

The Effect of Method of Colostrum Feeding (Bottle vs Tube) on Passive Transfer of IgG in Newborn Dairy Calves

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Introduction

Colostrum is an important source of nutrients and passively absorbed maternal immunoglobulins (e.g. IgG) to aid the newborn against infectious disease. Failure of passive transfer of IgG is associated with increased morbidity and mortality, reduced growth rate, delayed age at first calving and reduced first lactation milk production. Feeding method (bottle vs. esophageal tube feeder) may affect efficiency of absorption of IgG. No previous studies have been designed to investigate if a volume (large vs small) x feeding method (tube vs. bottle) interaction exists to affect efficiency of IgG absorption. This question is of practical importance because while many producers currently feed relatively large volumes of maternal colostrum, producers feeding commercial colostrum replacers according to label directions may only provide a relatively small volume. The objective of this study is to investigate the relationship between method of feeding and efficiency of IgG absorption, when either large or small volumes of colostrum are fed.

Materials and Methods

This study was completed at the TMF Facility in Emerald, Wisconsin. Criteria for enrollment included newborn calves that were singleton Holstein bull calves, removed from dam before suckling, had a birth weight greater or equal to 70 lb (32 kg), and were born with minimal to moderate assistance. Calves were removed within 30 minutes of birth and fed colostrum within 90 minutes of birth. Calf ID, birth date and time, birth weight, colostrum feeding time, calving ease and dam ID were all recorded. A blood sample was also taken before colostrum was fed. The method and amount of colostrum feeding was selected from one of four treatment groups including: Group 1: Fed one dose (100 gm IgG) of Colostrum Replacer* in a 1.5L final volume, using an esophageal feeder tube. Group 2: fed one dose (100 gm IgG) of Colostrum Replacer* in a 1.5L final volume, using a nipple bottle. Group 3: fed two doses (200 gm IgG) of Colostrum Replacer* in a 3.0L final volume, using an esophageal feeder tube. Group 4: fed

two doses (200 gm IgG) of Colostrum Replacer* in a 3.0L final volume, using a nipple bottle. * (Land O'Lakes Colostrum Replacer. Land O'Lakes, Inc. St. Paul, MN). After the first colostrum feeding all calves were fed a milk-protein based milk replacer (2 quarts, twice daily) using a bottle. After 24 hours a second blood sample was collected. Serum was separated, frozen, and sent to the Prairie Diagnostic Services Laboratory (Saskatoon, SK, Canada) for analysis of serum IgG levels using a RID method.

Results

Twenty-four calves were available for treatment groups one, two and three, and 25 calves were available for treatment group four. Serum IgG concentrations were significantly greater for calves fed two doses (200 g IgG) of colostrum replacer, as compared to calves fed one dose (100 g IgG) of colostrum replacer. When comparing the method of feeding between the one dose treatment groups, both the apparent efficiency of absorption of IgG (AEA%) and the 24-hr serum IgG concentration showed significant differences: Calves in treatment group 2 (one dose bottle) showed an average 10.6% increase in AEA of IgG and significantly higher mean serum IgG levels at 24 hrs of age (AEA =51.1%; serum IgG =12.5 mg/ml) over calves in treatment group one (one dose tube) (AEA =40.5%; serum IgG =9.85 mg/ml) ($P < .05$). However, when comparing the two dose bottle versus the two dose tube treatment groups, there was no statistical difference between mean AEA of IgG (AEA bottle =41.1%; AEA tube =39.0%) or 24 hour serum IgG levels (IgG bottle =19.65 mg/ml; IgG tube =18.65 mg/ml).

Significance

These results suggest that if a large volume of colostrum (e.g. 3L) is fed, there is no difference in final serum IgG concentrations or apparent efficiency of IgG absorption, regardless of whether a bottle or esophageal tube feeder is used. However, when a smaller volume is fed (e.g. 1.5L), improved passive transfer of IgG was achieved by using a nipple bottle.