

# Fetal Protection Against Continuous Exposure To Bovine Viral Diarrhea Virus Following Administration of A Vaccine Containing an Inactivated BVDV Fraction

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## Introduction

Bovine viral diarrhea virus (BVDV) is a major viral pathogen of cattle, leading to substantial economic losses. A major source of loss is attributed to fetal infection with subsequent fetal pathology. The major source of virus transmission is cattle that are immunotolerant and persistently infected with BVDV. The objective of this study was to determine if a commercially available killed BVDV vaccine (CattleMaster® Gold™ FP™ L5, Pfizer Animal Health) could protect cattle against viremia and fetal infection during continuous exposure to cattle persistently infected with the BVDV. This type of model may more closely represent natural challenge, including continuous exposure to multiple virus strains.

## Materials and Methods

Sixty BVDV sero-negative heifers were randomly assigned to group T2 (vaccinated 2 times 21 days apart with CattleMaster® Gold™ FP™ L5 corresponding to days 0 and 21 of the trial) and group T1 (vaccinated 2 times 21 days apart with 0.9% saline corresponding to days 0 and 21 of the trial). Following vaccination, all heifers were synchronized and artificially inseminated between days 35 and 44 of the trial. Starting at approximately day 50 of gestation (day 90 of the trial) until approximately day 150, 30 (15 from each group) randomly selected pregnant heifers were housed continuously with four PI cattle in 1.5-to 2.5-acre pastures at the MSU Veterinary Research Farm. Two of the PI cattle were infected with genotype 1 and two with genotype 2. Serum and whole blood was taken from the heifers on days 90, 97, 99 and 103 for virus isolation and days 90, 120 and 150 for serum virus neutralization (VN). All cattle were observed twice daily for adverse health

events. On approximately day 150 of gestation (day 190 of the trial), all fetuses were recovered by cesarean section, and fetal brain (cerebellum), liver, lung and spleen tissues were collected for virus isolation.

## Results

On day 90 (69 days following booster vaccination), the geometric mean serum virus neutralization titer of the vaccinated cattle was 724 and 351 against type 1 and type 2 BVDV, respectively. The geometric mean serum virus neutralization titer of the non-vaccinated cattle against genotype 1 and genotype 2 was <2 for both genotypes. BVDV viremia was detected in 3/15 (20.0%) of the vaccinated heifers and 8/15 (53.3%) of the non-vaccinated cattle. One non-vaccinated heifer aborted on approximately day 120 of gestation. BVDV was isolated from 14/14 (100%) of caesarean derived fetuses from non-vaccinated heifers. BVDV was isolated from fetuses derived by caesarean section from 4/15 (26.7%) of the vaccinated heifers. The proportion of BVDV infected fetuses between the two treatment groups was significantly different ( $p \leq 0.05$ ).

## Significance

Using both genotype 1 and 2 BVDV PI challenges in a continuous virus exposure model, a commercially available vaccine containing an inactivated BVDV fraction given prior to breeding can significantly reduce the risk of fetal exposure to BVDV. However, protection was not 100%, emphasizing the need to combine vaccination with identification and elimination of cattle persistently infected with BVDV as part of a comprehensive control program.