

Effect of adding gut active carbohydrates to colostrum replacer on passive transfer of immunoglobulin G in Holstein dairy calves

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Introduction

Early feeding of a sufficient quantity of high-quality colostrum is the key to good colostrum management and obtaining sufficient passive transfer of immunity in newborn calves. Various products have been added to colostrum to evaluate their potential for improving passive transfer of colostral immunoglobulins (Ig). Research findings suggest that maternal colostrum supplemented with gut-active carbohydrates (GAC) or mannan-oligosaccharides resulted in higher serum IgG concentrations in young mammals. The aim of this study was to investigate the effects of supplementing a commercial colostrum replacer (CR) with GAC on the serum IgG concentration and preweaning performance of dairy calves in a commercial farm setting.

Materials and Methods

In the winter of 2011–2012, newborn Holstein calves that were born as singletons and weighed > 70 lb (31.8 kg) on a commercial transition cow facility in western Wisconsin were enrolled in the study. Calves were removed from the dam within 2 hours after birth and before nursing, and were weighed. Calves were randomly assigned to be fed 1.5 doses (150 g IgG) of a commercial CR (Land O' Lakes Colostrum Replacement, Land O' Lakes Inc., Shoreview, MN) with (GAC group) or without (control group) supplementation with 30 g of GAC. The volume of each treatment was 1 gallon, and each calf was administered the assigned treatment via an esophageal feeder. After the initial treatment (ie, colostrum administration), all calves were bottle fed twice daily with 2 quarts of a non-medicated 22:20 milk protein-based milk replacer. A venous blood sample was collected from each calf prior to colostrum feeding and at 24 hours after colostrum feeding for determination of serum IgG concentration by means of a radial immunodiffusion assay. Bull calves were sold after 24 hours of age, whereas heifer calves remained on site and were monitored for health, growth, and survival until weaning at 7 weeks old. Comparisons between the 2

treatment groups were made with multivariable linear regression analysis.

Results

A total of 119 and 122 newborn Holstein calves were enrolled in the GAC and control groups, respectively. Of the 241 study calves, data on health, growth, and survival was available for 129 (GAC group, n=69; control group, n=60) heifer calves. Serum total protein (GAC, 5.68 g/dL; control, 5.69 g/dL) and IgG (GAC, 20.24 mg/mL; control, 20.28 mg/mL) concentrations and apparent efficiency absorption of Ig (GAC, 54.28%; control, 54.34%) did not vary significantly between calves in the GAC and control groups. Although the study sample size was not calculated to evaluate health outcomes, the incidences of diarrhea and pneumonia, average daily gain, and proportion surviving until weaning did not differ significantly between calves in the GAC and control groups.

Significance

Results indicated that the addition of GAC to a commercial CR did not improve the efficiency of absorption of IgG, serum IgG concentration, or preweaning health and performance in Holstein dairy calves. These findings conflict with results of another study, in which calves fed maternal colostrum supplemented with GAC had higher serum IgG concentrations than did calves that were fed maternal colostrum without GAC. These conflicting findings may be the result of differences in the type of colostrum fed (fresh maternal colostrum vs. CR) or the respective amount of microbial contamination in the colostrum (i.e., microbial contamination is likely higher in maternal colostrum than in the CR). Thus, further research is needed on the effects of supplementing colostrum or CR with GAC on passive transfer of immunity in calves before it is recommended or implemented in the industry.