

Johne's Disease

Johne's disease (paratuberculosis) is a chronic debilitating disease that affects the intestines of all ruminant animals, including cattle, sheep and goats. Although many animals in a herd may be infected, usually less than five per cent of infected animals develop clinical signs of disease. This is called the "iceberg effect." Under circumstances of stress, inadequate nutrition or parasitism, more of the infected animals may develop clinical disease. Once clinical disease develops, affected animals eventually die due to dehydration and starvation as a result of malabsorption of nutrients. There is no treatment for Johne's disease.

The true prevalence and economic losses associated with Johne's disease have not been determined. This is because there is no practical diagnostic test that reliably detects infections by the causative agent of Johne's disease, *Mycobacterium Avium Subspecies Paratuberculosis* (MAP), in those living animals that have not developed clinical disease. The fact that MAP grows very slowly delays the immunological response and detection of the bacterium in serum and in feces.

The epidemiology of the disease is different in dairy and beef herds, mainly due to management factors. The differences in cow and herd prevalence, along with the long incubation period of MAP, causes a broader range in sensitivity of the diagnostic tests (10 to 50 per cent) and high variation in the serology versus fecal culture tests, mainly during early stages of the disease when it remains sub clinical.

Several studies have been performed in Alberta in the last few years to determine the prevalence of Johne's disease. In these studies more than half of dairy herds and approximately 14 per cent of beef herds appear to be infected with MAP. However, these numbers may be higher due to the factors explained before.

The most significant economic losses associated with Johne's disease are decreased milk production and reduced salvage value of clinically affected

animals. Milk production from dairy cows affected with Johne's disease has been estimated to drop by 590 kg in the third lactation and up to 1,270 kg in the fourth lactation. Affected animals have an increased risk of being culled early and the slaughter weight of these animals was 59 kg less than non infected animals.

Cause

This disease is caused by *Mycobacterium Avium Subspecies Paratuberculosis*, which is closely related to the organisms that cause tuberculosis and leprosy. This organism does not cause disease in non-ruminant animals; however, these animals may perform as reservoirs, creating a risk to transmit the disease.

Infection with MAP is usually acquired by consuming feed and water contaminated with manure from infected animals. Fecal shedding from clinically affected animals has been estimated to reach more than 500 billion organisms per day. Obviously, the environment can become very heavily contaminated and

most animals on these farms will be exposed to the infection.

Up to 35 per cent of cows with advanced clinical disease will shed MAP in their milk. As well, there are reports of calves being born already infected, but this appears to occur only among dams that are shedding very high numbers of the organism.

Mycobacterium Avium Subspecies Paratuberculosis is resistant to environmental degradation, as well as many disinfectants. This organism survives in stagnant water, manure or deep soil for up to a year. It also withstands freezing at minus 14°C for up to a year. The ability of this organism to survive in the environment is reduced by the presence of urine or by the ensiling process.

Calves under six months of age are the most susceptible to infection. Depending on the

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number of organisms the calf is exposed to, only about a third of exposed calves become chronically infected with MAP. Clinical signs of disease are rarely observed in animals under two or three years of age. Consequently, this is a disease of adults in which the infection was acquired in the first few months of life.

Mycobacterium Avium Subspecies Paratuberculosis infects cells that line the intestines, but it is not detected by the immune system, or does not trigger an immune response enough to eliminate it at early stages in younger animals.

However, as the disease progresses clinical signs may appear as a result of the body's immune response to the presence of MAP, not by direct damage of the intestinal cells by the organism itself.

Signs of infection

Less than five per cent of infected animals develop clinical signs of illness. The reason for this is unknown. Infected animals without clinical signs act as carrier animals and are a source of infection to the environment on the farm.

Clinical signs rarely develop in animals under two to three years of age. However, calves exposed to a heavy burden of MAP may result in clinical signs at 18 months of age. Affected animals may develop intermittent bouts of diarrhea that gradually become more frequent. Other animals suddenly develop diarrhea, which persists until death.

Progressive weight loss is typical of this disease and may begin before diarrhea develops. Although affected animals appear unthrifty, with a rough hair coat and declining milk production, their appetite remains normal until the terminal stages of the disease. As a result of the chronic protein loss through diarrhea, affected animals may develop ventral edema (bottle jaw). Weight loss without diarrhea is the main sign of disease in sheep and goats.

Diagnosis

Animals with chronic, non-responsive diarrhea and progressive emaciation, coupled with a normal appetite should be viewed with suspicion. Johne's disease is confirmed by a postmortem examination where increase thickness and transverse folds in the intestinal lining are observed.

It may be difficult to detect infected animals that do not exhibit clinical signs. Culture of feces for MAP is expensive because of the long time required to grow the organism. Cultures must be incubated for up to four

months before they can be called negative. Intermittent shedding also makes a negative fecal culture difficult to interpret. Several blood tests are available but the number of false positives and negatives makes these tests unreliable.

Vaccination

Vaccines have been developed in the United States, Europe and New Zealand. They are effective in reducing the number of clinically affected animals. Unfortunately, vaccination does not reduce the total number of infected animals in the herd.

Reactions at the injection site in animals or in humans injected accidentally are major concerns regarding the use of paratuberculosis vaccines. These vaccines are not available in Canada because they interfere with subsequent tuberculosis tests.

Control

Producers should attempt to maintain a disease free herd by rearing their own heifer replacements. Purchasing replacements is risky because of the lack of a reliable test to detect infected animals that are not showing clinical disease.

Once the disease has been diagnosed in a herd, avoid selling the animals for dairy or breeding purposes. Infected herds have up to 20 times more carrier animals than those showing signs of disease.

Because of the difficulty in detecting carrier animals, eradication of Johne's disease from a herd is unlikely to be successful. Even complete depopulation may be unsuccessful due to the risk of purchasing carrier animals to repopulate the herd. Rigid culling procedures and improved herd management will reduce Johne's disease to acceptable levels.

Recommended management practices for infected herds include the following:

- Cull animals exhibiting signs of clinical disease that suggest of Johne's disease. Have the carcasses examined to confirm the diagnosis.
- Cull all offspring, dams and siblings of confirmed cases.
- Separate unthrifty animals from the herd.
- Clean and disinfect areas where affected animals have been kept. MAP is susceptible to 10 minutes exposure to five per cent formalin, 1:32 cresylic disinfectant, 1:40 phenol, 1:1000 mercury bichloride and 1:50 calcium hypochloride.

- Remove manure from the barn yard regularly and spread on cultivated land. Avoid spreading manure on pastures.
- Pasture calves on clean pasture and maintain in winter quarters separate from adults until the heifer enters the milking herd.
- Drain, fill or fence off sloughs.
- Protect young animals from adult manure drainage.
- Ensure feed and water are not contaminated with manure. Drinking water should be piped from clean sources.
- Remove calves from their dams immediately after birth and put them in clean quarters separate from adult animals.
- Clean the udder before drawing colostrum for calf feeding.
- Rear calves in individual pens and switch to a high quality, powdered milk replacer after 72 hours of age.

Alberta's Johne's Disease Initiative

The Alberta dairy industry has committed to work together to promote an awareness and educational initiative to minimize the spread of Johne's disease in dairy herds.

The Alberta Johne's disease initiative (AJDI) consists of four elements:

- education
- an on-farm Johne's disease risk assessment and management plan carried out by the herd's veterinarian
- research on the disease and on ways to improve the AJDI and to monitor its success
- Johne's disease Herd Status for herds that have participated in Alberta Agriculture and Rural Development's Herd Status program, or those producers desiring to proceed beyond implementing prevention and/or control measures for JD to become certified

For more information, please contact Alberta Milk at 780-577-3307.

The Canadian Johne's Disease Initiative (CJDI)

The Canadian Johne's Disease Initiative (CJDI) was created to promote awareness and education on Johne's disease and to reduce the prevalence of this disease in Canadian herds. CJDI is a collaborative activity primarily driven by industry with participation of governments and veterinary schools. This initiative is led by Dairy Farmers of Canada (DFC), the Canadian Cattlemen's Association (CCA), and the Canadian Animal Health Coalition (CAHC).

Funding from the Advancing Canadian Agriculture and Agri-Food Program (ACAAF) and industry, with leadership from CCA, DFC, and CAHC resulted in the development of the Canadian Voluntary Johne's Disease Prevention and Control Program (2005-6). A follow-up project (2008-9) developed guidelines for the national coordination of provincially delivered JD control programs and initiated a plan for moving forward. JD prevention in Canada is a targeted management assistance approach, not a regulatory program. The program provides two pathways. The first is the status pathway, which is designed for herds with low prevalence of infection. The second is the prevention pathway, which focuses on keeping the healthy and susceptible animals in the herd (i.e. young calves) disease free by reducing the risk of transmission from those animal that are presumably infected with Johne's disease.

Initially, the CJDI encourages provincial delivery of the Prevention Pathway of the JD program. Alberta, Ontario, Manitoba and Quebec have initiated programs. Other provinces, including Saskatchewan, British Columbia, and the Atlantic region are considering program options.

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For more information

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