

# Comparison of the Immune Response between a Pair of Noncytopathic and Cytopathic Bovine Viral Diarrhea Virus (BVDV) Type 1 Isolates

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## Introduction

Bovine viral diarrhea virus (BVDV) is a major pathogen of cattle causing severe respiratory and reproductive disease. BVDV vaccines remain an important part of the control strategy. Previous work has described higher antibody responses in animals infected with a noncytopathic (NCP) BVDV when compared to its cytopathic (CP) BVDV pair. Animals were re-infected 90 days later with either the same biotype or the other biotype. The animals infected with NCP initially were protected to a higher degree against re-infection with either biotype when compared to the animals infected with CP initially. In this study we wanted to see the effect of an initial infection (or vaccination) with a type 1 NCP or CP BVDV pair followed by infection with a virulent type 2 BVDV on clinical signs and immune responses.

## Materials and Methods

Two studies investigating the effect of BVDV biotype on the immune response and subsequent challenge with a virulent BVDV type 2 were performed. In Study 1, we used twenty 5-6 month-old calves seronegative for BVDV type 1 and BVDV type 2. The animals were randomly sorted into two treatment groups. The animals were first inoculated with a CP or NCP type 1 virus from a BVDV virus pair. The virus pair that was used was the Tifton, Georgia cytopathic (TGAC) and noncytopathic (TGAN) pair that was isolated from a single animal with spontaneous mucosal disease. Group 1 was inoculated intranasally with the cytopathic BVDV TGAC type 1 strain and Group 2 was inoculated intranasally with the non-cytopathic BVDV TGAN type 1 strain. Clinical assessments were performed daily and clinical samples were collected. A challenge of type 2 BVDV 1373 was administered to all of the animals on Day 91 of the study. Clinical assessments were performed daily for fourteen days and samples were collected. Study 2 was performed using seven unsuckled calves that were seronegative for BVDV type 1 and BVDV type 2. Three calves were infected with TGAC strain and three calves were infected

with the TGAN strain and one calf was an uninoculated control. Clinical assessments were performed daily and clinical samples were collected. Three weeks later the calves were infected with virulent type 2 BVDV 1373 strain. Clinical assessments were performed daily and clinical samples collected.

## Results

In Trial 1, the clinical scores were similar between the groups following the initial infection with either TGAC or TGAN with the exception of day 8 when there was a peak in the febrile response of the TGAN group. No remarkable clinical scores were noted following challenge with type 2 BVDV 1371. The white blood cell count (WBC) was similar between the two treatments following infection with 1373 BVDV. Platelets were more depressed following the initial infection and the challenge with 1373 in the TGAC group. Antibody response indicated that TGAN group developed antibodies faster (7 days sooner) and to higher levels (4-8X) higher than the TGAC virus. In the second study, the calves inoculated with the TGAN virus developed antibody titers faster and to higher levels than TGAC. When challenged with 1373, the TGAN calves had six febrile days compared to 16 for the calves initially infected with TGAC. Also, none of the febrile responses in the TGAN calves was greater than 104°F while there were three febrile responses greater than 104°F for TGAC calves.

## Significance

These studies indicate that non-cytopathic BVDV intranasal vaccination resulted in a faster immune response that was protective at an early age (within the first 2 weeks). However, at the 90-day challenge, the only differences observed were more depressed platelet counts in the cytopathic BVDV vaccinated calves. This may indicate that NCP BVDV vaccines may result in faster protection for animals at higher risk for BVDV infection and that there might be some qualitative differences in immunity.