

Preventing Persistent Infections of Bovine Viral Diarrhea Virus in Beef Cow Herds

Guide B-225

Revised by John Wenzel¹

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Cattle persistently infected (PI) with bovine viral diarrhea virus, commonly known as BVDV, represent a low-prevalence but high-cost disease affecting all segments of the industry due to limited monitoring and lack of diagnosing PI animals. This publication focuses on transmission routes and periods of susceptibility to BVDV, how to determine if an operation is low- or high-risk for contracting BVDV infections and PI animals, and how to develop a biosecurity plan to protect an operation against BVDV and PI animals.

PREVALENCE OF BVDV AND PI CALVES

Though a validated strategy to determine the status of BVDV and PI does not exist, it has been estimated that up to 10% of beef cow herds have at least one PI animal, and 1% of all calves born in the U.S. are born PI. In 2002, a survey of randomly selected beef herds in five geographically diverse states (Alabama, Nebraska, Nevada, North Dakota, and Ohio) found that 3.9% had at least one PI animal, and nearly 3 out of every 1,000 calves were PI. Approximately 20 to 50% of PI calves born are expected to die prior to weaning. Therefore, the prevalence rate of PI calves moving from the ranch to a stocker pasture or feedlot is 0.08 to 1.95%. Most PI calves will die before 24 months of age.

BOVINE VIRAL DIARRHEA VIRUS

Clinical signs of the PI manifestation of BVDV include profuse diarrhea, fever, and ulcers on the inside of the mouth and between the toes. BVDV is also included as a major component of the Bovine Respiratory Disease Complex and includes the clinical signs of fever, nasal and ocular discharge, difficult breathing, depression, loss of appetite, and possible death.

BVDV is commonly classified as a reproductive disease due to immense losses experienced with fetal reabsorption, abortion, fetal abnormalities, pre- and post-natal growth retardation, and the birth of PI calves. However, the disease is classified as a transition disease because of its impacts to the stocker and feedlot phases.



The virus can infect cattle through three infection routes: *in utero*, acute infection from exposure to other acutely infected animals, or acute infection from exposure to PI animals.

In utero Infection

Depending on the stage of gestation when a cow is exposed to and subsequently infected with BVDV, infection may result in fetal resorption, abortions, PI animals, or normal calves with a strong immune status.

Exposure of the dam to BVDV during the first 60 days of pregnancy will most likely result in a dead fetus that will be absorbed, aborted, or stillborn. Exposure to BVDV between days 40 and 125 of pregnancy most often results in PI calves. After approximately 150 days of pregnancy, the bovine fetus develops a functioning immune system that can mount protection against most strains of BVDV. Therefore, when cattle are exposed during the third trimester of pregnancy, the likelihood of fetal infection or abortion substantially decreases, but is not eliminated.

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Acute Infections

Acute (short-term) infections of the virus occur across all classes of cattle. Infected animals that have virus circulating in the blood stream (viremia) only shed the virus for approximately two weeks. Acute infections may occur in a susceptible cow herd, but are most common in stocker and feedlot cattle, primarily due to exposure from commingling with PI or acutely infected calves and the stress associated with the transition into these phases of the production cycle. The immunosuppressive effect of BVDV on calves is important in the battle against the complex of respiratory diseases experienced in high-stress and confinement situations following weaning and shipping.

PI Calves

Developing fetuses exposed to BVDV before 125 days of gestation may not recognize the virus as an infection since the fetal immune system is undergoing development during this time. This exposure is from either contact of the dam with an acutely infected animal or the dam being a PI cow. With BVDV present during immune system development, the fetus may recognize BVDV as “self” and never mount an immune response. As a result, the virus is incorporated into the genetic makeup of the calf and remains for the life of the animal. These calves are termed PI or persistently infected. The virus survives in the calf, and it will shed BVDV through all body secretions for the remainder of its life. PI cattle shed the virus at a much higher infective rate than acutely infected animals. PI calves are a source of BVDV exposure to all cattle they contact. PI animals are the primary reservoir for BVDV in all segments of the industry. These calves do not always present the clinical symptoms of the virus, but are often “poor doers” with a suppressed immune system, making them more susceptible to other calfhood diseases and resulting in higher sickness and death rates and a lower weaning percentage per exposed cow. However, some PI calves appear normal in all aspects, and can reproduce and remain in a cow herd from year to year. Every calf produced by a PI cow will be a PI calf. For every PI calf that survives to weaning, many other exposed fetuses never survive to birth, resulting in a higher rate of pregnancy loss in BVDV-exposed cows. Because some PI cattle will appear healthy and normal, laboratory assistance will be necessary to diagnose a PI animal. PI animals are born PI and cannot become PI later in life, so newborn calves can be tested for PI.

VIRUS TRANSMISSION

The virus typically enters an animal via close contact with an infected (acute or PI) animal via an oral or nasal route. Most commonly, acute or PI cattle shed the virus

in mucus, nasal and ocular discharge, saliva, feces, and urine. The virus can also be transmitted by contaminated water troughs, feed bunks, nose tongs, and semen. Acutely infected bulls will shed the virus in their semen for approximately two weeks; PI bulls can constantly shed the virus in their semen. This is especially important if a PI animal is present when cattle are gathered, commingled, and stressed with normal production practices such as branding and shipping.

DEFINING LOW- OR HIGH-RISK OPERATIONS

Beef cattle operations that could be classified as low-risk fit two major criteria: 1) a closed herd status and 2) having a vaccination program aimed at preventing fetal infection and/or transfer of BVDV. Because BVDV exposure occurs through contact with and/or exchange of bodily secretions, commingling cattle within a given pasture (e.g., newly received cattle, community grazing allotments, stray cattle, etc.) or across-fence contact with neighboring cattle constitutes an open herd. The likelihood of having a 100% closed herd in the Southwest is very low. Low-risk BVDV operations originating from either a closed herd and/or on a preventative vaccination program are not likely experiencing as much of a decline in reproductive performance (from normal) and tend to maintain a higher weaning rate per exposed cow.

High-risk operations, including those from open herds with no vaccination program designed to combat BVDV, tend to experience a decrease in pregnancy rates despite good nutrition and bull fertility, and a higher than normal incidence of sickness and death in calves prior to weaning despite good sanitation and nutrition. High-risk herds have an increased exposure to cattle infected with BVDV, which results in a higher percentage of cows and calves being infected with BVDV.

DEVELOPING A BVDV PREVENTION PLAN

Three major principles that should be adopted in a BVDV prevention plan include 1) enhancing immunity, 2) preventing exposure to at-risk animals, and 3) eliminating PI carriers from the herd.

Enhancing Immunity

Protecting the fetus from infection may be the most effective means of battling BVDV and PI in the cow herd. The goal of a vaccination program designed to combat BVDV and PI in cow-calf operations should be to prevent fetal infection and enhance immunity from the cow to the calf (colostral immunity).

It is of the utmost importance that you involve your veterinarian in the development of a BVDV biosecurity and vaccination program. In general, BVDV occurs in multiple types and strains. Therefore,

an effective vaccination program should involve adequate cross-protection against the multiple types and strains of BVDV. It is important to note that vaccination programs do not rid a herd of PI. However, if cattle have developed some immunity to BVDV, when they are exposed to the virus it will not spread as quickly. Both killed and modified-live virus (MLV) vaccines are available to provide protection against acute infections. Modified-live virus vaccines require at least a single dose and induce a stronger, longer-lasting immune response that provides cross-protection against different strains of BVDV. Killed vaccines require at least two doses (usually two to four weeks apart) and induce a weaker, shorter-lasting immune response, usually not providing effective cross-protection against different strains. Both killed and MLV vaccines require annual boosters to maintain a strong immune response.

The most common recommendations to induce fetal protection against BVDV infection involve using MLV vaccines that have a fetal protection claim and include protection from both type 1 and type 2 BVDV. These vaccines have proven to be the most effective if administered four to eight weeks before the beginning of the breeding season. Open replacement heifers should receive at least three doses of MLV between branding and the beginning of the breeding season to ensure active immunity. Nursing calves are usually protected if their dams received properly timed vaccinations against types 1 and 2 BVDV, and if the calves received adequate colostrum as newborns. However, colostral immunity has been shown to lose its protective effect beyond seven months of age, thus requiring further vaccination against BVDV for greater protection. Most vaccination programs for newly received stocker and feedlot cattle include the MLV types 1 and 2 BVDV vaccines administered in combination with vaccines to combat the entire bovine respiratory disease complex.

Preventing Exposure

Preventing exposure to at-risk animals is an essential component in a BVDV prevention plan. All newly purchased cattle, including pregnant cows/heifers, replacement heifers, and bulls, should be quarantined and tested before exposing them to the resident cow herd or pen mates. Many tests exist to identify PI cattle. However, skin tests (most commonly taken from an ear notch sample) analyzed by laboratory means are utilized to accurately distinguish between a PI and a normal animal that will clear the virus from its body. There is no known maternal interference with the skin test, so calves can be tested any time after birth. Upon collection, samples should be individually identified and kept cool or frozen until they are submitted to an accredited laboratory for analysis. The average cost is about \$5 per sample.

Testing and Eliminating PI Carriers

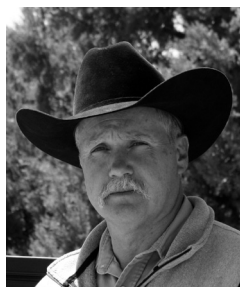
High-risk herds should undergo the most stringent screening program to identify and eliminate PIs. Cattle that test positive for BVDV should be sold for slaughter, isolated from other cattle for the remainder of their life, or euthanized. Beef from BVDV-infected cattle is safe for human consumption. Initial testing can be accomplished by testing all cows and bulls in the breeding herd, or by testing all the calves, dry cows, bulls, and bred cows at branding. If these tests come back as all negative, you have no PI cattle at this time, and with good biosecurity you may prevent exposure to BVDV. A known negative cow can have a PI calf if she was exposed to BVDV in the early stages of gestation. Once a cow herd is known to be negative, testing each subsequent calf crop will alert you if a BVDV exposure has occurred. Calves with a negative PI test have increasing value in the marketplace. It is highly recommended that producers evaluate suspected calf deaths for the presence of BVDV.

CONCLUSIONS

A BVDV screening and prevention program should be adequate to meet the needs of individual operations. If there is no herd history of BVDV, the most commonsense approach would entail implementing an effective vaccination program and testing only new cattle. Conversely, if BVDV is suspected or has a history on the operation, a more aggressive screening protocol may be necessary to reduce the prevalence of BVDV and PI animals. Contact your local veterinarian for assistance in developing a BVDV prevention program for your herd.

Access http://aces.nmsu.edu/pubs/_b/ and <http://aces.nmsu.edu/bqa/> for additional Extension publications and materials related to herd health and management.

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