Evaluating a Novel ELISA for BVDV to Identify Circulating BVDV in Cattle Vaccinated with Killed BVDV Vaccines

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Introduction

Bovine Viral Diarrhea virus (BVDV) has been shown to cause an insidious and costly disease in cattle operations. Detection and diagnosis of BVDV in beef cattle herds predominantly relies upon the detection of the presence of circulating BVDV antigen in a herd and is often made when animals are submitted for testing due to disease or death. However, BVDV can be present in herds without overt clinical disease. Therefore, ideally before testing all herd animals, it would be preferable to cheaply screen herds to identify those herds likely to have BVDV circulating and therefore benefit from individual animal testing. In this study we tested the hypothesis that circulating virus may be detectable in herds using killed vaccines by screening for antibodies to the non-structural protein (NSP) 2/3. The hypothesis motivating this project was that killed BVDV vaccines may not induce antibodies to the non-structural protein (NSP) 2/3. Animals vaccinated with such a vaccine would produce antibodies to NSP 2/3 if infected with live BVDV. Therefore, detection of antibodies to BVDV NSP 2/3 may have utility as a field test to detect the circulation of live BVDV within herds or sentinel animals vaccinated using a killed BVDV product.

Materials and Methods

Six biological companies were approached to submit samples for the study. These companies were selected based on personal contacts. The companies were contacted, advised of the purpose of the study and asked to submit the followings: pre-challenge sera from unvaccinated controls, and animals vaccinated with BVDV Type I and II (killed and modified live), as well as post challenge serum samples. Once received, the samples were tested with a serum virus neutralization (SVN) test using cytopathic strains of BVDV Types I and II. Animals were classified as BVDV positive if the SVN titer was 2 or greater. The samples were also tested for BVDV antibodies ELISA using Ceditest® BVDV ELISA kit for BVDV antibody detection which utilized monoclonal antibodies to the highly conserved NS-3 non-structural protein (P80).

Results

Two biologic companies agreed to provide samples from three trials. The samples provided came from challenge studies of 2 killed BVDV vaccines, identified as killed study 1 (1-3 month old calves) and killed study 2 (crossbred beef heifers)and one modified live BVDV vaccine identified as live study 3 (stocker/feeder crossbred calves). Each trial included a vaccinated and unvaccinated group. For all studies animals were randomly assigned to groups and all vaccinated groups received either 2 doses of a killed or one dose of modified live BVDV vaccines containing Type I and II strains. In the killed vaccine studies, post 1st vaccination and on the day of challenge none of the animals receiving the killed virus vaccine had detectable antibodies based on the Ceditest® ELISA and all had detectable SVN Type I responses. At this same time, for SVN Type II, positive titers were found in 17 of 21 animals in killed vaccine study 1 and 11 out of 11 animals in killed vaccine study 2. After exposure to the live challenge organism, 17 of 20 (killed study 1) and 6 of 10 (killed study 2) vaccinated animals had detectable antibodies to Ceditest® ELISA. After vaccination but prior to challenge with live organism 9 of 10 animals receiving the modified live virus had detectable antibodies to BVDV based on the Ceditest® ELISA and SVN Type I and II titers.

Significance

In these preliminary studies, this Ceditest® ELISA test has shown promise as a screening tool to detect BVDV circulation in an unvaccinated herd or a herd vaccinated with one of the killed BVDV vaccines tested here without the need for whole herd testing. Therefore, these killed vaccines, and perhaps others, could be used as marker vaccines in a BVDV eradication program. Breeding herds could be vaccinated with killed vaccines to reduce BVDV incidence and tested using the Ceditest® ELISA kit to confirm that they are free of circulating BVDV.

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