Johne's disease: new developments

■ Despite a year that brought several new developments in the fight against one of the most silent, insidious diseases facing the dairy industry, the battle plan remains the same: test and manage.

by Dave Natzke

From laboratories to lawmakers, the arsenal against Johne's disease gained some new tools in 2002. Using those tools in the trenches will determine whether dairy producers gain any ground in the war against the disease.

Most recently, U.S. Department of Agriculture and University of Minnesota scientists announced they have sequenced the genome of the bacterium that causes Johne's disease, *Mycobacterium paratuberculosis*. The discovery could lead to improved detection, vaccine development and the ultimate eradication of the disease.

Recognizing the importance of the disease and the devastating impact on dairy production, USDA has requested more than $20 million for a National Johne's Disease Management and Testing Program for the current fiscal year. The appropriation is pending approval in Congress.

A costly disease

At a recent animal health symposium, Johne's disease was identified among the three top health issues affecting dairy cattle, after mastitis and salmonella. The evaluation was based on four factors: production, transmission to humans, international trade implications and animal welfare concerns. Johne's negative impact ranked second in production and international trade. Although it did not rank high under human implications, consumers' perception makes Johne's a potential time bomb for the dairy industry.

According to the U.S. Department of Agriculture, about 22% of the nation's dairy herds – and about 24% of those in the Midwest – are infected with Johne's. The agency says at least 45% of U.S. dairy producers don't know about the disease.

Johne's ranks fifth behind mastitis ($1.7 billion), lameness ($600 million), reproductive concerns ($400 million) and metabolic ailments ($344 million). Conservative estimates for U.S. Johne's-related annual production losses are $200-$250 million, based on losses of almost 1.4 billion pounds of milk, premature culling of 11,000 cows, and nearly 20,000 cow deaths annually. The National Animal Health Monitoring System (NAHMS) calculated the loss to be $60 to $250/cow/year.

"The loss of milk production alone due to Johne's disease can be significant for individual dairies," said Todd Byrem, manager of technology for Antel BioSystems Inc., a subsidiary of NorthStar Cooperative and a USDA-accredited Johne's disease testing laboratory. Evaluating DHIA records using 305-day mature equivalent records for first, second and third and greater lactation animals, AntelBio calculated a 2,200-cow herd with 66 test-positive cows (3%), lost roughly 2,000 pounds of milk per lactation among test-positive animals. That's roughly 132,000 pounds of milk or $16,500 in lost milk income in one year. Milk component deviations of test-positive animals were -527 milk, -28 fat and -18 protein. Additional losses associated with Johne's disease include increased days open and decreased pregnancy rates, increased veterinary costs, increased culling, decreased salvage value and the cost of replacement animals."

Test and manage

The first step in controlling Johne's disease is testing. In conjunction with testing, each producer must analyze where the operation is most vulnerable to Johne's, and then design and implement an effective management plan. The plan should:

1. ***Determine*** the herd's disease status through testing.
2. ***Prevent*** Johne's introduction into the herd.
3. ***Prevent*** further spread of the disease.
4. ***Reduce*** and eliminate herd infection.
5. ***Establish*** a test-negative status.

AntelBio has produced a basic risk assessment questionnaire to evaluate areas on the dairy that could hinder its biosecurity. The questionnaire walks the producer and the dairy's advisory team through five general areas on the dairy: calving pens, preweaned calves, postweaned calves and bred heifers, mature cat-

FYI

■ **Log on to the University of Wisconsin School of Veterinary Medicine at www.johnes.org**

■ **Log on to the National Johne's Working Group web site at www.usaha.org/njwg/njwg.html.**

■ **Log on to AntelBio's web site at www.antelbio.com.**

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tle and purchased animals, and facilities and environment. Following the self-assessment, the publication provides general management objectives and recommended procedures in each area.

Successful implementation of a Johne's management plan will reduce the economic losses associated with Johne's disease, as well as improve overall biosecurity of your operation.

Testing developments

There are several Johne's testing methods, although there is debate over each method's accuracy. Most experts suggest annual whole-herd screening with a fecal, blood or milk ELISA test as a place to start.

The standard blood serum ELISA has up to 60% sensitivity and 99% specificity, compared to fecal culture. AntelBio says its Milk ELISA sensitivity is 51% and specificity is 99%, based on the blood serum ELISA. All figures vary from dairy to dairy; therefore, the performance of ELISA tests should be evaluated in each situation.

ELISA tests can determine approximate prevalence of Johne's disease in the herd, and should not be used to make individual culling decisions. Animals showing up Johne's-positive on ELISA tests can be retested using more accurate – and expensive – fecal culture testing.

There have been new developments in testing. Dr. Michael Collins, a UW-Madison microbiology professor who has studied Johne's disease for more than 20 years, has developed a technique, used in conjunction with the standard blood test, that classifies test results into five levels: negative, suspect, weak positive, positive and strong positive.

Each level has a recommendation for the cow's management, from segregating those with weak positive results to immediately culling all cows that test strong positive.

Such classification, says Collins, enables producers to make more cost-effective decisions on how to handle each cow.

Current blood tests provide only positive or negative results, which are based on a certain number of antibodies detected in the animal's blood.

"I think culling for slaughter all cows that test positive for Johne's disease is a little too expensive, a little too drastic," Collins said. "The economic consequences of mistakenly culling a cow due to a false-positive test result are high – roughly $1,300 a cow."

Purdue speeds process

Elsewhere, Purdue University scientists are using molecular research and other new technologies to reduce Johne's disease diagnosis time. Molecular techniques developed by Ching Ching Wu, a microbiologist with Purdue and the Indiana Animal Disease Diagnostic Laboratory, and her colleagues, make the faster diagnosis feasible. By coupling those techniques with new automated incubation equipment, diagnosis can be cut from 12 to 16 weeks to two to three weeks in highly infected animals, and about 42 days for those with low levels of infection.

Earlier this year, Trek Diagnostics Systems Inc. commercially introduced the new machine, ESP para-JEM system, which detects growth of *M. paratuberculosis*.

Trek, of Westlake, Ohio, developed the new diagnostic machine and Cornell University performed validation testing over the past year. Purdue and other veterinary laboratories – the University of Pennsylvania, University of California at Davis, University of Wisconsin Diagnostic Veterinary Laboratory and the National Veterinary Service Laboratory in Ames, Iowa – are using the machine on a trial basis.

A two-week fecal test using molecular technique is also available from AntelBio. And last year, AntelBio released its milk ELISA, with the chief benefits being cost and speed. Producers should receive results within five business days. The test is designed to indicate herd prevalence, suggesting additional testing and control measures that might be needed. The test can be incorporated with routine DHIA sampling, and can be conducted on fresh or DHIA preserved milk samples. ■

Researchers seek Johne's-resistant genetics

University of Wisconsin-Madison researchers are conducting a nationwide search to determine Johne's disease genetic resistance. That information could allow producers to select AI sires whose daughters show disease resistance.

"Johne's is a good candidate for prevention by genetic resistance because vaccines for the disease are only partly effective, and once cattle get the disease there is no cure," said dairy geneticist George Shook, who leads the UW research team.

The researchers are genotyping the daughters of 12 prominent Holstein bulls. The bulls have large numbers of daughters – up to 50,000 – in production in Dairy Herd Improvement program herds. The researchers are contacting herds that have five or more daughters of the 12 bulls (about 10% to 15% of DHI herds). Their goal is to test 10,000 cows.

The research project will pay for disease testing – a $25 benefit for each cow tested. In addition, for every project cow tested, producers can select another nonproject cow for a free test. Test results are returned to producers for use in controlling the disease in their own herds. The results are confidential, and won't be shared with anyone but the cooperating producer.

The project hasn't gathered enough samples yet to be conclusive, but Shook has already noticed one intriguing result: prevalence of the disease among bulls' daughters ranges from a low of less than 2% to a high of nearly 12%. "If these differences stand up through additional testing, we'll have some interesting and valuable comparisons to explain," he says.

The researchers planned to contact herds in the Eastern states and Wisconsin through the end of 2002, Central states in January 2003 and Western states in February, with contacts wrapped up by March.

For more information on the survey, contact George Shook at 888-400-8050 or e-mail shook@calshp.cals.wisc.edu.

Midwestern Johne's conference scheduled

A "Management is the Key to Controlling Johne's Disease," conference will be held Jan. 16, 9 a.m.-3:20 p.m., at the Holiday Inn Select, Appleton, Wis. Coordinated by the Wisconsin Herd Health Working Group and sponsored by corporate donations and public funds, the program is designed for dairy producers and employees, veterinarians, educators and other dairy advisers.

The morning program will provide an overview of new Johne's disease developments. Speakers and topics include:

- ***Johne's Disease Cause and Management Within Herds***
  Dr. Michael Collins, UW School of Veterinary Medicine
- ***Development of a Johne's Disease Management Plan***
  Dr. Vic Eggleston, UW School of Veterinary Medicine
- ***Spread of Johne's Disease Within the Dairy Industry***
  Dr. Libby Balzer, Wisconsin Department of Agriculture, Trade & Consumer Protection
- ***National and Minnesota Johne's Disease Programs & Diagnostic Overview***
  Dr. Scott Wells, University of Minnesota
- ***Overview of Marketplace/Food Safety Issues***
  Matt Mathison, Wisconsin Milk Marketing Board
- ***Johne's Disease Management: Industry Activities and Resources***
  Matt Joyce, Wisconsin Milk Marketing Board

The afternoon program will feature veterinarian and producer panels addressing experiences and management. Panels will be moderated by Dave Natzke, editor of *Midwest DairyBusiness*.

Register online on the WHHWG web site at www.whhwg.org or contact Dr. Michelle Wieghart at 715-425-0641 for a registration form. Registration after December 20, is $45 per person. Make checks payable to: UW-RF Dairy Outreach. Persons registering online or via fax may pay at the door.

Lodging reservations can be made by contacting: Holiday Inn Select, telephone 920-735-9955.

For more information on the Wisconsin Herd Health Working Group, contact: Dr. Michelle Wieghart, UW-River Falls Outreach Program, RDI Building, 410 S. 3rd St., River Falls, WI 54022; or call 715-425-0641.