

Comparison of serum concentrations and duration of BVDV 1, BVDV 2, BHV-1, BRSV, and PI3 virus-neutralizing antibodies in calves fed maternal colostrum or a colostrum replacer at birth

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Introduction

Providing newborn calves with high concentrations of neutralizing antibodies through colostrum is a key management strategy for the reduction of respiratory disease caused by BVDV, BHV-1, BRSV, and PI3 in young calves. When maternally-derived immunity decays, calves become susceptible to acute viral infection and disease. Duration of maternally-derived immunity is dependent on the amount of neutralizing antibodies absorbed from colostrum. Feeding a commercial colostrum replacer is an alternative to provide passive immunity to neonatal calves when availability of maternal colostrum is compromised. The ability of colostrum replacers to provide neonatal calves with an adequate concentration and duration of specific virus-neutralizing antibodies against common respiratory viruses has not been described. The objective of this study was to compare the total serum concentration and duration of BVDV, BHV-1, BRSV and PI3 virus neutralizing antibodies in calves fed maternal colostrum (MC) or a commercial colostrum replacer (CR) at birth.

Materials and Methods

Newborn male Holstein calves (n = 43) were removed from their dams at birth and assigned to colostrum replacer (CR) or maternal colostrum (MR) groups. Group CR calves (n=20) received two packets of Land O'Lakes-Bovine IgG® colostrum replacer (100 g of IgG per packet), and group MC calves (23) received 3.8 L of high quality fresh or frozen maternal colostrum (> 50 g of IgG per L). From each calf, blood samples were obtained prior to CR or MR feeding for BVDV virus isolation and determination of serum viral-neutralizing antibody titers. Additional blood samples were collected at two and seven days of age for determination of serum viral-neutralizing antibody titers, and monthly thereafter until the calves became seronegative. Antibody titers against BVDV1 and BVDV2 were determined by serum virus neutralization, whereas antibody titers against BHV-1, BRSV, and PI3 were determined by an indirect ELISA. Data were compared between treatment groups with repeated measures ANOVA as implemented in PROC GLM.

Results

Calves in the CR group had significantly ($P < 0.05$) higher BVDV1- and BVDV2-neutralizing antibody titers during the first four months of life, compared with those for calves in the MC group. The mean time for calves to become seronegative to BVDV1 and BVDV2 was seven and six months, respectively, for all calves and did not differ significantly between groups. Although virus neutralizing antibody titers against BHV-1, BRSV, and PI3 were similar between groups during the entire study period, calves in the CR group had significantly higher BRSV-specific antibody titers at seven days of life, compared with those for calves in the MC group. Conversely, calves in the MC group had significantly higher BHV-1-specific antibody titers at three months of life, compared with those for calves in the CR group. The mean time for calves to become seronegative to BRSV, BHV-1 and PI3 was eight months and did not differ significantly between groups. Calves in the MC group had large variations in BVDV, BRSV, BHV-1, and PI3-specific neutralizing antibody titers throughout the entire study period ($P < 0.05$).

Significance

The CR provided adequate concentrations of neutralizing antibodies against BVDV1, BVDV2, BRSV, BHV-1, and PI3, and the duration of passively transferred immunity was similar to that observed with MC. The CR used in this study provided higher concentrations of BVDV-specific antibodies during the first four months of life and may provide more effective protection against acute BVDV infection in young calves. Differences in concentrations of specific viral antibodies in maternal colostrum and differences in apparent efficiency of absorption (AEA) may be responsible for the individual titer variation observed in calves in the MC group. Large variations in neutralizing antibody titers against respiratory viruses within a group of young calves may result in poor herd immunity and increase the risk for introduction of infectious respiratory disease.