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Johne's Disease or Paratuberculosis

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Johne's disease (pronounced "Yone-es") or paratuberculosis is an incurable wasting disease of adult cattle that is being increasingly recognized in the United States. Since prevalence rates in U.S.-slaughtered cows range from 2 to 18 percent, Johne's disease is now considered a major problem. It is of more concern in dairy herds than beef operations since there is a larger percentage of cases in the dairy cattle population than in beef. This difference is probably unrelated to specific breed susceptibility but reflects differences in management practices and close confinement, both of which favor easier transmission of the organism. Therefore, the major problem is the infected dairy herd.

First described more than 90 years ago in Germany, Johne's disease is of particular concern to farmers breeding and exporting pedigree cattle. Countries free of Johne's disease almost invariably require cattle to come from Johne's-free herds and to have all cattle pass one or more blood tests. Currently, few U.S. herds have the favored Johne's-free status.

A specific bacterium related to the tuberculosis organism (hence the synonym paratuberculosis) causes an infectious enteritis with severe weight loss and diarrhea. It is economically important because some animals may be so emaciated that they are condemned at slaughter. Others suffer from reduced productivity (milk yield), now recognized to occur for a long period before clinical signs appear.

Origin of the infection

The organism lives in the intestinal cells and lymph nodes, where it causes progressive thickening of the bowel wall of the lower small intestine and upper large intestine. Infection sometimes extends to the lower large bowel and rectum. The organism is passed out in feces and easily survives in manure and stagnant pond water for a year or more.

New infections usually occur when young calves are exposed to the contaminated environment and ingest the organism by licking or sucking the dam's udder or vulval area. Infections also occur when young calves come in contact with dirty infected bedding in calving areas.

Venereal transmission by artificial insemination or natural service has never been demonstrated. Although the organism has been cultured from the milk of clinical cases, it is not yet known whether such milk can act as a source of Johne's infection for calves. This potential source of infection, however, should be considered in any control program.

Although infection starts in early life and new infections are unlikely after six months of age, clinical signs of Johne's disease rarely appear until cattle are 2 years old. The peak incidence occurs at 4 to 7 years, but some cases are found in cattle as old as 15 years.

Disease categories

Four groups of animals may be identified in an infected herd.

Group 1 comprises confirmed clinical cases which pass the organism in continuous watery diarrhea. The onset often coincides with the stress of calving. Although signs may have only been seen for six months, the organism may have been shed onto the ground for more than a year. A typically affected dairy cow may have had an unaccountable loss of production in the previous lactation. About 5 percent of the mature cows may be in this first category.

Group 2 comprises subclinical shedders of the organism and may include up to half of the adult cows. Some of these cows later show clinical signs of the disease, but the majority will remain apparently normal for the rest of their lives. However, chronic poor growth and production may be noted in some cows over a period of years, during which they continue to excrete the infection at intervals and perpetuate a herd problem. These are potentially just as dangerous for calf infection as Group 1.

Group 3 are the subclinical carriers. These cattle have acquired the infection, but do not develop Johne's disease and do not excrete the bacteria. In these cattle, the organisms have passed through the gut wall to reside in the bowel lymph nodes. Again, up to half the adult cattle in a herd may be in this category. Identification of these subclinical carriers, some of which may later become shedders (Group 2), is difficult.

Group 4 comprises the non-infected animals. This is the desired herd status, especially in purebred herds that may rely on cattle exports and in which a proven demonstration of freedom from infection is necessary.

Diagnostic problems

Identification of infected cattle and the above groups require laboratory testing, which can be time-consuming and inaccurate. A major problem is the diagnosis of animals in groups 2 and 3.

Group 1 cattle are suspected on clinical signs. Despite chronic diarrhea, these cattle continue to eat well and look bright. The manure is not mixed with blood or mucus. Repeated examination of feces or of bowel wall scrapings obtained by rectal palpation will eventually demonstrate typical bacteria.

Unfortunately, confirmation of the organism by culture takes up to three months because growth is slow. Although taking a culture is very time-consuming, it may be the most useful way of detecting the preclinical case.

Various blood tests are available but none is 100 percent accurate. The most reliable method in the live animal requires flank surgery and removal of part of a lymph node for bacteriological culture of the organism. This method is laborious and expensive.

Johne's Disease as a herd problem

The total losses from the clinical and subclinical forms of Johne's disease in U.S. dairy herds are estimated to be \$1.5 billion annually. One-third of dairy herds in some states are infected. Recently, the annual economic loss in Wisconsin was estimated to exceed \$52 million.

Diagnosis of a single case may be an indication of a serious herd problem and represent the tip of the iceberg on that farm. An adult cow with persistent diarrhea for months that is non-responsive to treatment is most likely to have Johne's disease.

Other possibilities include:

- Salmonellosis, which although unusual as a wasting disease in adults, has obvious public health significance
- Bovine virus diarrhea
- Winter dysentery, which usually affects several adult cattle simultaneously
- Parasitism, which rarely produces such dramatic signs in adults.

A rare kidney disease, amyloidosis, causes chronic diarrhea and weight loss, but both water intake and urine output are increased. In amyloidosis, rectal examination by a veterinarian is likely to reveal a massively enlarged left kidney and urine tests generally indicate a massive concentration of urine protein.

Eradication

A herd management program for eradication of infection, which may take four years, requires major changes. The average infected herd contains 38 to 42 percent infected animals (Groups 1, 2 and 3). Culling of infected animals in Groups 1 and 2, and ideally also Group 3, is necessary. Replacement calves may be vaccinated.

Because problems can arise with subsequent interpretation of the tuberculosis skin test, vaccination is not allowed in some states. Vaccine usage is only permitted by state regulatory veterinarians in herds which are found positive for Johne's disease and negative for tuberculosis. The vaccine can also produce local reaction at the injection site resulting in a firm nodular mass. Vaccination will unfortunately not protect against a massive infection. Vaccinated animals do not represent Johne's-free status. In fact, they represent potential carriers. Vaccination is part of a policy designed to force farmers to institute appropriate management practices for control and eradication of the disease.

Changes are necessary in calf-rearing procedures:

- Calves should be removed from the dams immediately after birth. Removal at one or two days old is too late because the infection may already have entered the calf.
- Calves should receive colostrum collected after careful udder disinfection.
- Calves should only be mixed with adult cattle when they reach breeding age, e.g. 18 to 20 months.
- Calf handling and feeding should be done each day before contact with adult dairy stock or by a different person, in order to avoid spread of

bacteria by hands, boots or clothing.

These additional steps must be taken to reduce the chance of infection of young cattle:

- Cows should calve in clean stalls or in dry and uncontaminated areas outdoors.
- Young cattle should not be permitted to graze land used by cows within the previous 12 months.
- Standing and stagnant water, which can be contaminated by bovine feces, should be drained or fenced.
- Water should be available from flowing streams or from fresh water piped into troughs.
- Slurry from cattle sheds should not be spread on pastures grazed by young stock.
- Breeding should be by artificial insemination, or with bulls which are confirmed negative for Johne's disease.
- Replacement animals should always be purchased from Johne's-negative herds (blood test negative).
- Calves of cows which subsequently become clinical cases (Group 1) or subclinical shedders (Group 2) should be culled because of exposure and possible infection from their dams soon after birth.
- Any cattle showing chronic diarrhea non-responsive to treatment should be culled immediately and unhealthy cattle should be isolated until a definite diagnosis is made.

Two additional conditions can complicate control measures. First, some calves are capable of being infected as fetuses. Such calves will, despite careful avoidance of post-natal infection, have a greater risk of developing disease. Such fetuses acquire infection across the placenta or membranes from the Group 2 or 3 dam.

Second, other ruminants on the same farm may also have the disease. Johne's disease occurs in goats, occasionally in sheep and also in wildlife such as white-tailed deer. To what extent these species serve as reservoirs of infection for cattle by contaminating common grazing is not yet known. Infected sheep tend simply to lose condition, diarrhea is uncommon and cases are often incorrectly diagnosed as having gastrointestinal or other internal parasitism. The sheep intestine may not show the typical corrugated appearance as in cattle.

It must be emphasized that no single test will detect all infected (Groups 1, 2 and 3) cattle. Culture of feces from every adult bovine every six months with removal of positive cattle is not usually practicable, although it has been shown to eliminate clinical disease. Rearing of calves separate from cows until they reach breeding age may be possible in some dairy herds, but is not feasible in beef herds or in sheep and goat flocks.

Future policy

A herd program for eradicating Johne's disease requires deliberation and thorough discussion with veterinary advisers. A national eradication campaign cannot be contemplated until more accurate tests, capable of detecting preclinical infection (Groups 2 and 3), are available. In some countries, an increased awareness of Johne's disease by producers, who have tended to cull early clinical cases, has led to a reduction of the problem. Consult with your local veterinarian for additional information.

Related MU Extension publications

- G2120, Bovine Leukosis
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2120>
- G2122, Trichomoniasis
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2122>
- M150, Beef Cow/Calf: Herd Health Maintenance
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=M150>
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