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Feeding Pasteurized Non-Saleable Milk Did Not Increase the Risk for *Mycobacterium Avium* subsp. *paratuberculosis* Infection in Adult Dairy Cows

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Introduction

Johne's disease is a chronic intestinal infection of ruminants caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP). While the most important route of transmission is generally considered to be through the ingestion of infective feces in the calf's environment, other potential sources of transmission could include shedding (or post-harvest contamination) of the organism in colostrum or milk. One study reported that 27% of subclinical infected cows had culture-positive supramammary lymph nodes and 12% had culture-positive milk (Sweeney et al., 1992). The relative importance of consuming raw milk in MAP transmission to calves has not been quantified.

The relatively recent introduction of commercial on-farm pasteurization equipment has offered producers an economically attractive method to feed pasteurized non-saleable milk while preventing or reducing pathogen transmission. While most in-lab studies have reported that pasteurization resulted in the complete elimination of viable MAP (Stabel, 1996; Keswani and Frank, 1998; Grant et al., 1999; Stabel, 2001; Gao et al., 2002; Stabel et al., 2003), some studies have reported some colonies surviving the pasteurization process if the milk was inoculated at high concentrations (Chiodini and Hermon-Taylor, 1993; Grant et al., 1996). However, with the exception of two of these studies, (Stabel, 2001; Stabel et al., 2003), most of this research was completed using in-lab simulations of pasteurization. The objective of this study was to describe if feeding pasteurized non-saleable milk controlled the transmission of MAP in calves, as compared to commercial milk replacer, under conditions of natural exposure.

Methods

Phase 1 of the study (birth to weaning) was completed between Dec. 2001 and Oct. 2002. Participating farms included a large dairy in central Minnesota (850 cows, 10-12% seroprevalence for MAP infection), and a smaller dairy (250 cows; 17% seroprevalence for MAP), the latter of which acted as the heifer grower operation for both dairies. A total of 439 heifer and bull calves born on both dairies were transported to the calf grower at 1-2 d of age, where they were systematically assigned to be fed either pasteurized non-saleable milk (PM, n = 222) or a conventional 20:20 milk replacer feeding program (MR, n = 217) until weaning. Non-saleable milk collected from the large dairy was pasteurized (145 °F x 30 min) before each feeding using a commercial batch pasteurizer (DairyTech, Inc. Windsor, CO). Analysis of preweaning performance has shown that calves fed PM had significantly higher rates of weight gain and significantly reduced treatment and mortality rates in the preweaning period vs calves fed MR (Godden et al., 2005).

Phase 2 of the study involved the long-term follow-up of heifer calves into adulthood.

Of 437 heifer and bull calves originally enrolled into phase one of the study, 104 and 116 heifer calves were weaned from the MR and PM feeding programs, respectively. Unfortunately, due to the unforeseen sale and dispersal of the larger participating dairy in late 2003, a significant number of the study heifers from the large herd were lost to follow-up. As many of these heifers as possible were tracked into their new herds. Follow-up testing was ultimately completed in 54 and 65 adult cows from the MR and PM treatment groups, respectively, in five different herds in WI, MN, IN and CA. Blood and fecal samples were collected from study cows at an average age of 25.0, 42.4 and 56.5 months of age, and tested for serum antibodies to MAP (IDEXX ELISA) and growth of the organism in feces using fecal culture. DHIA records of all calving events, total lactation milk production, and culling or death events were collected until the end of the study follow-up period on January 30, 2007. Logistic regression and survival analyses, both controlling for random herd effects, were used to evaluate the effect of treatment on risk and age of removal from the herd, and risk and age for testing positive to infection with MAP.

Preliminary Results and Conclusions

Of adult cows who were present at the first Johne's test event at approx. 25 months of age, the proportion that were removed from the herd by the end of the study follow-up period (approx. 57 months of age) was 53.7% and 41.5% for calves originally fed MR or PM, respectively. Survival analysis indicated cows originally fed MR were at significantly higher risk for removal from the herd between first calving and the end of the follow-up period on Jan. 30, 2007 (Hazard ratio = 1.38, $P < 0.05$). There was no difference in risk for a positive MAP test (fecal culture, serum ELISA or both) during the follow-up period for cows originally fed MR (27.8%) as compared to cows originally fed PM (21.5%) ($P = 0.36$).

Despite the limited sample size, cows originally fed PM were not at increased risk for MAP infection, and experienced increased longevity in the herd, as compared to cows originally fed MR. These results suggest that, if raw milk is indeed an important source of MAP transmission to calves (significance as yet undetermined), then on-farm pasteurization was effective in destroying viable MAP in the milk or else reduced concentrations of viable MAP to levels below an infective dose. Until the significance of raw milk feeding as a potential source of MAP transmission can be verified, producers implementing a Johne's control program are advised to feed calves either pasteurized milk or commercial milk replacer in the preweaning period.

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