

Johne's Disease In Cattle

Johne's (pronounced *Yo-nee-z*) disease is a chronic infection with a bacteria called *Mycobacterium paratuberculosis*. The disease is found in cattle, sheep, goats and other ruminants including elk, deer and bison. The infection is primarily located in the intestinal tract but the organism can be found in many tissues of the body.

Animals typically do not show clinical signs of the disease until 2-10 years after becoming infected. Clinical signs include diarrhea and weight loss despite a normal appetite. As the disease progresses the animal may become hypoproteinemic and develop intermandibular edema or bottle jaw. As further progression occurs animals become increasingly weak and emaciated.

The Causative Organism

The causative organism is *Mycobacterium paratuberculosis*. It is an aerobic, non-spore forming, gram positive, non-motile, acid-fast bacillus. It can survive in the environment for extended periods. It has been shown to be 99.7% homologous with the genome of *Mycobacterium avium*. This has led some to suggest that it be classed as a subspecies of *Mycobacterium avium*.

Pathogenesis

It is generally believed that calves are infected at birth or in the first weeks of life and go on to develop signs in 2-10 years. In utero infection is also known to occur with infection rates being as high as 50% in calves born to clinically affected cows. The infection rate is less for calves born from infected but not clinical cows and has been estimated at 9% by some. The organism is shed in large numbers in the feces of both clinical and non clinical animals. It is also present in the colostrum and the milk.

Once the animal has been infected the organism invades the intestinal lining. The animal responds to the infection by multiplication and infiltration of immune cells producing a thickened digestive tract. This results in less efficient absorption of water and nutrients which then leads to weight loss, diarrhea and finally death.

Stages Of The Disease

The disease has been characterized as having four stages:

Stage one: Silent Infection

These are animals from birth to two years. These animals are infected but there is no way to determine if the infection is present or not.

Stage Two: Inapparent Adult Carriers

These animals do not show clinical signs but may have detectable antibodies in their blood. They may shed organisms in the feces and milk or give birth to infected calves.

Stage Three: Clinically diseased

These animals show clinical signs as described earlier. Most of these animals are positive on fecal culture and some serologic tests.

Stage Four: End Stage Disease

These animals are severely emaciated and will not pass slaughter examination for human consumption.

Incidence

The incidence of the disease in Alberta is not known. Some U.S. studies show an overall prevalence rate of 1.6% to 10.8% depending on the state involved. In general prevalence is thought to be higher in dairy cattle than in beef cattle.

Testing

There are a variety of tests available. Some are better at confirming the disease in clinical cases and others better suited to herd surveys. The "Gold Standard of tests" still remains fecal culture. Its major drawback remains that culture may take up to four months to complete. Blood testing in the past has been plagued by tests that missed too many true cases (false negatives) and too many false positives. Some of the Elisa tests now available eliminate most of the false positives but the number of false negatives can still reach 50% in some cases.

The choice of test or tests to run should be made in consultation with the herd veterinarian.

Control Measures

Control measures revolve around testing, culling and management practices. Testing has been covered above. Culling positive animals is the mainstay of any Johne's eradication program.

Culling removes shedders from the herd and reduces the overall infection risk. Culling must be based on economic realities that exist in every operation and on the long term goals. If eradication is to succeed, every infected animal must be removed at some point.

It appears that embryo transfer is a means by which valuable genetics may be saved before culling as the risk of an infected donor passing the infection via embryo transfer is small. The organism can be recovered from fresh and frozen semen. Whether this is a significant means of transmission is not known at this time.

Management plans can be quite complex and are based on herd infection rate and economic realities. The basic premise is to reduce the amount of infected manure that is ingested by all livestock, especially young calves, thus all rules about sanitation apply. Consultation with a veterinarian is essential to ensure a good outcome.

Zoonotic Potential

Over the years it has been noticed that there exists a similarity between Johne's disease in livestock and Crohn's disease in humans.

Recent work to show that the *Mycobacterium paratuberculosis* is present in most tissues of infected cattle and that it can be grown from pasteurized milk has led to renewed efforts to prove a link. At the present time there is no hard evidence that the causative agent is the same and some work to show that it is not. It would be prudent for all livestock producers to tune in to the debate so as to be able to position their herds accordingly.

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