



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

Learning from Research

Johne's disease continues to be a priority for many researchers worldwide, and that is to be expected as Johne's disease is a worldwide challenge. The following research studies were gleaned from professional publications—and each is accompanied with a “what this could mean to veterinarians and producers” point of view.

Research Study: “Bottlenecks in Best Management Practices Identified in the Alberta Johne's Disease Initiative:

Published in Proceedings of the 11th International Colloquium on Paratuberculosis (ICP)

Researchers: R. Wolf, H.W. Barkema, E. McDonald, B.S. Mason, G. Ollis, M. Slomp, J. DeBuck. K. Orsel

This study, which involved 201 dairy farms and 182 completing their risk assessment, identified common management practices on Alberta dairy farms and assessed whether there are differences in management between *MAP*-positive and *MAP*-negative farms.

Several management practices known to be associated with the odds of *MAP* infection were identified in more than 50% of the received questionnaires: 63% of the farms had no restriction of any visitor access to any animal; 77% purchased animals within the last five years without consideration of the *MAP* infection status of the seller herd; and 55% of the producers fed calves with bulk tank milk or with

pooled milk from several cows.

Regarding farms having no visitor restrictions to access to animals, the researchers called it “a big hazard for introduction of *MAP* and other infections on a dairy farm.”

The following chart shows the percentage of farms that acknowledged the following management practices. Note that these are broken out by infection status of the herd and that, in each case, the negative herds were less likely to have these risky practices.

| | % Negative Herds | % Positive Herds |
|--|------------------|------------------|
| Clinical Johne's disease observed on the farm | 27 | 52 |
| Manure is spread on pastures in which heifers graze in the same year | 5 | 12 |
| At least trace amounts of manure are visible at water troughs and feed bunks of lactating cows | 58 | 76 |

What could this mean to veterinarians and producers? Weaknesses in management—bottlenecks in best management practices—may be infringing on the control process. Dairy producers wanting to control Johne's disease can implement simple, low-cost management practices to help achieve their goal.

Research Study: “Shedding Patterns Over Time of *Mycobacterium Avium* subspecies *Paratuberculosis (MAP)* in Cattle”

Published in Proceedings of the 11th

International Colloquium on Paratuberculosis (ICP)

Researchers: R. Guatteo, A. Joly, H. Seegers, E. Buran, C. Fourichon

Since early detection and culling of high shedders of *MAP* is a key factor to controlling *MAP* transmission, one of the areas this study investigated was the existence of different shedding patterns. The study involved two dairy herds and one beef herd that had at least one clinical case and a seropreva-

lence of >8%. All adults and heifers more than 14 months old were sampled.

Dairy herd A had 79 animals tested at least once while Dairy herd B had 86 animals tested at least once. The beef herd had 224 animals tested at least once. A total of 311 animals from the three herds were sampled twice consecutively. Of those 311 animals, 32% were found persistently positive, 43% persistently negative and 25% positive only once.

One hundred animals from among the three herds were sampled
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three times consecutively. Of these, 31% were determined to be persistently positive, 33% persistently negative and 36% shed intermittently.

What could this mean to veterinarians and producers? Persistent shedders are herd challenges and should be a target for early culling in infected herds. In addition, culling decisions based upon test results should be included in control plans.

Research Study: "Short Communication: Examination of Milk Filters by Real-time PCR as a Herd-level Indicator of the Presence of *Mycobacterium avium* subspecies *paratuberculosis* in Dairy Herds"

Published in the *Journal of Dairy Science*, March 2012.

Researchers: I. Slana, P. Kralik, A. Kralova, V. Babak, I. Pavlik

This study assessed the suitability of real-time quantitative PCR (qPCR) for the detection of *Mycobacterium avium* ssp. *paratuberculosis* (MAP) DNA in milk filters as a herd level

indicator of *paratuberculosis* infection.

The study involved 79 samples from textile or metal milk filters from 15 herds where infection ranged from non-infected to more than 10% of animals confirmed positive for Johne's disease.

MAP infection was correctly confirmed using the milk filter DNA testing in 11-12 farms known to be infected (based upon fecal and tissue culture results). MAP was not detected in filters from three farms where Johne's disease was never diagnosed.

Based on statistical analysis of the data, research supports the evidence that milk filters may be a useful tool for the direct detection of MAP on the herd level, with probability of successful MAP detection in milk filters in a herd with MAP-infected cows of at least 94.3%.

Researchers note that "Absolute numbers of MAP detected on the milk filter can be used for a rough estimation of *paratuberculosis* prevalence >10% in the herd."

What could this mean to veterinarians and producers? Analysis of milk filters for the presence of MAP can be a useful tool for the detection of Johne's disease on the herd level before initiating any individual control

strategies.

Research Study: "Low Rate of Detectable *in utero* Transmission of *Mycobacterium avium* subspecies *paratuberculosis* in a Dairy Herd with a Low Prevalence of Johne's Disease"

Published in the *Journal of Veterinary Diagnostic Investigation*, January 2012.

Researchers: J.M. Adaska, R.H. Whitlock

This study focused on *in utero* transmission of MAP. During the study, researchers cultured tissues from neonatal calves born to cows of known test status for the presence of MAP and found that tissues from a single calf was born to a test-positive cow shedding large numbers of organisms in the feces were positive for MAP.

The detected overall transmission rate was approximately 2% (1/49). The detected transmission rate in cows that were fecal culture positive and serum enzyme-linked immunosorbent assay (ELISA) suspect or positive was approximately 4.3% (1/23).

What does this mean to veterinarians and producers? These research findings agree with previous findings regarding *in utero* transmission. And, while newborn calves

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Research shows that unborn calves can become infected *in utero* if their mothers are infected with MAP.

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and young animals typically become infected with *MAP* from ingesting the bacteria on manure-covered teats or via colostrum or milk from infected cows, unborn calves can also become infected *in utero* if their mothers are infected with *MAP*.

Research Study: "The Collection of Lymphatic Fluid from the Bovine Udder and its Use for the Detection of *Mycobacterium avium* subsp. *paratuberculosis* in the Cow"

Publication: *Journal of Veterinary Diagnostic Investigation*, January 2012.

Researchers: J.L. Khol, P.J. Pinedo, C.D. Buergelt, L.M. Neumann, W. Baumgartner, D.O. Rae

This research study evaluated the feasibility of lymph collection from the bovine udder and investigated if the lymphatic fluid might be of diagnostic value in cows infected with *MAP*.

While collecting lymph fluid from cows, researchers also recorded the level of difficulty associated with collection and the reactions of the cows. They reported that the collection of lymphatic fluid caused no or mild signs of discomfort in 94.6% of the cows. Lymphatic fluid was attained on the first attempt in 51.8% of cows while sample collection was unsuccessful in 12.1%.

MAP was detected in 43.1% of all lymph samples. The bacterium was present in 66.7% of cows with clinical Johne's disease, in 42.8% of asymptomatic cows with a positive or suspicious ELISA result in blood and in 38.7% of cows with a negative ELISA result in blood.

What does this mean to veterinarians and producers? The study shows that most cows tolerated the procedure well, and the procedure



MAP-infected manure slurry on grassland is "a clear infection hazard for grazing livestock and a potential for the contamination of runoff after heavy rains."

can easily be performed on farm. The isolation of *MAP* from lymph fluid also suggests that this approach could be used for the early detection of Johne's disease in cattle.

Research Study: "Fate of *Mycobacterium avium* subsp. *paratuberculosis* after Application of Contaminated Dairy Cattle Manure to Agricultural Soils"

Publication: *Applied and Environmental Microbiology*, March 2011

Researchers: M. Salgado, M. T. Collins, F. Salazar, J. Kruze, G. Bölske, R. Söderlund, R. Juste, I. A. Sevilla, F. Biet, F. Troncoso, and M. Alfaro

This research project looked at what happens to *MAP* when manure slurry is applied to a loamy or sandy soil and whether amount of rainfall impacts the pathogen.

Using a lysimeter—a device for collecting water from the pore spaces of soils and for determining the soluble constituents removed in the drainage, researchers found the greatest proportions of *MAP*-

positive leachates in sandy-soil in the manure-treated group receiving the equivalent of 1,000 mm (39.4 inches) annual rainfall. Under the higher rainfall regimen (78.75 inches per year), *MAP* was detected more frequently in loamy soil than in sandy soil.

MAP was detected more often in grass clippings than in the soil.

When researchers cultured the soil at different depths, *MAP* was recovered only from the uppermost levels of the soil.

Factors associated with *MAP* presence were soil type and soil pH ($P < 0.05$). For *M. paratuberculosis* presence in grass clippings, only manure application showed a significant association ($P < 0.05$).

What does this mean to veterinarians and producers? This research indicates that *MAP* tends to move slowly through soils—but faster through sandy soil. Research findings also show that *MAP* tends to remain on grass and in the upper layers of pasture soil. Bottom line: Spreading *MAP*-infected manure slurry on grassland is "a clear infection hazard for grazing livestock and a potential for the contamination of runoff after heavy rains."