

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

Warming Boxes Help Calves Grow Into Healthy Cows

While controlling and managing the spread of Johne's disease is a priority in dairy operations of all sizes, farm managers at the Michigan State University (MSU) Dairy Cattle Teaching and Research Center have an even greater incentive riding on achieving this goal. After all, Johne's disease in a research herd can result in erroneous data results—or skew data results—on university-led research projects.

That's a key reason why the MSU Dairy Cattle Teaching and Research Center signed their cattle on nearly nine years ago as a test herd for the Michigan Johne's Disease Control Demonstration Project. Conducted by MSU researchers and MSU Extension specialists, the project involved evaluating Johne's disease control strategies in an effort to identify which management practices are the most effective at controlling the spread of the disease.

"We were very interested in participating in the Johne's Disease Control Demonstration Project," said Bob Kreft, farm manager at the MSU Dairy Cattle Teaching and Research Center. "We wanted to identify and quickly eliminate any Johne's disease from the herd because, if our animals are Johne's-positive, it can confuse the other research going on in the barns."

The Michigan Johne's Disease Control Demonstration Project required that the university's herd of 250 head of lactating dairy animals be tested for the disease and any animals confirmed positive with Johne's were culled. Although testing confirmed that the prevalence of the disease in the herd

was very low, Kreft sought to reduce the incidence or potential incidence for Johne's disease even further by focusing on management practices.

As a part of the demonstration project, team members conducted an on-farm audit for possible areas of transmission. This audit pinpointed two areas of concern: the calving area and the practice of feeding pooled colostrum to newborn calves.

To control the spread of Johne's disease in the calving area, farm employees designed warming boxes for outside of the maternity pens. Now, as soon as calves are born, they

are transferred from the pen in which they're born to one of these separate calf boxes. The boxes are built on an elevated, grated floor equipped with small space heaters that can be turned on during cooler weather.

Additionally, the tractor and feed mixer no longer travel through areas in the barn where there may be manure. *Mycobacterium avium* subsp. *paratuberculosis* (MAP) can be spread throughout the barn when manure clings to the tires of farm equipment. The tractors now drive into the feeding alley, backing out after delivering feed instead of driving over the areas where the cows walk. This eliminates the spread of MAP.

Animal pens have also been rearranged so that the breeding-age heifers don't come in contact with the milking-age animals. Previously, the two groups were only separated by a gate, which still allowed contact between the younger and older animals.

"On this farm, a heifer doesn't meet a cow until she's 22 months of age," Kreft said.

MSU continues to monitor the herd's progress by conducting herd tests at mid-gestation and when cows calve. Despite the aggressive strategy, occasionally an animal tests positive for Johne's, further justifying the importance of having a long-term evaluation and management strategy in place.

The Michigan Johne's Disease Control Demonstration Project was a partnership between the MSU College
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Calf warming boxes designed by the Michigan State University dairy team help control the spread of Johne's disease in the calving area.



Veterinarian-Dairy Producer Handbooks Updated, Available Online

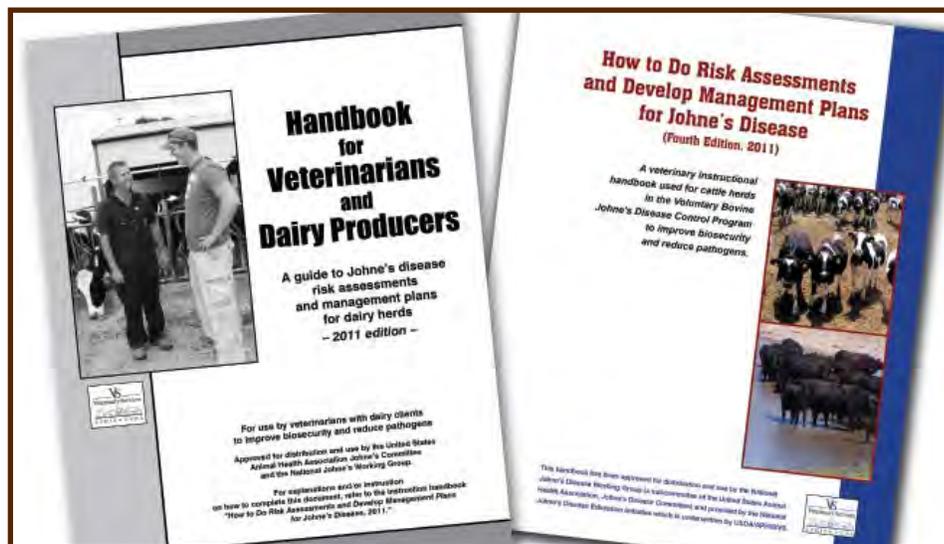
Dairy producers and their veterinarians who want to help prevent or control Johne's disease in their herds often ask where they should start with the process. The answer: Begin by conducting an on-farm risk assessment, then develop and follow a management plan specific to a farm or ranch.

The recently updated "Handbook for Veterinarians and Dairy Producers—A guide to Johne's disease risk assessments and management plans for dairy herds, 2011 edition" and "How to do Risk Assessments and Develop Management Plans for Johne's Disease" are available for dairy producers and their veterinarians who are serious about addressing Johne's disease and stopping the financial drain of this devastating disease. This fourth edition of the handbooks reflects the USDA's updated Uniform Program Standards for the Voluntary Bovine Johne's Disease Control Program and are significantly more user friendly.

"The team in charge of developing the 2011 edition of the handbooks brainstormed long and hard to develop easy-to-comprehend and easy-to-complete information and forms, and I think all three handbooks are home runs," states Dr. Elisabeth Patton, chairman of U.S. Animal Health Association's Johne's Disease Committee.

Patton explains that the handbooks are for use by veterinarians with dairy clients to improve biosecurity and reduce pathogens, particularly *Mycobacterium avium* subspecies *paratuberculosis* or *MAP*, the bacteria known to cause Johne's disease. The 'how to do risk assessments and develop management plans' handbook is a companion piece to the guide handbook.

"Together the handbooks are a veterinarian's manual to help dairy producers reduce or prevent Johne's disease in their herds," Patton adds. "That said, many of the management



These two handbooks encourage a dairy producer and a veterinarian to work hand in hand toward preventing/controlling Johne's disease on the farm.

practices developed to address Johne's disease should help reduce the presence of other pathogens as well."

The "Handbook for Veterinarians and Dairy Producers" is short and to the point: one page is devoted to "current herd health status and concerns" while the remaining six pages address risk assessment and management recommendations related to calving area, pre-weaned heifer calves, post-weaned heifers, bred heifers, cows and bulls, and replacements and additions.

The 23-page "How to do Risk Assessments and Develop Management Plans for Johne's Disease" goes more in depth and covers seven key steps to help reduce or prevent Johne's disease.

Step 1— Collect information on current herd health status and production

Step 2— Collect history, owner goals and biosecurity data and estimate Johne's disease prevalence

Step 3— Assess risks for transmitting Johne's disease among specific animal groups, with descriptive guidelines for scoring risk factors for dairy herds or beef herds

Step 4— Consider how Johne's

disease management efforts will benefit and integrate with other health and performance issues

Step 5— Select critical management practices to include in the management plan

Step 6— Build the elements of a testing strategy

Step 7— Do a reality check. Will the plan work? Plan to monitor it.

The Fourth Edition, 2011, of the handbooks are a collaborative effort of the National Johne's Disease Education Initiative, the Johne's Disease Committee of the United States Animal Health Association (USAHA), the National Johne's Working Group and the USDA's Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS).

PDFs of the dairy veterinarian handbook and the "How to do Risk Assessments and Develop Management Plans for Johne's Disease" are online at www.johnesdisease.org, along with the companion handbook for veterinarians and beef producers. Please contact your State Designated Johne's Disease Coordinator for specific information related to your state.

Research Update

New Antibody Specific for MAP Developed

When trying to identify a specific bacterium as the cause for disease symptoms, researchers have been known to get false positive results from cross-reactivity. Such has been the case of any antibody used to detect *Mycobacterium avium* subsp. *paratuberculosis* (MAP) that was known to react with its close relatives the *M. avium* subspecies member including *silvaticum*, *hominissuis* and *avium*.

But this situation is about to change.

After years of work, researchers at the USDA's National Animal Disease Center have produced a monoclonal antibody that specifically binds to only MAP strains.

"When the antibody was checked for specificity, the results were astounding," states John Bannantine, a research microbiologist at NADC.

The resulting data was so impressive that USDA recently awarded a U.S. patent for this antibody.

Bannantine adds, however, that trying to find the protein that the antibody binds to led him "on a wild goose chase." He said he initially thought that the antibody reacted with a protein encoded by a gene that was not originally identified in the MAP K-10 genome, a genome sequenced by Bannantine and Vivek Kapur at Penn State University back in the early 2000s.

"I was surprised at finding this new putative gene because I thought we were pretty thorough when K-10 was annotated," Bannantine states.

When pieces of data didn't add up, Bannantine kept digging and turned to Srinand Sreevatsan, University of Minnesota. Bannantine was confident that Sreevatsan would help out as both are members of the Johne's Disease Integrated Program (JDIP), a comprehensive consortium of scientists whose mission is to

promote animal biosecurity through the development and support of projects that are designed specifically to enhance knowledge, promote education, develop real-world solutions and mitigate losses associated with Johne's disease.

"He's been great to work with," Bannantine states. "This has been a real strength of the whole JDIP program. . .being able to call on other researchers within the program for help."

It turns out the gene "missed" by annotation in the K-10 genome was not a real gene after all but an epitope that mimicked a similar epitope in a real gene that is annotated in K-10. With this discovery, all pieces of data now fit like a glove. The only remaining question: Why is the antibody so exquisitely specific?

Editor's Note: Funding for JDIP is provided by USDA through competitive award number 2008-55620-18710 from the Animal Biosecurity program of USDA-CSREES National Research Initiative.

APHIS-JDIP Vaccine Project

Developing a more effective vaccine to help prevent Johne's disease is another project undertaken by the Johne's Disease Integrated Program (JDIP). Sponsored in part by USDA/APHIS/VS, the JDIP Vaccine Project has completed the first two phases of the project. The five mutants showing the best protection from challenge have now moved forward into the final phase of the vaccine project.

Phase III is the goat model being conducted in the lab of Dr. Murray Hines II at the University of Georgia. A total of 80 goat kids are being used in five test and three control groups. Results of this work will be available the fall of 2012.

Seven Research, Education, Extension Projects Funded

The Johne's Disease Integrated

Program annually provides competitive awards for meritorious research, education and extension projects addressing Johne's disease. This year 15 proposals with requested funding of \$1.23 million were received.

After rigorous peer review, seven proposals were approved for funding:

- MAP interaction with intestinal mucosa—Luiz Bermudez, Oregon State University
- MAP inhibition of macrophage apoptosis: A key immune evasion tactic—Paul Coussens, Michigan State University
- Clinical trials in Johne's disease control: Heat treatment of colostrum and maternity pen management—Sandra Godden, University of Minnesota
- Epidemiology and biostatistics core—Yrjo Grohn, Cornell University
- Education and outreach—Jeannette McDonald, University of Wisconsin
- Defining the characteristics of sporulation in MAP—Srinand Sreevatsan, University of Minnesota

Yes, thanks for funding in full or in part by USDA, research focused on Johne's disease is ongoing. After all, the more we know about Johne's disease, the better we can reduce this devastating disease in herds and/or help MAP from entering other herds.

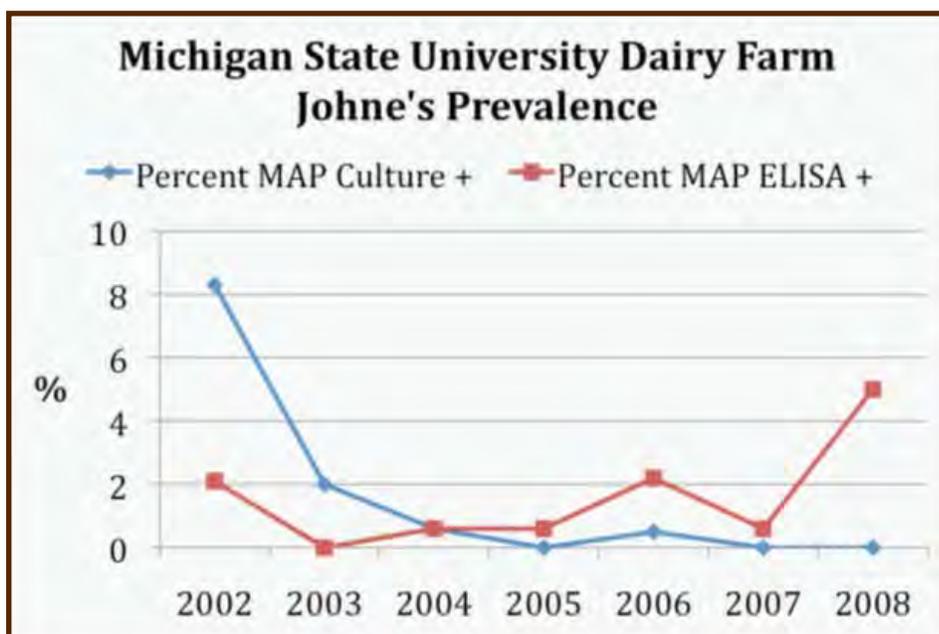
To learn more about Johne's disease prevention and control, please contact your state Designated Johne's Coordinator. A list of state DJCs is available online at www.johnesdisease.org.

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Warming Boxes (Continued)

of Veterinary Medicine, MSU Diagnostic Center for Population and Animal Health, State of Michigan Department of Agriculture and Rural Development, and the U.S. Department of Agriculture in collaboration with nine Michigan veterinary clinics. Findings from the Michigan farms involved in the study were pooled with data collected from 17 other states as part of the larger, multi-state project, the National Johne's Disease Control Demonstration Project.

You can find additional information on the Michigan Johne's Disease Control Demonstration Herd Project at <http://cvm.msu.edu/johnes>.



The Food for Thought

Johne's disease is Johne's disease no matter what country it's in. The following points were gleaned from information provided by the Government of Alberta, Canada, Agriculture and Rural Development, Hernan Ortegon, DVM, MSc, DVSc and serve to remind us that Johne's disease has no boundaries.

- Several studies have been performed in Alberta in the last few years to determine the prevalence of Johne's disease. In these studies, more than half of dairy herds and approximately 14 percent of beef herds appear to be infected with MAP. However, these numbers may be higher. (Editor's Note: Good reason to secure animals from a low-risk Johne's disease herd when purchasing animals.)

- Infection with MAP is usually acquired by consuming feed and water contaminated with manure from infected animals. Fecal shedding from clinically affected animals has been estimated to reach more than 500 billion organisms per day. Obviously, the environment can become very heavily contaminated and most animals on these farms will be exposed to the infection.

- Up to 35 percent of cows with advanced clinical disease will shed MAP in their milk. As well, there are reports of calves being born already infected, but this appears to occur only among dams that are shedding very high numbers of the organism.

- Calves under six months of age are the most susceptible to infection. Depending on the number of organisms the calf is exposed to, about a third of exposed calves become chronically infected with MAP. Clinical signs of disease are rarely observed in animals under two or three years of age. Consequently, this is a disease of adults in which the infection was acquired in the first few months of life.

- Less than 5 percent of infected animals develop clinical signs of illness. The reason for this is unknown. Infected animals without clinical signs act as carrier animals and are a source of infection to the environment on the farm.

- Once the disease has been diagnosed in a herd, avoid selling the animals for dairy or breeding purposes. There are up to 20 additional infected animals for each clinical case of Johne's disease seen on a farm.

