Use of a New Bulk-tank Milk Test to Measure Prevalence of Johne's Disease in Utah and the Intermountain West

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Introduction

The objectives were estimation of dairy herd-level prevalence of Johne's disease (JD) in Utah and parts of surrounding states, and estimation of the sensitivity of a single bulk-tank milk test for detection of JD. Johne's disease is a chronic intestinal disease of dairy cattle; effects can include milk production loss, weight loss, diarrhea, death, and increased culling risk. Most US dairy farms do not test for the disease, therefore prevalence is unknown.

Materials and Methods

Signed participation forms were collected from dairy producers by field personnel from the two main milk buyers in Utah and adjacent areas. Two milk samples from all bulk tanks on participating farms were collected one month apart by milk haulers and coded for anonymity. Samples were frozen and shipped overnight by courier to a laboratory for testing for *Mycobacterium avium* subsp *paratuberculosis* (MAP), the JD agent. An ELISA for anti-MAP IgG1 and a PCR to detect MAP (both designed for bulk milk) were run on every sample.

Results

Signed forms were returned by 170 of 251 (68%) producers in the milk shed. A total of 476 bulk milk samples were collected from all tanks on the 170 participating farms, sampled twice one month apart. All samples arrived frozen at the laboratory. MAP was detected in bulk milk from 67 of 170 (39%) dairies tested. The most common test results among the 67 dairy farms defined as JD-positive were one or two positives in four tests (n=28 farms). Lowest proportions of all tests JD-positive on farms were: 2/48 (farm with 12 tanks), 1/10 (n=3), 1/8 (n=3), 2/14, 2/12 (n=2); highest proportions positive: 13/24, 7/12, 6/8, 9/12, 5/6, 10/12, 4/4, 8/8. One hundred fifty-eight tank samples (316 tests) were tested resulting in 136 positive results from the 67 true JD-positive farms; sensitivity of one bulk tank milk test was 136 of 316 = 43% for JD detection. From the 103 JD-negative farms, all 318 tank samples (636 tests) were negative for MAP. Probability of false-negative results on a single test was $(1-0.43)=0.57$. The probability of true-negative JD status depended on the number of tank samples tested. E.g., for farms with one bulk tank, two samples, four tests (2 ELISA, 2 PCR), with all results negative, the true-negative probability was $[1 - (0.57)4]=(1-0.11)=89\%$. For farms with at least two bulk tanks, at least four samples tested (eight tests), all negative for MAP, true-negative probability was at least 99%.

Significance

Nearly 40% of dairy herds in Utah and the intermountain west tested positive for JD. These results support published speculation that proportion of US herds with JD has increased over the last 15 - 20 years. However, the prevalence detected was three times that from a recent report that 13% of dairy herds in the western US were positive. A recent European literature review concluded that "prevalences of MAP would have to be guesstimates based on available data". The increase in proportion of herds with JD is not surprising, considering that testing for the disease is not utilized on so many farms. Monthly bulk milk sample testing with sensitivity of 43% is a practical way to screen dairy herds for presence of JD. Milk sampling is markedly more convenient than fecal or blood sample testing for any disease of dairy cattle. Studies on use of individual cow milk tests for accuracy, practicality, and together with management strategies, effectiveness in reducing the prevalence of JD in dairy herds are needed.