

## Dairy 2002 Johne's Disease Follow-up Study: Management Practices and Within-Herd Prevalence

### Johne's Disease Background

Johne's disease is caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP). In addition to cattle and other ruminants, many species of domestic and wild animals worldwide have been diagnosed with Johne's disease.

MAP infection has a long incubation period; clinical manifestation of disease does not commonly occur for 2 or more years after initial infection. Clinical signs of Johne's disease include chronic diarrhea, weight loss despite a normal appetite, and decreased milk production.

Organism detection and measuring antibody response are the two main methods used to test for MAP infection. For organism detection, fecal culture is used most commonly. For antibody response, an enzyme-linked immunosorbent assay (ELISA) blood test is used most often. Fecal-culture testing takes more time to complete than the ELISA and is more expensive. Neither of these tests is perfect due to variation in incubation periods, intermittent fecal shedding, and the varied immune response of individual animals to infection.

### NAHMS Dairy 2002

The National Animal Health Monitoring System's (NAHMS) Dairy 2002 study provided population estimates for management practices related to the transmission of MAP infection. In addition, 106 herds participated in testing to determine within-herd prevalence of Johne's disease and to evaluate the association between selected management practices and Johne's disease. The Dairy 2002 Study was conducted in 21 major dairy States<sup>\*</sup> via multiple phases of data collection during all of 2002 and January 2003. Biologic sampling was conducted from March 25, 2002, to January 9, 2003.

<sup>\*</sup>California, Colorado, Florida, Idaho, Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New Mexico, New York, Ohio, Pennsylvania, Tennessee, Texas, Vermont, Virginia, Washington, Wisconsin.

### Johne's Disease Risk Assessment

As a component of the NAHMS Dairy 2002 Study, operations participated in an on-farm risk assessment of management practices believed to contribute to the transmission of MAP. Although some questions were directed to the producer (such as herd disease history, testing, and particular management practices) the majority of questions were designed to be answered subjectively by the visiting animal health official. During the risk-assessment process, numerical scores were assigned for question responses and/or observations, and then totaled for each management area. Assessed management areas included calving areas, preweaned heifer calves, postweaned heifer calves, bred heifers, and adult cows. The assessment was constructed so that more points were possible for calving areas and preweaned calves, since these may be the areas where most animals contract MAP infection. Results were published in NAHMS' "Johne's Disease on U.S. Dairy Operations, 2002" (<http://www.aphis.usda.gov/nahms>).

### Dairy 2002 Johne's Disease Follow-up Study Results

The Follow-up Study was based on a subset of the 106 Dairy 2002 operations and was incorporated to lengthen and repeat selected data collection activities. Therefore, the specific objectives of the Johne's Follow-up Study were to

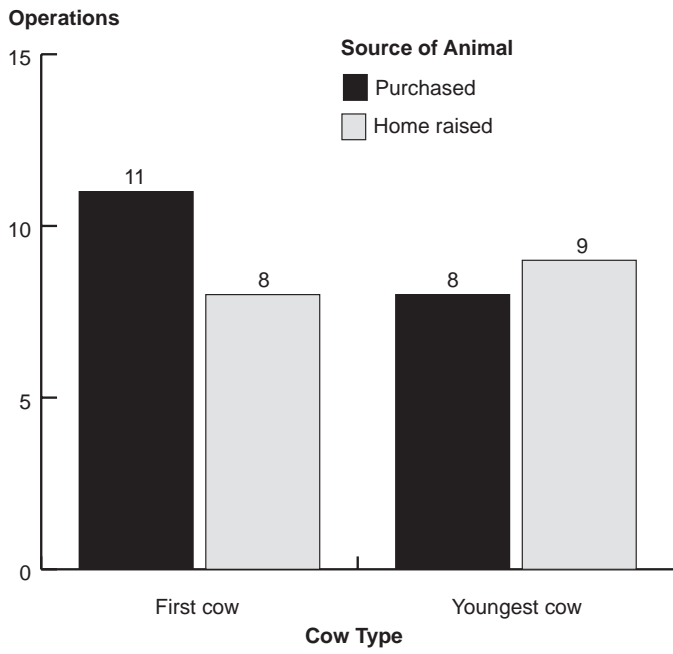
- Evaluate changes in management practices relating to perceived risk of MAP transmission between 1996 and 2003, and
- Evaluate changes in herd prevalence based on repeat testing.

The Johne's Disease Follow-up Study was conducted on 29 operations from 14 of the 21 States that participated in the Dairy 2002 study and had agreed to repeat the risk assessment and testing. Questions relative to historical management practices were added to the Dairy 2002 risk assessment for use in the Follow-up Study.

Testing for MAP infection was performed using serum ELISA and fecal culture methods, with 6,880 and 5,329 samples tested, respectively. Data and biological samples were collected from November 2003 to June 2004.

Of the 29 participating operations, 27 completed the Follow-up Study risk assessment. On 19 operations, at least 1 clinical case of Johne's disease was observed. On 11 of these 19 operations, the source of the first cow with clinical signs of Johne's disease was reported as a purchased animal. The youngest cow with clinical signs was reported as a home-raised animal on 9 of 17 operations (Figure 1).

**Figure 1. Number of Operations by Source of First Cow and Youngest Cow With Clinical Signs of Johne's Disease**



**Changes in Management Practices from 1996-2003**

MAP transmission can occur from dam to calf during pregnancy, or by the ingestion of contaminated feces, milk, or colostrum. It is thought that calves under 6 months of age are most susceptible to MAP infection. Operations participating in the Follow-up Study were asked to report historical information (1996-2003) on 10 management practices that may expose calves to MAP (table 1).

Of the 27 operations that participated in the risk assessment, 15 did not feed waste milk in 2003 (positive management practice) and 12 did feed waste milk. Six operations had stopped feeding waste milk since 1996 (positive change), while two operations had begun feeding waste milk since 1996 (negative change). Of the 12 operations feeding waste milk in 2003, 10 were not pasteurizing waste milk. One of the two operations feeding pasteurized waste milk had started pasteurizing since 1996.

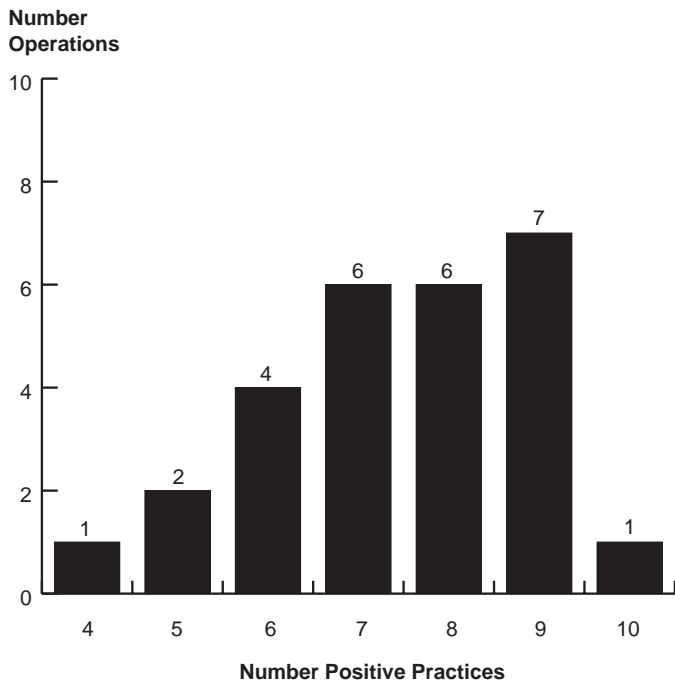
**Table 1. Number of operations reporting specific management practices in 1996 and 2003**

Positive Management Practice	Number of Operations Reporting Positive Management Practices	
	1996	2003
Removed calves from dam prior to suckling	11	17
Calves not fed waste milk	11	15
Calves not fed pooled colostrum	11	14
Calving not routinely allowed in sick pen	23	25
Calves not allowed access to feedbacks	24	25
Calves not allowed contact with adult manure	22	23
Calf feeding equipment not contaminated with manure	22	23
Separate water sources for heifers and cows	23	23
Calving in individual maternity pens	6	7
Separate pasture for heifers and cows	27	27

Overall, 12 of the 27 operations changed at least 1 management practice from 1996 through 2003. Nine operations improved management practices, and one operation made four positive improvements. Two operations implemented both positive and negative management changes over the 8-year period, and one operation made one negative management change and no positive changes. One was the greatest number of negative changes implemented on any operation.

Ten positive management practices was the maximum achievable. One operation was performing all 10 positive practices in 2003, and 1 operation was performing just 4. Most operations were performing seven to nine positive management practices during 2003 (Figure 2).

**Figure 2. Number of Operations by Number of Positive Management Practices in 2003**



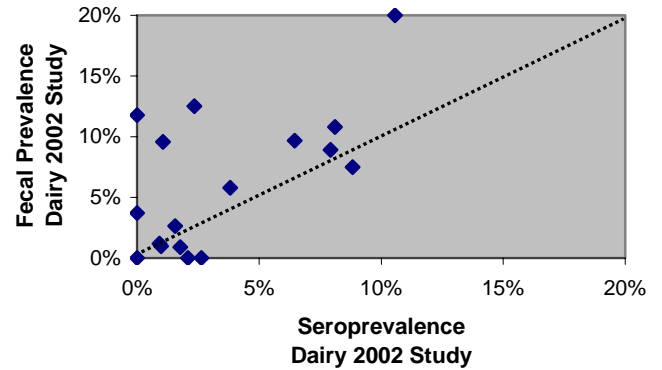
**Testing Prevalence Data**

For the Follow-up Study, within-herd prevalence of MAP infection was determined by fecal culture and ELISA on all 29 operations. Follow-up Study results were compared to Dairy 2002 results. Mean time between herd testing in the two studies was 21 months, with a range of 13 to 24 months. Approximately the same number of animals per operation was tested in each study, although all herds were not fecal culture tested during Dairy 2002. Only 17 of the 29 follow-up herds had both fecal culture and serology testing performed during the Dairy 2002 study. Specific testing methods used during Dairy 2002 are described in the NAHMS Johne's Disease on U.S. Dairy Operations, 2002 report.

Fecal-culture testing methods differed slightly for the Follow-up Study and the Dairy 2002 study. For Dairy 2002, three culture methods (Herrold's egg yolk agar, BACTEC™ 460, and TREK ESP®) were performed on each sample at the National Veterinary Services Laboratories (NVSL) in Ames, IA. Fecal culture for the Follow-up Study was performed using only the BACTEC 460 filter method at the Johne's Testing Center, in Madison, WI. Serum samples for both studies were tested using the Biocor Paracheck™ kit at NVSL.

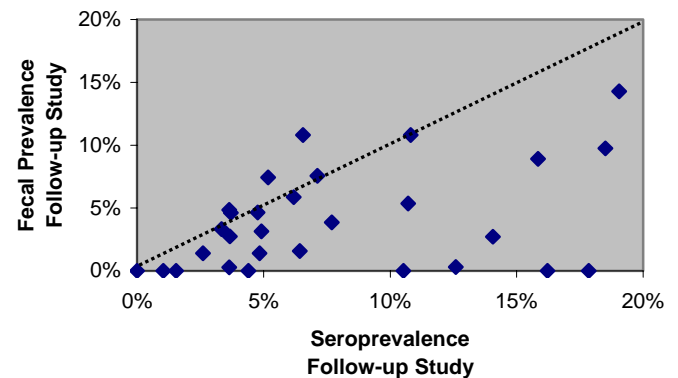
For the majority of operations in the Dairy 2002 study, the fecal-culture prevalence estimate was higher than the seroprevalence estimate (Figure 3). Because fecal culture is a more sensitive diagnostic test, these results were expected.

**Figure 3. Within-Herd Apparent Prevalence Comparison Dairy 2002 Study (n=17 herds in Follow-up Study)**



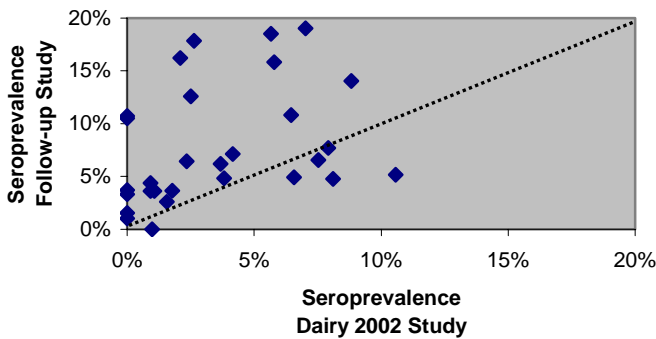
In contrast to results from the Dairy 2002 study, the majority of within-herd apparent prevalence estimates for serology were higher than for fecal culture in the Follow-up Study. Fecal culture within-herd prevalence estimates for operations in the Follow-up Study ranged from 0.0 to 14.3 percent. Only 5 of the 29 operations had higher fecal-culture prevalence than seroprevalence in the Follow-up Study (Figure 4). Since it has been shown that fecal culture detects a larger percentage of infected animals, these results are surprising. Possible explanations for this discrepancy include selective removal of fecal-culture-positive cows from Dairy 2002, seasonal variation in shedding and antibody response, sample handling, and laboratory deviation.

**Figure 4. Within-Herd Apparent Prevalence Comparison Follow-up Study (n=29 herds)**



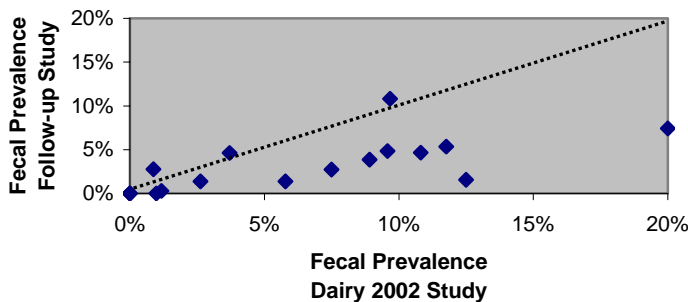
The within-herd seroprevalence estimates for MAP infection for the Follow-up Study ranged from 0.0 to 19.0 percent, compared to a range of 0.0 to 10.5 percent for Dairy 2002 (Figure 5). Of the 29 operations tested, 6 had lower seroprevalence, while the remaining operations had higher seroprevalence in the follow-up compared to Dairy 2002. Two of the operations that had no animals test positive during Dairy 2002 had greater than 10-percent seroprevalence in the Follow-up Study. One of these operations did have fecal-culture positive animals during both studies, while the other operation had no culture-positive animals in either study. Both operations were small (25 and 89 head, respectively) and neither had purchased animals since 1999.

**Figure 5. Within-Herd Apparent Seroprevalence Comparison (n=29 herds)**



The within-herd fecal culture prevalence estimates were generally higher in Dairy 2002 compared to the Follow-up Study (Figure 6). Since three culture methods were used in 2002, and only one method was used in the Follow-up Study, the sensitivity of testing during the 2002 study was most likely higher. It also is possible that individual animal results from the 2002 study were used by producers to remove fecal-culture positive cows prior to the Follow-up Study.

**Figure 6. Within-Herd Apparent Fecal Prevalence Comparison (n=17 herds)**



## Summary

Based on results from the Follow-up Study, it appears that the majority of participating producers have not changed their management practices in a number of years. Although many management practices that may limit young calves' exposure to MAP have been implemented on some dairies, a high percentage of dairies have not adapted these practices, including removing calves from their dams immediately after calving, feeding single-source colostrum (preferably from test-negative cows), or pasteurizing colostrum and waste milk. Many producers may be reluctant to implement these management strategies because they do not recognize their value or because of the costs involved in implementation. In addition, findings from the repeated within-herd prevalence testing suggest that testing methods need to be consistent when comparing estimates over time.

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