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JOHNE'S DISEASE: WHAT IS THE FUTURE?

What is Johne's disease? Johne's disease (pronounced *yo-KNEES*) is a condition of cattle and other ruminants that causes chronic diarrhea, weight loss, infertility, and eventual death in animals that are infected years earlier. The causative agent of Johne's disease is *Mycobacterium paratuberculosis*, a slow-growing bacterium that can live in the environment for a year or more. Johne's disease in cattle has economic, regulatory, legal, and human health significance.

How does Johne's disease affect cattle? Cattle with clinical Johne's disease exhibit severe diarrhea and weight loss. The cattle are usually from 2 to 10 years of age when they show signs of this disease. In most cases they became infected with the bacteria at or near birth. Between the time of infection and the first clinical signs is usually several years, during which the cattle appear healthy.

How do you diagnose Johne's disease? For cattle with clinical signs of Johne's disease diagnosis is relatively easy. These animals exhibit weight loss and diarrhea as the primary signs. However, many diseases show signs of diarrhea and weight loss, including: (1) parasites (roundworms, liver flukes, coccidiosis), (2) BVD (bovine virus diarrhea), (3) copper deficiency, (4) liver failure, (5) grain overload (founder), (6) selenium deficiency, and (7) Salmonellosis, to list just a few.

Cattle with advanced Johne's disease have "bottle jaw" (fluid accumulation under the jaw). A serum sample submitted by your veterinarian to the California Veterinary Diagnostic Laboratory can confirm a diagnosis of Johne's disease for these sick animals. If the sample is positive, the animal has Johne's disease. If an animal dies or is euthanized, a post mortem examination can also easily diagnose the condition. Also, the feces can be cultured for the presence of *M. paratuberculosis*; however, the laboratory culture of this organism from the feces takes 12-16 weeks.

When testing serum from cattle that have not yet developed clinical signs of diarrhea or weight loss, this laboratory test is often negative, despite the fact that these carrier animals will eventually develop clinical disease and be positive on the serum tests. **This is the problem with Johne's disease diagnosis:** identifying the carrier animal that is not yet showing signs of weight loss or diarrhea and is shedding *M. paratuberculosis*. Your veterinarian can help you with diagnosing these animals in a herd.

How does the Johne's agent cause disease? The organism, *Mycobacterium paratuberculosis*, usually gains access to the host via oral ingestion, although other routes are possible. The *M. paratuberculosis* bacterium initially infects the last segment of the small intestine. The growth of the organism and spread of infection is slow and usually takes several years before any disease is detectable in the individual animal. As the amount of small bowel inhabited by the bacterium increases, the numbers of organisms shed in the feces increases. These *M. paratuberculosis* organisms in the feces of cattle are the primary way Johne's is spread from animal to animal. With time, the infection in the intestinal tract becomes more widespread and the lymph nodes near the bowel become infected with *M. paratuberculosis*. Later, the organism can become disseminated outside the intestinal tract and infect the uterus, mammary lymph nodes, udder, and sexual organs of bulls. Therefore, the agent can be shed in the milk and semen in addition to the feces. By the time the agent has spread outside the intestinal tract, the feces contain large numbers of *M. paratuberculosis* that can serve as a source of infection for many animals in the herd.

How does transmission of the agent occur? Transmission can occur in several ways. The first to consider is **prenatal or in utero** transmission of the agent. In this instance, the agent passes from the infected cow to the calf **before birth** and the calf is born infected. Infected cows that are showing clinical signs of Johne's disease (weight loss, diarrhea) transmit the agent to the unborn calf 20 to 40% of the time. For infected cows that are not showing signs of Johne's disease (asymptomatic), *in utero* transmission occurs about 8% of the time. Clearly, heavily infected, pregnant cows that are showing signs of weight loss or diarrhea should not be kept in the herd to "get just one more calf." These cows will have too high a chance of infecting their calf prenatally and will also shed high numbers of the organism in the environment. If these cows do not transmit the agent to their calf *in utero*, it is probable they will infect their calf (and perhaps many others) soon after birth.

The most common time of infection of calves occurs soon after birth. The young calves are most susceptible to the disease. The organism can be in the feces of the cow and can also be in the colostrum or milk. Also, there is usually some manure on the udder of cows, even in the best of circumstances. Therefore, the act of suckling can expose the calf to *M. paratuberculosis* in feces on the udder, in the milk (or colostrum), or to fecal contamination in the environment.

Two factors determine susceptibility to infection by the Johne's agent; (1) age, and (2) dose of the organism. The younger the animal, the more susceptible. As an animal reaches one year of age, the resistance rises to that of adult levels. Also, the higher the dose, i.e., the more Johne's organisms encountered, the more likely an infection will result. So very young cattle ingesting a high dose of organisms are most likely to become infected and conversely, adult animals ingesting a low dose of organism are least likely to become infected. On beef operations, occasionally, twin calves or orphan calves do not have access to colostrum from their dams and colostrum from dairy cattle is given to these beef calves. Because the incidence of Johne's disease is much higher in dairies, there is increased risk that the *M. paratuberculosis* organism could be introduced into a clean beef herd in this manner. This could be a potential for herd to herd transmission.

Other means of transmission exist. This agent can also infect sheep, goats, and wildlife ruminants such as deer. Johne's disease can affect all these species in a similar way to which it affects cattle. Therefore, transmission can theoretically occur between these ruminant species. Fecal contamination of clothes, boots, and equipment could also move the agent from one premise to another or from animal to animal. Therefore, human activity can be a means of transmission.

One of the more important means of transmission on beef operations is via infected bulls. The *M. paratuberculosis* organism can be found in the semen and accessory sex organs of infected bulls. Inoculation of the uterus with the Johne's organism can result in infection of the cow. Additionally, bulls are with the cowherd when the calves are young and if the bull is infected and shedding the organism in his feces (even when he has no signs of disease) he is exposing all the calves at a time when they are most susceptible. The practice of sharing or leasing breeding bulls (particularly older bulls that could be shedding the organism in their feces at high levels) can result in significant spread of Johne's disease in beef herds.

Is Johne's disease a public health concern? There has been quite a lot written about the possible link between Johne's disease in ruminants and a disease in humans called Crohn's disease. Crohn's disease is an inflammatory disease of the intestine (ileum and colon) that usually affects patients during the prime of life (teens to early twenties). Most Crohn's disease patients require surgery and intensive medical therapy and suffer chronic pain throughout their lives. Most Crohn's disease patients describe their quality of life as poor. **Whether *M. paratuberculosis* is the cause of Crohn's disease is not known at present.** Any association may be that patients with severe bowel disease have more chance of opportunistic colonization of their disrupted intestinal mucosa by these types of bacterial agents. However, research in this area will continue and if the Johne's agent does cause Crohn's disease, beef producers will need to eliminate this agent from their herds.

What is the future for control of Johne's disease in cattle? Recently, proposals for programs to eliminate Johne's disease in cattle herds have been developed. The California Department of Food and Agriculture's Animal Health Branch in cooperation with the California Cattlemen's Association and other groups has formed a Johne's advisory group. Programs to certify herd status with respect to Johne's disease will be developed for California based on the programs approved by national organizations. Herd certification will be particularly important for seedstock or purebred herds. **As we all recognize, introducing Johne's disease into your herd by purchasing high priced bulls or heifers is not progress!** Also, because of the insidious nature of this disease, it can be potentially devastating to purebred herds. Infected herds that sell bulls or replacement heifers could lose their markets. Knowingly selling cattle from an infected herd could cause the seller to become liable for future losses by the buyer due to Johne's disease.

The Johne's disease herd status program will be voluntary. Herds will be assigned status based on the amount of testing done in the herd to assure the herd is not infected. The more testing and the more rigorous the tests, the higher the herd status. This herd status will be particularly important for seedstock producers. For buyers of bulls, etc., it will be important to purchase cattle from herds that are actively testing to assure their cattle do not have Johne's disease. There will be herd status testing programs for herds known to have had Johne's disease in the past and there will be programs for herds that have been clean. No one will be left out of the opportunity to participate in this voluntary program.

Control of Johne's disease is essential for a healthy herd. One very important point of control is preventing the introduction of known infected cattle into a herd. **The problem with controlling the spread of Johne's disease is that we can't efficiently identify the individual carrier animals before they show signs of weight loss or diarrhea.** Therefore, you must avoid introducing animals into your herd from unknown sources, such as leasing bulls, purchasing dairy cattle (which have a higher incidence of Johne's disease than beef cattle) for nurse cows, fertilizing pastures with manure from other herds (particularly dairy herds), or other practices that would expose calves to manure from potential Johne's carrier cattle. Preventing Johne's disease introduction is particularly important because elimination of the disease from a herd can be very difficult. The voluntary herd status programs will hopefully provide a mechanism to work toward preventing this disease or eliminating it from beef herds. As further information on the California Johne's advisory group becomes available, we will pass it on in this column.

In summary, Johne's disease in cattle causes diarrhea, weight loss, and eventual death in infected cattle. It is a complicated disease because it has a long incubation period, the agent can survive in the environment for long periods, and carrier cattle (that can shed the organism) with no signs of disease are difficult to detect at present. Your veterinarian is your most important source of specific information about this disease and can help you diagnose this condition and help control this disease in your herd if necessary.

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