

# Transmission of Bovine Viral Diarrhea Virus from Persistently Infected Cattle to Pregnant White-tailed Deer

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## Introduction

Substantial impact of bovine viral diarrhea virus (BVDV) on the cattle industries has prompted introduction of organized control programs in many states. These programs primarily focus on identification and removal of persistently infected (PI) cattle, the main source of BVDV transmission. In addition to cattle, BVDV may infect a large number of species within the order Artiodactyla as demonstrated by seropositivity. The white-tailed deer is the most abundant wild ruminant species in North America and BVDV infection has been documented in this species. Recently, experimental inoculation of pregnant white-tailed deer resulted in the birth of a persistently infected fawn. Considering the role of PI cattle in the maintenance of BVDV within cattle populations, PI white-tailed deer that harbor and shed the virus continuously may hamper successful execution of control efforts. The objective of this study was the investigation of interspecific BVDV transmission by cohabitation of PI cattle with pregnant white-tailed deer.

## Materials and Methods

In December of 2006, seven female and one male white-tailed deer were captured by cannon net and translocated to a captive deer pen. Captive deer were ascertained to be free from BVDV and BVDV antibodies by virus isolation, virus neutralization and immunohistochemistry procedures and natural mating occurred in captivity. Two cattle, each PI with a BVDV 1b strain (AU526 and KY16) were cohabitated with the deer beginning at approximately 50 days of pregnancy. Cattle and white-tailed deer shared a pen of approximately two acres as well as feed and water sources for a period of 60 days. After removal of PI cattle from cohabitation, pregnancies were followed to term and parturitions occurred in July and August of 2007. With the exception of 2 neonates, all fawns were translocated to isolation rooms to be hand-raised. Virological status of fawns was assessed by virus isolation, immunohistochem-

istry, RT-PCR and virus neutralization procedures. When no further parturitions were expected, all adult deer were humanely euthanized and evidence of BVDV transmission was assessed by virus isolation and virus neutralization.

## Results

From the seven does, nine live fawns (six twins and three singlets) and twin still-born fetuses were born in the summer of 2007. Of the seven pregnancies, four resulted in offspring that were PI with BVDV. Persistent infection was demonstrated in the twin stillborn fetuses and three singlet fawns by immunohistochemistry on skin samples, PCR and virus isolation procedures. Live-born fawns harbored the BVDV strain AU526, while the still-born fetuses harbored strain KY16, as indicated by comparison of sequence analyses of the 5'NTR from the fawns and PI cattle. In one set of twin fawns not PI, high titers of antibodies against BVDV were detected, suggesting *in utero* exposure to BVDV after development of the fetal immune system. The other live born fawns not PI with BVDV possessed relatively low antibody titers to BVDV which may have been the result of passive transfer of antibodies via colostrum. Transmission of BVDV as indicated by seroconversion was demonstrated in all exposed adult deer. All samples from adult deer were negative on virus isolation at time of euthanasia.

## Significance

This is the first study to document BVDV transmission between cattle and white-tailed deer in a natural model of exposure. In our cohabitation model, interspecific BVDV transmission was efficient and resulted in a high number of PI white-tailed deer. The presence of free-ranging wildlife PI with BVDV may result in spill-back infections in cattle and contribute to maintenance of BVDV within animal populations. Further evaluation of white-tailed deer as potential reservoir for BVDV should be considered when executing BVDV control efforts.