

BOVINE PARATUBERCULOSIS

(JOHNE'S DISEASE)



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What Is Bovine Paratuberculosis?

Bovine paratuberculosis (Johne's Disease) is considered a major disease problem in cattle. It is unclear if the disease is more prevalent and spreading or if it is recognized more frequently because of greater awareness.

Bovine paratuberculosis is a fatal, chronic, infectious disease of cattle and other ruminants, characterized by persistent diarrhea and emaciation. Post mortem findings include a thickening and corrugation of the lining of the intestine. These changes parallel the debilitating diarrhea characteristic of the disease.

Bovine paratuberculosis has been recognized for nearly 100 years. In 1895, Johne and Frothingham reported finding organisms with staining characteristics (acid fast) similar to those associated with avian tuberculosis. Denmark experienced a chronic incurable enteritis in cattle in the early 1900s. Bang, in 1906, described the disease much as it is seen at the present time. He termed it *enteritis chronica bovis pseudotuberculosis* or *paratuberculosis* which establishes its close relationship to bovine tuberculosis. By 1908 the disease was recognized in several countries, including the United States. Bovine paratuberculosis is found wherever ruminant animals are raised. The disease also affects sheep, goats, and other wild or domestic ruminants.

What Is The Cause Of Bovine Paratuberculosis?

44.3
19
8
788
1,943
Paratuberculosis is caused by *Mycobacterium paratuberculosis*. One strain, the cattle strain, is the more common one found in disease outbreaks in cattle. There are two sheep strains capable of infecting cattle. Paratuberculosis bacteria have a peculiar waxy covering which is responsible for the organism's characteristic staining pattern and explains its longevity outside animals. This protective waxy coat also explains why the bacteria can live so long in the animal, evading the

animal's natural protective responses. They can survive in contaminated soil for years, although sunlight, drying, and high soil pH rapidly decrease the number of infective bacteria.

The bacteria seem to be more active in acid soils than in alkaline ones; severe clinical disease has resulted when infected cows were moved from alkaline to acid soils. The effect of trace element excess or deficiency is unknown, but some suspect they may play a role in the development of the disease.

Under field conditions the disease is transmitted by consuming feed and water contaminated by the feces of animals shedding the bacteria. Therefore, in cattle, the usual avenue of infection is from an infected dam to her calf. Contaminated calving areas and watering places play a role in infecting older susceptible animals.

The incubation time from infection as calves to signs of clinical disease can extend from two to six years. During this period an infected animal may respond to the bacteria, develop an immunity and never develop any signs of clinical disease. Other animals remain infected for their lifetime and may or may not shed bacteria during times of stress, such as at calving time. A small percentage of animals break with clinical disease, often at calving time, develop a debilitating diarrhea and die. Other animals may exhibit clinical signs of the disease, appear to recover, and weeks to months later again exhibit clinical disease which progresses to death. **The mortality rate in an infected herd usually is less than 1 percent per year but can be as high as 10 percent or more.**

This disease begins with intake of the paratuberculosis bacteria by a susceptible animal. In a contaminated environment most calves may become infected, but most of them will spontaneously overcome the infection. The remaining infected animals become carriers of the disease or become clinically ill. The ingested bacteria are picked up by cells lining the intestine where they multiply and spread to local lymph nodes and to other cells in the intestinal lining. Clinical disease is precipitated by a very rapid growth of the bacteria, likely during a period of stress when the immune system is compromised. This rapid proliferation



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of the bacteria and the cells that ingest them results in a marked thickening of the intestinal wall. This thickening results in malabsorption with consequent diarrhea.

Paratuberculosis bacteria may occasionally be found in the uterus, udder, and testicles. It is possible to have intrauterine infections and infections via milk or semen.

What Are The Clinical Signs Of Paratuberculosis?

In cattle, clinical signs seldom if ever appear before two years of age. The onset of clinical disease often accompanies or follows a period of stress such as calving, or shipping or concurrent disease. A profuse diarrhea is a cardinal feature of the disease in cattle. The diarrhea is watery, homogenous and without an offensive odor. Weight loss is pronounced even though the animal continues to eat and drink well. In dairy cows a significant drop in milk production is apparent. The course of the disease varies widely, with some animals having intermittent bouts of diarrhea followed by apparently normal periods. The clinical phase may last weeks or months, but a steady progression of emaciation, dehydration and weakness terminates in death. Cases occur sporadically because of the variable and long incubation period. Death loss is usually low. Total economic losses result not only from dead animals but especially from reduced milk production, mastitis and infertility in subclinically infected animals.

How Is Paratuberculosis Diagnosed In Cattle?

A chronic, intractable, recurrent diarrhea with weight loss in a mature animal is suggestive of paratuberculosis. Other diseases must be considered before a definitive diagnosis can be made. Diseases such as bovine virus diarrhea may exist concurrently with paratuberculosis, perhaps even precipitating clinical disease. Other diseases to be considered in a differential diagnosis are coccidiosis, winter dysentery, internal parasites, pyelonephritis, liver abscesses, malnutrition, or hardware disease. These diseases can be ruled out after a thorough examination by a veterinarian and/or diagnostic laboratory tests.

Several tests are used to assist in a definitive diagnosis. An intradermal or intravenous injection of a special bacterial preparation (Johnin) has been used for many years. False positive and negative results may occur. The CF (complement fixation) test was considered a standard serologic test for years but its accuracy has been questioned.

The standard definitive test has been to culture the paratuberculosis bacteria from the feces of infected, shedding animals. This test takes a minimum of 12 weeks of incubation on special media before a sample can be called negative. The bacteria are difficult to grow under laboratory conditions. Culturing feces will

not detect infected animals which are not shedding the bacteria; however, false positive culture tests seldom occur.

Newer tests have been developed which may make it possible to identify most infected animals. The AGID test — or agar gel immuno diffusion test — is a new application of an old principle. It has the disadvantage of being relatively insensitive and may yield false positive or false negative results. It does not pick up early clinical cases; it is best used to confirm findings of clinical disease.

The ELISA, or enzyme linked immunosorbant assay, test is a recent development which could aid in the control and/or eradication of paratuberculosis. It is based on detecting antibody in the serum of animals that have been infected with *Mycobacterium paratuberculosis* and have responded to it. It has the disadvantage that some false positive results occur.

Treatment

Many drugs, including streptomycin, viomycin and isoniazid, that have been successfully used in human tuberculosis have not altered the clinical course of bovine paratuberculosis. **At the present time there is no treatment.**

Prevention And Control Of Paratuberculosis

Certain management measures are necessary to prevent bovine paratuberculosis. Raising, rather than buying, replacement heifers and using artificial insemination are two important considerations because bovine paratuberculosis is usually introduced into clean herds by purchasing infected cattle.

Rotating calving areas, tilling or disking calving areas and spreading manure in tillable land rather than in pastures will reduce the number of infective bacteria in the ground.

Vaccination programs for calves, separating calves from dams at birth and feeding pasteurized colostrum have been successful in containing the disease in dairy herds, but these practices may not seem practical in a beef operation. Vaccination apparently prevents clinical disease but does not prevent infection. Vaccination reactions (swellings and abscess formation) also occur in vaccinated calves.

A control/eradication program requires time and patience. It would be unlikely that a herd could be cleared up from paratuberculosis in less than three to four years.

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