Feeding Heat-Treated Colostrum to Dairy Calves

D. Hagman; S. Godden, *DVM, DVSc*
Department of Veterinary Population Medicine, University of Minnesota, St. Paul, MN

Introduction

Colostrum is a necessity to prevent failure of passive transfer and accompanying illness in dairy calves. However, colostrum is also a vehicle for many pathogenic bacteria, including *Salmonella enteritidis, Listeria monocytogenes., Escherichia coli, Mycoplasma bovis* and *Mycobacterium avium* subspecies *paratuberculosis* (MAP), the causative agent of Johne's disease. Recently the dairy industry has increasing interest in utilizing pasteurized waste milk to feed to calves. Pasteurization reduces or eliminates harmful pathogens in the milk. Now producers are wondering if colostrum fed to calves can also be pasteurized. Previous attempts to batch pasteurize colostrum at the industry standard of 145°F (63°C) for 30 minutes eliminated the pathogens but also denatured up to 30% of Immunoglobulin G (IgG) while making the final product more viscous to feed. In 2004-2005, studies conducted at the University of Minnesota showed that heat treatment at 140°F (60°C) for 60 minutes was sufficient to eliminate or significantly reduce pathogens, including MAP, but had no significant effect on IgG levels or the viscosity of the colostrum. While this low-temperature, long-time approach to heat-treat colostrum worked well in the lab, we needed to determine if it could also be successful when heat-treated colostrum was fed to newborn calves on a commercial dairy farm. Our objective was to determine if we could successfully feed heat-treated colostrum to newborn calves without causing any harm to the animal. This would require that calves fed heat-treated colostrum experience no adverse effects on passive transfer.

Materials and Methods

A controlled study was completed at the Transition Management Facility (TMF), a commercially owned and operated dry- and transition-cow facility in Baldwin, WI. Pools of fresh first-milking colostrum were collected from cows within one hour of calving. Half of each pool was refrigerated immediately and fed fresh to calves over the next one two two days. The other half of each pool was heat-treated at 140°F (60°C) for 60 minutes using a commercial batch pasteurizer (DairyTech Inc, Windsor, CO), refrigerated, then fed to calves over the next one to two days. Newborn calves were systematically assigned to be fed four quarts (3.8 L) of either the fresh or heat-treated colostrum within one to two hours of birth (n=25 calves per treatment group). Prior to feeding, blood samples were taken from each calf to be analyzed for calf serum total protein (TP, gm/dl) and IgG (mg/ml) concentrations. After feeding, the calves were kept in individual hutches and fed two quarts of milk replacer twice daily. Twenty-four hours (+/- 1 hour) after feeding colostrum, blood samples were again collected and analyzed for calf serum total protein (gm/dl) and IgG (mg/ml) concentrations.

Results

The 0-hour serum IgG and TP levels were not significantly different between treatment groups. However, 24-hour serum IgG and TP concentrations were significantly higher for calves fed the heat-treated colostrum as compared to calves fed fresh colostrum. The mean 24-hour serum IgG and TP concentrations were 17.5 mg/ml and 5.9 gm/dl for the fresh-colostrum group vs. 22.3 mg/ml and 6.3 gm/dl for the heat-treated colostrum group, respectively ($P < 0.05$).

Significance

Calves fed heat-treated colostrum had a significant increase in IgG absorption across the gut wall. We hypothesize that this occurred because, for calves fed heat-treated colostrum, there were fewer bacteria present in the small intestine to interfere with colostral antibody absorption (colostrum bacteria counts not reported here). Results from this study show that heat-treated colostrum can be successfully fed on commercial dairy farms to reduce pathogen exposure without harming passive transfer in newborn calves. Further studies will be necessary to determine and quantify possible economic and health benefits from adopting this practice.