



Johne's Disease – Beef

NATIONAL JOHNE'S
EDUCATION INITIATIVE

A cooperative effort of the National Institute for Animal Agriculture, USDA, APHIS, Veterinary Services, in association with the National Johne's Working Group & United States Animal Health Association

3 Stages of Johne's Disease Infection

Johne's disease is a slow, progressive, contagious, untreatable bacterial disease (caused by *Mycobacterium avium paratuberculosis*) that ordinarily infects calves and typically does not show clinical signs until animals are three or more years of age. Although older infected animals maintain a normal temperature, they exhibit weight loss and diarrhea that tends not to respond to treatment. In the later stages of the infection, animals can become weak.

Johne's disease or paratuberculosis in cattle has three stages:

STAGE I: Silent, subclinical, non-detectable infection

Typically this stage occurs in all calves, heifers and youngstock less than two years of age and many adult animals exposed to small doses of disease-causing organism. Infected animals at this early stage are rarely detected with currently available diagnostic tests, including fecal culture or serologic tests (ELISA). This stage

progresses slowly over many months or years to Stage II.

STAGE II: Subclinical infection

Typically this stage occurs in older heifers or adults. Animals at this stage appear healthy but are shedding adequate numbers of *M. paratuberculosis* organisms in their manure to be detected on fecal culture. Blood tests will detect some but not all animals at this stage. Blood test (ELISA) positive animals should be confirmed positive by fecal culture. These animals pose a major but often hidden threat for infection of other animals through contamination of the environment.

STAGE III: Clinical Johne's disease

Stage III is any animal with advanced infection—the onset which is often associated with a period of stress such as recent calving. Cattle at this stage have intermittent, watery pea-soup manure. Animals lose weight and gradually drop in milk production but continue to have a good appetite. Some animals appear to recover but



Is this two-year-old Johne's disease free or at Stage I or II? You can't tell by looking.

often relapse in the next stress period.

Most Stage III animals are shedding billions of organisms and are positive on culture.

Clinical signs often last several weeks to months before the animals are sent to slaughter in a thin, emaciated condition.

In the final and terminal aspects of Stage III of the fatal disease, animals become emaciated with fluid diarrhea and develop "bottle jaw."

MAP Protein Study Leads to Discovery

Mycobacterium avium subspecies *paratuberculosis* (MAP) is the bacteria responsible for the onset of Johne's disease, and researchers have now sequenced the MAP genome—which contains all its genes. As a result, researchers now have information about the different proteins that are made from those genes.

"MAP is like a stealth organism," states Dr. Judy Stabel, microbiologist at Agricultural Research Service's National Animal Disease Center. "It shelters in the host's white blood cells and stays at low levels until stress makes the disease apparent. And it's

one of the hardest organisms to work with in the field."

Working with an array of 96 proteins associated with MAP, Dr. Stabel along with Dr. John Bannantine and other NADC colleagues identified three proteins that prompt the most robust immune response from antibodies in the serum of Johne's disease-infected cattle. Bannantine says that, with additional work, these segments might provide crucial building blocks for development of a diagnostic tool for Johne's disease.

Bannantine adds that NADC studies have cleared up another aspect of

MAP infection.

"When an animal is first infected, there is a cell-mediated response to the bacterium," he says. "We thought that another type of immune response—the one that produces antibodies—developed much later. But in experimentally infected animals, we can use this array to detect exposure to MAP as early as 70 days after the animal is infected—much earlier than previously reported in field studies."

The next step is to determine whether these early-detected antigens are recognized by infected cattle in real-world herds.



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Johne's Disease Risk Assessment for Beef Producers

Although most U.S. beef herds are not infected with Johne's disease, it is estimated that eight out of 100 U.S. herds may be infected with this devastating disease. If you have culled animals because of chronic diarrhea and/or weight loss, your herd is at greater risk of having Johne's disease.

Johne's disease quietly robs your bottom line, as cows clinically infected with Johne's disease may look normal but they tend to produce less milk resulting in lighter calves at weaning. Plus, infected cows can be slower to breed back, extending your calving season and younger calves at marketing.

The most common method of infection is the ingestion of *Mycobacterium avium paratuberculosis* (MAP) bacteria via manure-contaminated udders, milk, water or feed.

Infected animals shed large numbers of bacteria in their feces, leading to contamination of feed and water sources. Infected animals can also shed the bacteria in their colostrum and milk, and infected dams can also pass the disease in utero on to their offspring.

MAP is an extremely hardy bacterium. Research shows that, while MAP cannot multiply outside the animal in nature, it can survive in contaminated soil or water for more than a year because of its resistance to heat, cold and drying.

Management Risk Assessment

A walk-through on your beef enterprise can help you identify practices that are a risk for spreading Johne's disease—as well as other fecal-oral and colostrum-milk transmitted pathogens.

Calving Area

Since calves are the most susceptible to infection, risk factors for the maternity or calving area should be assessed for the potential of a newborn to ingest manure or MAP from mature cattle. Considerations include ground and pen surfaces, contaminated udders and teats, suckling colostrum from an infected cow or manure contamination of a calf's body surfaces.



- | Yes | No | Risk Factor |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Are multiple cows in the calving area at a time? |
| <input type="checkbox"/> | <input type="checkbox"/> | Is any individual calving pen used for additional calvings without being cleaned out between uses? |

- | | | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Is manure allowed to build up in the calving area and pose a risk for calf ingestion? |
| <input type="checkbox"/> | <input type="checkbox"/> | Is manure present on the udder of any heifer or cow calving? |
| <input type="checkbox"/> | <input type="checkbox"/> | Are high-risk Johne's disease cows and suspects in the calving area? |
| <input type="checkbox"/> | <input type="checkbox"/> | Are sick cows kept in the calving area? |



Nursing Calves

Calves are the most susceptible to infection. As such, risk factors for this group should be assessed for the potential of a calf to ingest manure or MAP from mature cattle. Considerations include ground and pen surfaces and potentially contaminated colostrum, milk, water or feed. Consider all sources for potential manure contamination including colostrum or milk from infected cows, accidental contamination of any colostrum, milk, feed or pen surfaces from mature cattle, utensils, equipment, traffic splatter or people.

- | Yes | No | Risk Factor |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Are cow/calf pairs pastured with Johne's disease clinical or suspect cattle? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does manure build up in the pasture posing a risk for calf ingestion? |
| <input type="checkbox"/> | <input type="checkbox"/> | Can a calf's feed be contaminated with manure from cows or bulls at any time? |
| <input type="checkbox"/> | <input type="checkbox"/> | Can a calf's water be contaminated with manure from cows or bulls at any time? |
| <input type="checkbox"/> | <input type="checkbox"/> | Are sick calves kept with or near sick cows? |

Weaned Calves

Risk factors for this group, which includes heifers up to 16 months of age, should be assessed for the potential of a calf to ingest manure or MAP from mature cattle. Considerations include ground and pen surfaces, water and/or feed.

- | Yes | No | Risk Factor |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Do weaned calves have contact with mature cattle or their manure? |

- Is it possible for manure from cows or bulls to contaminate the feed?
- Is it possible for manure from cows or bulls to contaminate water sources?
- Do heifers or young bulls share pasture with mature cattle?
- Is manure spread on pasture then used by or fed to heifers?

Bred Heifers, Yearling Bulls

Although this group of cattle is believed to be substantially less susceptible to Johne's disease than newborn calves, risk factors for this group deserve attention.



- | Yes | No | Risk Factor |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Do heifers or yearling bulls have contact with mature cattle or their manure? |
| <input type="checkbox"/> | <input type="checkbox"/> | Is it possible for manure from mature cattle to contaminate the feed? |
| <input type="checkbox"/> | <input type="checkbox"/> | Is it possible for manure from mature cattle to contaminate the water? |
| <input type="checkbox"/> | <input type="checkbox"/> | Do bred heifers or yearling bulls share pasture with mature cattle at any time? |
| <input type="checkbox"/> | <input type="checkbox"/> | Is manure spread on pasture or forage then used by or fed to heifers? |

Cows

Even though cattle more than 24 months of age are believed to be less susceptible to Johne's disease, infected cattle may shed MAP and other pathogens in their feces and add significantly to the overall pathogen load in their environment. Ultimately, you should strive to reduce the pathogen load in the environment.

- | Yes | No | Risk Factor |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Is it possible for feed to be contaminated with manure? |
| <input type="checkbox"/> | <input type="checkbox"/> | Is manure contamination of the water possible? |
| <input type="checkbox"/> | <input type="checkbox"/> | Do cows have access to accumulated or stored manure? |
| <input type="checkbox"/> | <input type="checkbox"/> | Is manure spread on pasture or forage, then grazed or fed the same season? |
| <input type="checkbox"/> | <input type="checkbox"/> | Are cows showing chronic diarrhea and weight loss left in the general population and not tested for Johne's disease? |

Additions & Replacement Groups

A key to Johne's disease prevention and control is to not introduce infected animals into the herd.

- | Yes | No | Risk Factor |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Do you purchase replacement heifers, bulls or other beef animals from herds of unknown Johne's disease and health status? |
| <input type="checkbox"/> | <input type="checkbox"/> | Do you lease or borrow any stock, including bulls, from multiple sources or herds of unknown Johne's disease and health status? |

General Management

- | Yes | No | Risk Factor |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Do you use the same equipment to handle feed and manure? |
| <input type="checkbox"/> | <input type="checkbox"/> | Do you prevent mature cow manure contamination of all feed and water, including standing run-off water? |

Helping Yourself

Any area marked "yes" on your checklist deserves attention as these practices are a risk for spreading Johne's disease.

Good management and hygiene of maternity areas, calves and heifers and young bulls and clean feed and water are basic for Johne's disease control plus help prevent the spread of other bacteria, viruses and intestinal parasites spread by fecal shedding.

- Johne's disease prevention will help to minimize calf diseases caused by *E. coli*, Salmonella, BVD, Rota and Corona viruses.
- Cleaning and clean environments promote the health of periparturient cows.
- Attention to keeping feed, water and facilities clean for growing animals can improve growth and help control coccidian, cryptosporidia and nematodes.

An ounce of prevention is worth MORE than a pound of cure when it comes to Johne's disease. And prevention at home is your best protection.

Your veterinarian can help you develop a Johne's disease prevention and control plan and can implement testing strategies to identify the most infectious animals.

To learn more about Johne's disease prevention and control, please contact your state Designated Johne's Coordinator. A list of state DJCs is available online at www.johnesdisease.org.

2nd New Horizons Johne's Disease Control Workshop Aug. 10

Exploring ways to most effectively address Johne's disease at the farm level is the focus of the 2nd New Horizons in Johne's Disease Control workshop planned for Monday, Aug. 10, at Willey Hall, University of Minnesota, Minneapolis, Minn. Registration starts at 8:00 a.m., with opening remarks at 8:45 a.m. and sessions wrap-up at 5:00 p.m.

Conducted in conjunction with the 10th International Colloquium for Paratuberculosis (ICP), the 2nd New Horizons in Johne's Disease Control workshop is geared for producers and veterinarians and will look at the importance of Johne's disease to the producer, management strategies for young stock and mature animals and tools to help reduce shedding in infected animals. The end of the day will be devoted to case studies and a question-and-answer session.

Registration for the one-day workshop is \$85/ person and includes Monday's sessions, lunch and handouts as well as a Sunday, Aug. 9, discussion session about the role *M. avium paratuberculosis*, the bacterium that causes Johne's disease in livestock, may or may not have in relations to Crohn's disease in humans.

Topics and speakers for the 2nd New Horizons in Johne's Disease Control workshop is provided at right. Registration for the workshop is available online at <http://www.cvm.umn.edu/outreach/events/icp/icpreg/home.html>. Please note that individuals attending the 2nd New Horizons in Johne's Disease Control workshop qualify for a special registration package for the remainder of the 10th International Colloquium for Paratuberculosis, Aug. 9-14.

The ICP and 2nd New Horizons in Johne's Disease Control workshop are sponsored by the Johne's Disease Integrated Program (JDIP), an international collaboration of 50 universities and government agencies with primary funding from the National Research Initiative. The mission of the Johne's Disease Integrated Program is to promote animal biosecurity through the development and support of projects designed to enhance knowledge, promote education, develop real-world solutions and mitigate losses associated with Johne's disease.

Workshop Agenda

Sunday, Aug. 9

- 6:00 p.m. Opening Session
- 7:00 p.m. Reception

Monday, Aug. 10

- 8:00 a.m. Registration and Coffee
- 8:45 a.m. Welcome
- 9:00 a.m. Immediate Costs to Individual Herds –
Dr. Chuck Fosler
- 9:30 a.m. Human Health Concerns–
Dr. William Chamberlin
- 10:00 a.m. Proposed New Strategic Plan &
Implementation Strategy –
Dr. Ken Olson
- 10:15 a.m. Discussion
- 10:30 a.m. Break
- 10:50 a.m. Primer on Johne's Management & Control –
Dr. Scott Wells
- 11:10 a.m. Colostrum Feeding –
Dr. Sandra Godden
- 11:30 a.m. Milk Management –
Dr. Sandra Godden
- 11:50 a.m. Off-site vs. On-site Housing –
Dr. Ian Gardner
- 12:10 p.m. Discussion
- 12:30 p.m. Lunch
- 1:30 p.m. Use of Tests in Infected Herds –
Dr. Soren Nielsen
- 2:00 p.m. Environment of the Adult Cow –
Dr. Bob Whitlock
- 2:30 p.m. Discussion
- 3:00 p.m. Break
- 3:20 p.m. Update on Vaccination Research –
Dr. Elisabeth Patton
- 3:45 p.m. Monensin Sodium –
Dr. Steve Hendrick
- 4:10 p.m. Case Studies, Risk Assessment –
Dr. Mike Collins
- 5:00 p.m. Discussion

