

Johne's Disease: Problems of Diagnosis & Control

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Summary

Johne's disease is a specific infectious enteritis of cattle, sheep, and goats. It is characterized by progressive emaciation, chronic diarrhea, and a thickened and corrugated wall of the intestines. Johne's disease is caused by the organism *Mycobacterium paratuberculosis*. It is strongly acid fast and also gram positive. Synonyms for the condition are bovine paratuberculosis or chronic bacterial enteritis.

Case Report

History

On August 4, 1987 a three year old Brangus cow was admitted and donated to the Oklahoma State University food animal clinic. She had a history of chronic diarrhea, weight loss, and poor physical condition which had become worse over the last six months. She seemed to be the only cow affected out of a herd of 50 cows.

Clinical Findings

The clinical findings upon physical examination were:

- 1) feces stained hocks and tail, thin unformed feces which did not have an offensive odor or presence of blood.
- 2) no fever was present.
- 3) severe emaciation with generalized muscle wasting.
- 4) a rough, faded hair coat
- 5) good appetite with excessive thirst.
- 6) rectal examination revealed that she was not pregnant.

Differential Diagnosis

Coccidiosis (*Eimeria bovis*)

Helminth parasites (*Ostertagia ostertagii*)

Salmonellosis

Malnutrition

Chronic traumatic reticuloperitonitis

Pyelonephritis

Hepatic abscesses

Chronic molybdenum toxicity

Liver flukes (*Fasciola hepatica*)

Diagnostic Test Performed and Results

- 1) Serology—complement fixation test (CF).
Results were negative.

- 2) Stained fecal smear for acid fast organisms.
Results were negative.

- 3) IV Johnin test. Reagents not available at OSU.

- 4) Surgical biopsy. Excisional biopsy of the ileocecal lymph node through a left flank incision. Histopathology was positive for acid fast organisms.

- 5) Fecal culture. Results were still negative at the time of necropsy.

Diagnosis

The only definitive diagnosis of Johne's disease is made by positive histopathology of an ileocecal or terminal ileum lymph node.

Prognosis

Prognosis is grave, since the disease can only be diagnosed in the terminal stages and mortality is near 100%.

Treatment

Treatment of the disease is not recommended since clinical signs are seen only in the terminal stages of the disease. Drugs useful in the treatment of other myobacterial infections have been used, and none have been satisfactory.

Necropsy Findings

The terminal ileum and the ileocecal valve were very edematous and thickened. Corrugation of the mucosa was evident. The mucosal epithelium was intact but was thrown into deep folds that could not be flattened out by stretching the gut wall. The ileocecal and mesenteric lymph nodes were enlarged and edematous. Generalized emaciation with serous atrophy of fat was a constant finding.

Discussion

The causative agent, *Mycobacterium paratuberculosis* is transmitted by oral ingestion of fecal contaminated feed or water from infected cows, by calves less than six months old. These young calves are highly susceptible. The incubation period is rarely less than one year and often extending for many years. In cattle, clinical signs do not appear before two years of age and are most common in the two to six year old group with females being affected more than males. Because of the abnormally long incubation period, infected animals may excrete organisms in the feces for 15-18 months before clinical signs appear.

After calves less than six months old become infected they may spontaneously recover in a few weeks or they may become resistant or shedding carriers. Both of the carrier states can progress to clinical disease cases later on. The natural resistance of the animal largely determines the outcome of the infection.

The primary site of infection is the wall of the intestine at or adjacent to the ileocecal junction. The lesion in the ileocecal valve region will gradually extend anteriorly to the jejunum and posteriorly to the colon and rectum. In advanced cases the affected gut is greatly thickened and the mesenteric lymph nodes are often swollen and edematous.

In infected calves *Mycobacterium paratuberculosis* proliferates very slowly and sets up the massive epithelial cell infiltration in the lamina propria of the mucosa and also the submucosa as well. This results in decreased absorption, chronic diarrhea, and resulting malabsorption. There is a reduction in protein absorption and a positive leak of protein into the lumen of the jejunum. In cattle it is this loss of protein which results in the extensive muscle wasting characteristic of the disease.

Conclusions

Difficulty is often encountered in the diagnosis of Johne's disease in individual animals because of the lack of dependability of available tests. Some diagnostic tests helpful in identification of the disease are listed here as well as certain benefits and drawbacks of each test.

- 1) Complement fixation test
 - Antibodies aren't detectable during the first year after infection, are detectable as the lesions become more severe, but then usually disappear before the early signs of illness.
 - False positives are due to cross-reacting antibodies with *Corynebacterium* and *Mycobacterium sp.*
- 2) IV Johnin test.
 - This test will detect approximately 80% of the cattle with clinical signs and is considered more reliable than either the complement fixation or the ID Johnin test.
- 3) ID Johnin test
 - Less reliable than the IV Johnin test and more likely to be differences in interpretation of results between individuals.
- 4) Stained fecal smears
 - A negative test is unreliable due to the intermittent shedding of organisms with the disease.
 - Many acid fast saphrocytic bacilli are present in feces normally causing false positive results.
 - This test will detect 30-60% of the clinically affected animals.

- 5) Fecal culture
 - This test is severely limited in its application because of intermittent shedding of diseased animals, and laboratory cultures must be incubated for three weeks. If a positive culture is obtained, it is a definitive diagnostic test.
- 6) Rectal biopsy
 - The rectal mucosa is invaded only in the terminal stages of the disease.
 - Many animals with terminal Johne's disease fail to have rectal lesions at all.
- 7) Surgical biopsy and Histopathology
 - Excisional biopsy of the terminals ileum or ileocecal lymph node is recommended as a method of making a positive diagnosis of Johne's disease.

As one can see, diagnosis is often difficult. If Johne's disease is diagnosed in a herd there are only control measures to be followed; since, treatment is unsuccessful. The control of Johne's disease may be handled in one of three ways:

- 1) *Vaccination*
 - Only if allowed by the state veterinarian. It may be used only in TB free states since it will cause the vaccinates to react positively to a TB test. If vaccination is used it must be given before 8 weeks of age.
- 2) *Identification and slaughter*
 - Carrier animals aren't always detected by diagnostic tests and many will shed the organisms for months before testing positive. Also, many non-infected animals will show false positive results.
- 3) *Maintain a separate herd*
 - Remove calves from the dam at birth and maintain them in a separate herd; or sell all progeny out of the herd for slaughter animals and don't keep any for replacement breeding stock. When the reproducing life span of the majority of the herd is almost gone, sell the entire herd for slaughter purposes.

Always remember that Johne's disease is a reportable disease and should be reported to the state veterinarian once diagnosed.

Advisers: Dr. Larry Rice and Dr. Eric Williams

References

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