Passive Transfer of Antibodies in Pregnant Cattle Following Vaccination with Bovi-Shield®

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Introduction

Prior research has shown that neonatal calves have various levels of immunoglobulins (IgG) following passive antibody transfer from the dam. Variability in neonate serum IgG is related to the dam's prior vaccination history, the interval from vaccination to parturition, and type of vaccine administered. Strategic vaccination could improve passive transfer and positively impact neonatal morbidity and mortality.

Materials and Methods

The study objective was to evaluate the viral serologic response and passive transfer of antibodies in pregnant beef and dairy cows following vaccination with a commercial modified-live vaccine (MLV) containing bovine herpes virus 1 (BHV-1), bovine viral diarrhea virus (BVDV) types 1 and 2, parainfluenza virus type 3 (PI3), and bovine respiratory syncytial virus (BRSV) along with five serovars of leptospira (Bovi-Shield GOLD® FP® 5 L5). All cows were vaccinated pre-breeding [dairy cows, Bovi-Shield GOLD® FP® 5 L5; beef cows, Cattle-Master GOLD® FP® 5 L5, killed virus (BVDV types 1 and 2, Leptospira, KV) and MLV (BHV-1, PI3, BRSV) vaccine]. Pregnant cows were randomized to either a non-vaccinated control group (dairy, N = 36; beef, N = 16; T1) or a vaccinate group (dairy, N = 34; beef, N = 19; T2). Dairy cows were vaccinated at dryoff and the beef cows were vaccinated at 228-271 days of gestation (T2 only). Blood was collected from the cows at vaccination, calving, and 10 days post-calving. Cows were monitored for signs of parturition, and colostrum was collected pre-nursing. A calf blood sample was obtained pre- and three days post-colostrum intake. Serum and colostral virus neutralization (serum=SVN, colostral=CVN) antibody titers for BHV-1, BVDV types 1 and 2, PI3, and BRSV were evaluated for each time point.

Results

None of the control animals exhibited signs of natural exposure to the five viruses as indicated by a lack of increase in SVN antibody titers during the study. All calves retained in the analysis were seronegative (BHV-1, BVDV, PI3, SVN < 1:2, BRSV SVN ≥1:8) pre-nursing. No adverse events were related to the vaccination. Dairy: At calving vaccinates exhibited significantly higher ($P<=0.05$) geometric least squares mean (GLSM) SVN antibody titers for BHV-1 (T1 = 12.1 and T2 = 23.4), BRSV (T1 = 35.7 and T2 = 46.3) and PI3 (T1 = 116.9 and T2 = 188.2) but similar BVDV1 (T1 = 52.8 and T2 = 64.6) and BVDV2 (T1 = 69.8 and T2 = 92.5) SVN antibody titers when compared to controls. At 10 days post-calving, GLSM SVN antibody titers for vaccinates were significantly higher ($P<=0.05$) for BHV-1 (T1 = 16.1 and T2 = 24.2) and PI3 (T1 = 103.1 and T2 = 169.9) but not different for BRSV (T1 = 36.1 and T2 = 45.6), BVDV1 (T1 = 98.0 and T2 = 107.9) and BVDV2 (T1 = 78.9 and T2 =106.4). The GLSM CVN antibody titers were significantly higher ($P<=0.05$) for vaccinated dams versus controls for BHV-1 (T1 = 113.1 and T2 = 220.3), PI3 (T1 = 1159.7 and T2 = 2423.9) and BVDV2 (T1 = 1219.0 and T2 = 1830.7) but were not different for BRSV (T1 = 324.7 and T2 = 436.6) and BVDV1 (T1 = 1217.5 and T2 = 1448.6). At three days post-colostrum intake, GLSM SVN antibody titers were significantly higher ($P<=0.05$) in calves from vaccinated dams versus control calves for BHV-1 (T1 = 13.1 and T2 = 17.7) but were not different for PI3 (T1 = 246.8 and T2 = 379.6), BRSV (T1 = 50.6 and T2 = 69.0), BVDV1 (T1 = 363.1 and T2 = 301.8), and BVDV2 (T1 = 382.8 and T2 = 414.1). Beef: Vaccinated dam's GLSM BVDV2 CVN antibody titers were significantly higher ($P<=0.05$) than controls (T1, 3090.3; T2, 9690.1). Calves from vaccinated dams had post-colostrum GLSM BVDV2 SVN antibody titers that were significantly higher than controls ($P<=0.05$) [T1, 1152.9 vs. T2, 2361.3].

Significance

Modified live vaccination in late gestation cows that were vaccinated pre-breeding with a MLV or KV vaccine, dairy and beef, respectively, resulted in a higher level of serum and colostral antibody titers for multiple viral antigens in dams and their offspring.