

Effect of feeding heat-treated colostrum on risk for infection with *Mycobacterium avium* subsp. *paratuberculosis*, milk production and longevity in Holstein dairy cows

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Introduction

Johne's disease, caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP), is one of the most economically important infectious diseases of U.S. dairy cattle. Colostrum is an important source of protective immunoglobulins (IgG) but can be a source of exposure to important pathogens including MAP. Several years ago, we developed a colostrum heat-treatment (HT) protocol (60 °C x 60 min) which preserved important colostrum IgG while eliminating most common pathogens and significantly reducing MAP in inoculation studies. Short-term studies reported that calves fed HT colostrum had improved serum IgG levels and reduced morbidity in the preweaning period as compared to calves fed fresh colostrum. However, research has been lacking to investigate whether calves fed HT colostrum also experienced longer term benefits including reduced risk for infection with MAP. The objective of this study was to complete a multi-herd randomized field study to describe the effect of feeding HT colostrum on long-term outcomes including transmission of MAP, milk production and longevity within the herd.

Materials and Methods

The study was initiated in summer 2007 on 6 large Midwest dairy herds. Daily on each farm, colostrum was collected from fresh cows, blended, divided into two aliquots, and then one aliquot heat-treated in a commercial batch pasteurizer at 60 °C for 60 minutes. A sample from each batch of colostrum was collected for PCR testing (MAP-pos. vs. MAP-neg.). Newborn heifer calves were removed from the dam within 30-60 minutes of birth and systematically assigned to be fed 3.8 L of either blended fresh (FR, n=434) or blended heat-treated (HT, n=490) colostrum within 2 hr of birth. After reaching adulthood (> 2 years old), study animals were tested once annually for 3 yr for infection with MAP using serum ELISA and fecal culture. Lactation records describing milk production data and death or culling events were collected during the 3-year adult testing period. Multivariable model logistic and linear regression was used to investigate the effect of

feeding HT colostrum on risk for testing positive to MAP during the 3-year testing period (positive/negative; logistic regression) and on first and second lactation milk yield (kg/cow; linear regression), respectively. Cox proportional hazards regression was used to investigate the effect of feeding HT colostrum on risk for removal from the herd.

Results

Fifteen percent of all study animals were fed PCR MAP-positive colostrum with no difference between the FR and HT group. Over the 3-year testing period, there was no difference in the proportion of animals testing positive for MAP when comparing the HT group (10.5%) versus the FR group (8.1%) (Odds Ratio (Fresh)=0.75, 95% CI: 0.46-1.20). There was no effect of treatment on milk production in either the first lactation (HT=11,797 kg; FR=11,671 kg; $P=0.41$) or second lactation (HT=11,013 kg; FR=11,235 kg; $P=0.33$). The proportion of cows leaving the herd by the study's conclusion at approximately 61 months of age was not different for animals fed HT (68.0%) versus FR (71.7%) (Hazard Ratio (Fresh)=1.08, 95% CI: 0.92-1.26) colostrum. There was no difference in treatment effect among the 6 herds.

Significance

Although previous studies have reported short-term benefits including improved passive transfer of IgG and reduced morbidity in the preweaning period, the current study found no benefit to feeding HT colostrum on long-term outcomes including risk for transmission of MAP, milk production in the first and second lactation, and longevity within the herd. As such, producers adopting the practice of feeding colostrum HT at 60°C for 60 min should do so with the understanding that, while there may be short-term health benefits to the preweaned calf, we have thus far not identified any long-term benefits. Research will continue to investigate if this colostrum HT protocol may be improved to offer both short- and long-term health and performance benefits including the control of MAP transmission.