BVD Type I and Type II SN Titer Response in Weaning Age Beef Calves Following the Administration, in Various Combinations, of Two MLV Vaccines Containing Different BVD Type 1 and Type 2 Strains

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Introduction

Many preconditioning and feedlot vaccination protocols require two doses of BVD vaccine. Typically the same vaccine and same strains of BVD are used for each dose. Following vaccination, the immune response will be strongest against the strains of BVD virus in the vaccine; however, the immunity developed must also protect against exposure to heterologous strains in the field. Due to antigenic diversity in BVD virus, it is important to stimulate immunity against as wide array of viruses as possible. Theoretically, using combinations of different vaccines containing different strains of BVD will expose the immune system to a wider range of BVD virus. Whether this results in an improved immune response or broader protection against field strains of BVD remains to be proven. The objective of this study was to determine if vaccination with different combinations of two modified live virus vaccines, containing different strains of BVD Type 1 and 2, would improve serum neutralization (SN) titer response and weight gain.

Materials and Methods

Fifty bulls and fifty heifers were randomly assigned to one of four treatment groups. The calves were approximately five months old, varied in age by 30 days and were BVD-PI negative based on immunohistochemistry of ear notches. Calves received an initial dose of MLV vaccine on day 0 (preweaning) and were revaccinated on day 25 (weaning). The two MLV vaccines, vaccine A – Bovi-Shield® Gold 5 and vaccine B – Express® 5, used in this study contained IBR, BVD Types 1 and 2, PI3 and BRSV. A 2-ml dose of each vaccine was administered. Vaccine A was administered intramuscularly and vaccine B subcutaneously, both according to label. The vaccines contained different strains of BVD Types 1 and 2; vaccine A contained NADL (Type 1) and 53637 (Type 2), and vaccine B contained Singer (Type 1) and Bolin 296 (Type 2). The treatment groups were as follows:

- Group 1 (n=24, bulls=13, heifers=11)
  Initial dose of vaccine A, revaccinated with vaccine A
- Group 2 (n=24, bulls=12, heifers=12)
  Initial dose of vaccine A, revaccinated with vaccine B
- Group 3 (n=25, bulls=12, heifers=13)
  nitial dose of vaccine B, revaccinated with vaccine A
- Group 4 (n=25, bulls=12, heifers=13)
  Initial dose of vaccine B, revaccinated with vaccine B

Prior to revaccination, a heifer in group 1 and a bull in group 2 died of causes unrelated to vaccination and were not included in the data analysis.

Blood was collected on day 0 (initial vaccination), day 25 (revaccination) and day 56 (end of study). Serum samples were separated and stored frozen. All sera were analyzed at the same time for serum neutralizing (SN) antibody activity at Benchmark Bio Labs. Serology was performed on all samples using NADL, Singer and NVSL 125c as challenge viruses in separate assays. Individual calf weights were recorded on day 0 and Day 56.

Geometric mean titer (GMT) was calculated based on the least squares mean natural log titer for each treatment group at each sampling time. The natural log of the SN titer and average daily gain were analyzed to evaluate the differences between the treatment groups. The natural log titer at day 0 was analyzed using ANOVA to test for baseline treatment differences. The natural log titer at day 25 and day 56 were analyzed using analysis of covariance, where day 0 natural log was tested as a covariate. ADG was analyzed with analysis of covariance using day 0 weight as a covariate. For all analyses, if the F-test for sex by group interaction was significant, two-sided pair-wise comparisons between groups for each sex were performed. If the F-test for the sex by group interaction was not significant, but the F-test for differences among group means was significant, two-sided pair-wise comparisons between groups were performed. T-tests were used for all pair-wise comparisons.

Results

At day 56, there were significant differences in

BVD Type 1 titers between the various vaccine combinations. The geometric mean titers for all treatment groups were lower in the SN assay utilizing NADL as the challenge virus compared to the assay utilizing Singer as the challenge virus; however, the differences between the groups were the same regardless of the challenge virus used. Vaccinating initially with vaccine B (Singer) resulted in the highest BVD Type 1 titers regardless of whether the animals were revaccinated using vaccine B or vaccine A (NADL). Two doses of vaccine A (group 1) resulted in a significantly lower titers ($p<0.0001$), to both Singer and NADL viruses, compared to groups 2, 3 and 4, all of which used vaccine B in the program. Two doses of vaccine B (group 4), or an initial dose of vaccine B followed with vaccine A (group 3), resulted in a significantly higher titer ($p\geq0.2641$) versus an initial dose of vaccine A followed by a dose of vaccine B (group 2). There was no significant difference ($p\geq0.2641$) between two doses of vaccine B (group 4) compared to an initial dose of vaccine B followed by vaccine A (group 3). At day 56, there were no significant differences ($p=0.099$) in the geometric mean titers for BVD Type 2 between any of the groups. Average daily gain did not differ significantly between the treatment groups ($p=0.632$).

Significance

This preliminary study provides information for practitioners to consider when developing vaccination protocols for weaning age beef calves. The study revealed that utilizing different vaccines containing different strains of BVD Type 1 at initial vaccination and revaccination improved the BVD Type 1 titer response. The serological response to vaccination also depended on the order in which the vaccines were administered. The highest titers were obtained when vaccine B, containing the Singer strain of BVD Type 1, was used as the initial vaccine. Additional studies are needed to evaluate if the difference in titers may be due to the strain of BVD Type 1 in the vaccines, the amount of BVD antigen in the vaccines or due to the presence of an adjuvant. In addition, future studies with a larger number of animals should be completed to evaluate if the differences in the BVD Type 1 titers seen in this study correlate with lower morbidity, mortality and improved performance.

Endnote

Express is a registered trademark of Boehringer Ingelheim Vetmedica, Inc.
Bovi-Shield is a registered trademark of Pfizer, Inc.