



JOHNE'S DISEASE – DAIRY

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

Johne's Disease — What You Need to Know, Part I

The National Animal Health Monitoring Systems Dairy 2007 study indicates that 68.1 percent of U.S. dairy operations are infected with *Mycobacterium avium* subspecies *paratuberculosis* (*MAP*), the organism that causes Johne's disease. The 2007 NAHMS study also suggests that at least one in four U.S. dairy operations may have a relatively high percentage of Johne's-infected cows in their herds.

There are three stages of Johne's disease in cattle:

STAGE I: Cattle are infected but showing no clinical signs and not shedding *MAP*.

Typically this stage occurs in calves, heifers, and young stock less than two years of age and many adult animals exposed to small doses of the disease-causing organism. This stage progresses slowly over many months or years to Stage II.

STAGE II: Cattle are infected, shedding *MAP* but do not show clinical signs of the disease.

Typically this stage occurs in older heifers or adults. These animals pose a major, but often hidden, threat for infection of other animals through contamination of the environment.

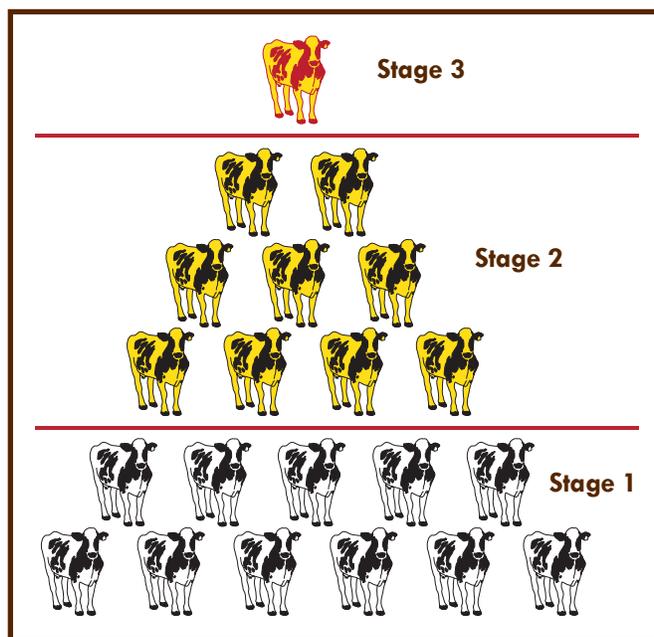
STAGE III: Cattle are shedding *MAP* and showing clinical signs.

The onset of Stage III is often associated with a period of stress, such as recent calving. Cattle at this stage have intermittent, watery manure. Animals lose weight and gradually drop in milk production but continue to have a good appetite.

Some animals appear to recover but often relapse in the next stress period. Most of these animals are shedding billions of *MAP* organisms that can infect herdmates and calves.

In the final and terminal aspects of Stage III of the fatal disease, animals become emaciated with fluid diarrhea and develop "bottle jaw." The carcass may not pass meat inspection for human consumption in the later phases of Stage III.

'The Iceberg Phenomenon' –



In the typical herd, for every animal showing clinical signs (Stage III), many other cattle are present in the earlier stages of the disease. The clinical case represents only the "tip of the iceberg" of the Johne's infection.

For every Stage III cow expect:

1-2 more cows in Stage III (clinically diseased)

6-8 cows in Stage II (unapparent shedders)

10-15 cows in Stage I (infected but not shedding *MAP*)

Researchers contend that, in a herd of 100 milking cows, two clinical cases at one time suggest 20-30 others are infected, and less than half of the infected cattle are detectable by fecal culture. If 25-30 animals are fecal

culture positive on a single test in a herd of 100 adult cattle, it is likely that at least 50 percent of the cattle (or 50 animals) in the herd are infected.

The iceberg phenomenon illustrates the key concept in recognizing the potential impact that Johne's disease can have on a herd. That is, if the infection remains unchecked, the rate and number of infected animals in the herd increases progressively over

time. Early diagnosis and prevention of spread, before clinical cases have surfaced, can avoid the development of Johne's disease into a significant herd problem five to ten years into the future.



New Research Quantifies Negative Impact of Johne's Disease on Reproduction

Johne's disease researchers and experts have long known that the bacteria that causes Johne's disease—*Mycobacterium avium* ssp. *Paratuberculosis*, commonly referred to as *MAP*—has a negative impact on dairy reproduction and often leads to culling, even early culling.

Additional research in this area confirms and quantifies the negative impact of Johne's disease on dairy reproduction. The results of the research were published in the August 2010 issue of the *Journal of Dairy Science*, Vol. 93, Issue 8, Pages 3513-3524. Researchers were R.L. Smith, R.L. Stawdermant, Y.H. Schukkent, S.J. Wells, A.K. Pradhant, L.A. Espejo, R.H. Whitlock, J.S. Van Kessell, J.M. Smith, D.R. Wolfgang and Y.T. Grhon.

To better understand the implications of *MAP* infections and Johne's disease in a dairy herd, the researchers calculated the rates of calving and culling for cows in each stage of *MAP* infection relative to uninfected cows.

Data from six commercial dairy herds—involving 2,818 cows with 2,754 calvings and 1,483 cullings—were used for analysis.

Cows in each study herd were individually tested on a regular basis for *MAP*, and herds were followed for four to seven years.

Johne's disease status, test-negative, low-positive (low-shedding or ELISA-positive only) or high-shedding was defined as a time-dependent

variable for all cows with at least one positive test result or two negative test results.

Research results show that non-shedding animals were significantly less likely to be culled in comparison with animals in the low-shedding or ELISA-positive category.

The researchers also observed an increased calving interval in animals shedding high levels of *MAP* compared with low-positive animals.



To learn more about the cost of Johne's disease to dairy producers, send an email to info@johnesdisease.org and ask for your free copy of the 16-page "Cost of Johne's Disease to Dairy Producers" booklet.

Vaccine Project in Phase 2

With a strong interest among many producers and veterinarians to have a more effective vaccine to help protect against Johne's disease, USDA/APHIS/VS is funding a vaccine project overseen by the Johne's Disease Integrated Program. The first phase of the project was an in vitro screening of all submitted candidates in laboratories at the University of Wisconsin-Madison and the University of Minnesota. Phase 2, which has begun, is to evaluate the Top 10 candidates using a mouse model.

The top candidates identified in Phase 2 will then be evaluated using a goat model.

"The goat model provides results very similar to those expected from cattle, but they are obtained more

rapidly and at a lower cost," states Dr. Ken Olson, JDIP Outreach Coordinator.

"It is anticipated that, at the end of this process, one or more vaccine candidates will be identified for potential commercial development."

Dr. Olson adds that the project, from start to finish, is expected to take approximately three years.

Editor's Note: Commonly referred to as JDIP, the Johne's Disease Integrated Program is a comprehensive consortium of scientists whose mission is to promote animal biosecurity through the development and support of projects designed specifically to enhance knowledge, promote education, develop real-world solutions and mitigate losses associated with Johne's Disease. The coming together

of scientists promotes efficiencies through collaborative research and sharing the intellectual and physical resources that are critical to overall success.

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.