Effect of vaccination of beef cows during gestation on transfer of passive immunity and clinical protection of calves against experimental challenge with BRSV

Manuel F. Chamorro, DVM, MS, PhD, DACVIM[1]; **David Martinez**, DVM, MS[1]; **Amelia Woolums**, DVM, PhD, DACVIM, DACVM[3]; **Ricardo Stockler**, DVM, MS, DABVP-Dairy[1]; **Thomas Passler**, DVM, PhD, DACVIM[1]; **Scott Silvis**, BS, MS[2]; **Gage Raithel**, BS[2]; **Paul H. Walz**, DVM, MS, PhD, DACVIM[2]

[1]Department of Clinical Sciences, College of Veterinary Medicine, Auburn University, Auburn, AL 36849

[2]Department of Pathobiology, College of Veterinary Medicine, Auburn University, Auburn, AL 36849

[3]Department of Pathobiology and Population Medicine, College of Veterinary Medicine, Mississippi State University, MS 39762

Introduction

The bovine respiratory disease complex (BRDC) is the leading cause of death of beef calves older than 3 weeks of age and causes major economic losses to producers (USDA NAHMS Beef Part IV. 2007-2008). The bovine respiratory syncytial virus (BRSV) is an important cause of respiratory disease in young calves. Clinical protection against BRSV provided by vaccination of young calves at different ages and with different levels of maternal antibodies has not resulted in significant reduction of BRDC-associated morbidity and mortality (Theurer et al, *J Am Vet Med Assoc*, 2015). Clinical protection provided by maternally derived immunity against BRSV has been inconsistent in the literature and could negatively affect the efficacy of vaccination programs in young calves (Ellis et al, *Can Vet J*, 2014). In contrast, failure in the transfer of passive immunity and rapid decay of colostral antibodies have been suggested as risk factors of pre-weaning beef calf pneumonia (Smith DR, *Anim Health Res Rev*, 2014). The objective of this study was to determine if vaccination of beef cows during gestation resulted in greater transfer of BRSV-specific maternal immunity and provided prolonged clinical protection of calves against experimental challenge with BRSV.

Materials and Methods

Forty multiparous 6 to 7 month-pregnant crossbreed beef cows were stratified by age and randomly assigned to 1 of 2 treatment groups. Group A (n=20) was vaccinated with 2 doses of a multivalent inactivated-BRSV vaccine (Triangle 10HB®, BI Animal Health) 21 d apart following manufacturer›s recommendations. Group C (n=20) served as the unvaccinated control group and received 5 mL of 0.9% saline solution subcutaneously 21 d apart. Calving occurred in a single pasture and nursing of colostrum was unassisted and occurred within natural conditions. At 48 hours of life and before challenge, serum samples were collected from all calves to evaluate initial titers and decay of colostrum-derived BRSV antibodies. All calves were early weaned at calf ages between 92 and 126 d. After weaning, calves were challenged with BRSV (d 0). Assignment of respiratory scores and collection of serum and nasal secretion samples for evaluation of BRSV antibodies and BRSV shedding occurred on d 0, 4, 6, 8, 14, 21, and 28. Clinical scores, antibody titers, and BRSV RT-qPCR results were compared between groups using repeated-measures analysis in a mixed generalized linear model with SAS 9.45.

Results

The mean Log2 colostrum-derived BRSV-specific antibody titers in serum at 48 hours and before BRSV challenge was significantly higher in calves from vaccinated dams (6.2 +/- 0.5 and 5.35 +/- 0.6) compared with calves from unvaccinated dams (4.7 +/- 0.5 and 4.2 +/- 0.5). After BRSV challenge, a greater proportion of calves from unvaccinated dams (60%) developed fever (rectal temperature > 103.1°F [39.5°C]) compared with calves from vaccinated dams (36.8%). On d 21 after challenge, the proportion of calves with abnormal attitude, breathing pattern, and nasal discharge scores was greater in calves from unvaccinated dams compared with calves from vaccinated dams (80%, 85%, and 65% vs 47.3%, 73%, and 56.3%, respectively). A greater number of calves from unvaccinated dams shed BRSV in nasal secretions compared with calves from vaccinated dams (6 vs 2, respectively).

Significance

Vaccination of beef cows during the last trimester of pregnancy with 2 doses of an inactivated-BRSV vaccine to increase the level of passively transferred BRSV specific immunity is a practical and adequate strategy to reduce clinical respiratory disease caused by BRSV in young beef calves from cow-calf operations.