that fecal culture does not. About one percent of animals that do not have Johne's will test positive for Johne's on the ELISA. It is important to recognize this and obtain a fecal sample from ELISA positive animals for confirmation of Johne's. Animals not infected with *M. paratuberculosis* will test negative on the follow-up fecal culture and would be properly considered Johne's negative. However, these animals will need to be followed carefully. Some animals that test positive on the ELISA test may not be shedding organisms, but they may be infected and shed organisms in feces at a later date.

**Necropsy of a suspect animal**, with submission of tissue, blood, and fecal samples to the diagnostic lab, is another way to diagnose Johne's in a herd. Lesions are very characteristic and numerous bacteria are commonly seen in lesions. Cultures can be done on tissues, which gives more reliable results than culture of feces only.

**Prevention of Johne's Disease**

*Producers who do not have Johne's disease should take every precaution to avoid introducing it to their herd.*

The most common way to introduce Johne's into a herd is through purchase of a Johne's infected animal. When purchasing an animal, ask if the seller knows about Johne's disease or has Johne's in their herd, and what (if anything)
they are doing about it. Inquire if the herd has an active Johne's surveillance program, including a testing program. This gives some measure of certainty whether or not the seller is concerned about Johne's disease and is looking for evidence of Johne's in their herd. **Buyers should preferentially purchase from herds with ongoing, active Johne's testing programs.**

Testing new animals for Johne's on arrival after purchase is a good idea. However, yearlings that are truly Johne's infected may be in the early, subclinical stages of the disease and test negative on arrival. Therefore, with yearlings and calves, rather than relying on individual animal testing at the time of purchase, it is important to have some level of confidence that the herd of origin does not have an ongoing Johne's problem.

Purchasing middle-aged animals may decrease the risk of Johne's. Most animals that will develop Johne's would be expected to have done so by the time they are five. However, this is not always the case. If animals are more than five years of age, testing at purchase gives the buyer more confidence that they do not have Johne's.

Semen purchased from a reputable commercial firm poses little risk for introduction of Johne's.

Purchasing properly processed embryos for embryo transfer into recipients in your Johne's negative herd is not considered to present a high risk for Johne's. However, **be extremely cautious purchasing female recipients for use in an embryo transfer program.** Often, these females come from multiple, unknown sources and may introduce Johne's disease into the herd or infect the fetus.

**Control of Johne's Disease**

Once identified in a herd, control of Johne's disease is a frustrating, long-term commitment. Many producers have experience with some disease condition that swept through their herd one year and the following year things were back to normal. Johne's is not like this. It will not subside, and it will only get worse. Even with an excellent control program, new cases of Johne's may continue to be identified for four to five years. In some herds, control of Johne's may require a 15-year commitment.

There are no effective antibiotic treatments for Johne's disease. Many antibiotics have been tried, but none are effective or practical.

Johne's control programs will vary from herd to herd, and each program needs to be formulated with the individual herd in mind. Herd size, likely number of infected animals, herd management, and herd goals need to be considered.

It is difficult to describe one program that will fit all herds, but several basic control points are applicable to most circumstances.

**Cull clinical Johne's cows immediately.** Remove animals with signs of Johne's (diarrhea) from the herd. At a bare minimum, place these animals in strict isolation and test to confirm Johne's disease. If they test positive, cull them.

**Follow the herd testing program outlined by your veterinarian.** This is the central feature of a Johne's control program in beef herds. **At minimum, test all cows at least annually, and remove all cows shedding the organism.**

These cows may not have diarrhea and may look normal, yet results of fecal culture tests indicate that they are shedding *M. paratuberculosis*. They are contributing to environmental contamination with the Johne's organism; **cull them.**

**Maintain clean calving areas.** Clean between cows. If calving pens are constructed of impervious materials, disinfect them between cows if possible. Although no disinfectant is completely effective against *M. paratuberculosis*, orthophenyl phenate is at least partially effective.

At minimum, remove all bedding and debris between cows, and rebed the pen with clean bedding. **Any procedure that helps assure that the susceptible newborn calves will have minimal contact with potentially infected fecal material will help limit the spread of Johne's.**

**Maintain turnout pastures to minimize calf contact with infected manure.** Multiple turnout lots are preferable to one, large turnout pasture. When using multiple lots, fill the first lot with pairs and close to additions, then fill the second lot and close, and so forth. **The goal of this management practice is to limit the number of potentially infected cows a young calf may encounter.** It can also be a useful technique for control of other infectious diseases (scours) of baby calves.

**Spread all manure onto non-pastured land.**

**Limit access to wet, low-lying areas.** These may represent areas where *M. paratuberculosis* may survive for many years.

**Do not contaminate feed for young stock with manure.** Do not use the same equipment to handle feed and to move manure. Do not use feed sweepings (refused feed) from adults to feed to calves; it could have manure contamination.
Management Summary for Controlling Johne's Disease

Control of Johne's disease is intended to halt the transmission of *M. paratuberculosis* with the herd. Since there are no effective treatments for cows already infected, the control program should identify infected cows early so they can be removed before they add contamination to the premises.

In the dairy industry, the central point of Johne's control rests on prompt removal of the newborn calf to a non-contaminated environment and feeding non-infected colostrum and milk. The goal is to produce a Johne's free calf, assuming that intrauterine transmission did not occur.

*In the beef herd, Johne's control relies primarily on testing to identify infected cows, culling them immediately, and maintaining clean calving/nurse pasture areas.* Early removal of the calf from the dam is not a viable option for most beef producers, but it may be considered in the case of an extremely valuable individual.

*Formulate a Johne's control program with the assistance of the herd veterinarian.*

All farm personnel must fully cooperate for a Johne's control program to be effective.

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