Efficacy of bovine viral diarrhea modified-live virus vaccine to provide fetal protection for BVDV type 1 and 2 virus in cattle

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Introduction

Effective control of bovine viral diarrhea virus (BVDV) requires that vaccination provide a high level of protection not only to the dam, but also to the calf in utero, preventing fetal infection and the development of persistently infected (PI) calves. The objective of this study was to determine if primiparous cows vaccinated with a BVDV modified-live virus vaccine (Titanium® 5 L5 HB, Elanco Animal Health, Greenfield, IN, USA) were protected from fetal infections and the development of PI calves following exposure to virulent non-cytopathic type 1 and 2 BVDV.

Materials and Methods

This study was conducted as a separate BVDV type 1 (C1) and type 2 challenge (C2). For both challenge studies, primiparous cows were seronegative to BVDV type 1 and BVDV type 2 (< 1:2 serum neutralization titer) and found to be negative for persistent infection by ear notch immunohistochemistry prior to starting the study. Approximately two-thirds of the non-pregnant crossbred Angus primiparous cows (C1; n=33, C2; n=36) received a multivalent modified-live bovine rhinotrachetis-virus diarrhea-parainfluenza 3-respiratory syncytial virus vaccine that provides protection to both BVDV type 1 and type 2 ($BVDV^+$; Titanium® 5 L5 HB). The remaining primiparous cows (C1; n=17, C2; n=18) received a modified-live bovine leptospira canicola-grippotyphosa-hardjo-icterohaemorrihagiae-pomona bacterin vaccine ($BVDV^-$). For both C1 and C2, estrous was synchronized to condense the breeding period. Following the breeding period, pregnancy was diagnosed via ultrasonography. For C1, isolates of BVDV type 1 (strain BJ) were obtained from persistently infected animals and the challenge virus (5 mL) was administered to study animals intranasally. For C2, isolates of BVDV type 2 (strain PA 131) were obtained from persistently infected animals and the challenge virus (5 mL) was administered intranasally. Cows were observed for clinical signs of illness daily from d -2 to 14 relative to challenge, and were humanely slaughtered at a commercial plant for fetal tissue collection at 71 to 81 d post-challenge. The primary endpoint measurement of this study was the assessment of the proportion of PI calves between treatments following an intranasal challenge with either BVDV type 1 (C1) or type 2 (C2) during pregnancy when females are susceptible to develop fetal infections. Harvested fetuses from which BVDV type 1 or 2 were isolated were considered PI.

Results

For C1 the percent of calves PI with BVDV was decreased ($P < 0.05$) in the $BVDV^+$ treatment compared to the $BVDV^-$ treatment. The calculated prevented fraction was 89% for animals in the $BVDV^+$ treatment relative to the $BVDV^-$ treatment. For C2 the percent of calves persistently infected with BVDV was decreased ($P < 0.05$) in the $BVDV^+$ treatment compared to the $BVDV^-$ treatment. The calculated prevented fraction was 91% for animals in the $BVDV^+$ treatment relative to the $BVDV^-$ treatment.

Significance

Overall, results in this study indicate that the investigated vaccine, Titanium® 5 L5 HB, provides fetal protection against a virulent non-cytopathic BVDV type 1 and 2 challenge when administered prior to breeding.