

Assessment of vaccine efficacy in early-weaned beef calves challenged with bovine viral diarrhea virus (BVDV)

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Introduction

Early weaning of beef calves is a management strategy that beef cattle producers can implement to reduce their forage needs and maintain the cow herd during severe drought. To ensure the economic success of early weaning, adequate vaccination protocols must be implemented. Vaccination of young calves against BVDV is a key management strategy to prevent economic losses associated with disease caused by BVDV in beef herds. The purpose of this study was to evaluate the efficacy of different BVDV vaccines for protecting calves against virulent BVDV challenge 45 days after vaccination, and the effect of BVDV vaccination on weight gain of early-weaned beef calves that become acutely infected with BVDV.

Materials and Methods

Forty-eight beef calves were weaned at approximately 72 days of age. At weaning, calves were assigned to 1 of 4 different BVDV vaccination (ie, treatment) groups. Group A received phosphate saline (control; n = 12), group B received BRD-Shield® (12), group C received Express5® (12), and group D received Bovishield Gold 5® (12). Following vaccination, each treatment group was isolated in separate pastures to prevent transmission of vaccine strains among groups. Forty-five days after vaccination, all calves were challenged with virulent BVDV 2 strain 1373. Calves were examined and clinical scores were recorded daily after BVDV challenge. Body weights were recorded at birth, weaning, BVDV challenge (day 0), and 28 days after challenge. From each calf, a serum sample for determination of serum neutralizing antibody titers against BVDV was obtained before vaccination, before BVDV challenge, and after challenge. After BVDV challenge, serum, nasal secretion, and whole blood samples were obtained for BVDV virus isolation and CBC (whole blood samples). Outcomes were compared among treatment groups by means of repeated measures ANOVA as implemented in Proc-GLM.

Results

Before vaccination, serum antibody titers against BVDV types 1 and 2 were similar among all 4 treatment groups and were considered adequate. After vaccination and before challenge, vaccinated calves (groups B, C, and D) had higher antibody titers against BVDV types 1 and 2 antibodies, compared with those for non-vaccinated control calves (group A). Calves in group D had lower antibody titers against BVDV types 1 and 2 antibodies before challenge, compared with those of calves in groups B and C. Between days 6 and 14, BVDV was isolated from 11 calves in Group A and 6 calves in the vaccinated groups (groups B, C, and D). On day 6, BVDV was isolated from 5 calves in Group D, compared with only 1 calf in each of groups B and C. After BVDV challenge, the mean white blood cell count for calves in group A was significantly ($P < 0.05$) lower, compared with that for vaccinated calves (groups B, C, and D). Clinical scores did not differ significantly among the 4 treatment groups; however, average total and daily weight gains from days 0 to 28 were significantly ($P < 0.05$) higher for vaccinated calves (groups B, C, and D; 78.88 lb and 2.6 lb [35.85 kg and 1.18 kg], respectively), compared with the average total and daily weight gains from days 0 to 28 for non-vaccinated calves (group A; 25.41 lb and 0.9 lb [11.55 kg and 0.4 kg], respectively). Calves from group D had lower average total and daily weight gains from day 0 to day 28 (60.9 lb and 2.1 lb [27.7 kg and 0.95 kg], respectively), compared with that for calves from group B (87.5 lb and 3.1 lb [39.7 kg and 1.4 kg], respectively) and group C (76.25 lb and 2.7 lb [34.6 kg and 1.2 kg], respectively).

Significance

Vaccination of early-weaned beef calves against BVDV at weaning and in the presence of maternally-derived immunity resulted in higher weight gains after challenge with virulent BVDV, compared with that of non-vaccinated calves. Antibody titers against BVDV

were adequate and similar among groups before vaccination. However, before BVDV challenge, vaccinated calves developed serum antibody titers against BVDV types 1 and 2 that were higher than those developed by non-vaccinated control calves, which suggested that interference of maternally-derived immunity with the

individual humoral immunity of vaccinated calves was incomplete. For calves in groups B and C, the higher mean serum antibody titers against BVDV types 1 and 2 before challenge might explain their lower level of viremia on day 6 and the greater weight gains after challenge, compared with those for calves in group D.