USDA Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE

Bovine Viral Diarrhea on U.S. Beef Cow-calf Operations
NAHMS Beef 2017 Study

Information Brief

September 2023

INTRODUCTION

Cattle infected with bovine viral diarrhea (BVD) virus can show several different clinical signs, though the most important effects of BVD infection in a cow-calf herd are associated with reproduction. BVD can cause decreased fertility, abortions, and congenital malformations in calves. Persistent infection can occur in fetuses exposed to the virus between 40 and 125 days of gestation. Persistently infected (PI) calves will shed large quantities of the virus throughout their lives in nasal and oral secretions and in feces. These cattle will never clear the infection. Typically, PI calves are poor performers; however, some will grow relatively well and even make it into the breeding herd and become pregnant. PI heifers and cows always produce PI calves. Most PI calves are the result of transient BVD infections of their dams during pregnancy. Transiently infected cattle shed relatively low quantities of virus for 7 to 14 days, but then clear the infection and stop shedding the virus. Clinical signs of transient infection in calves can include diarrhea or pneumonia. Transient infection often causes no apparent clinical signs in cows other than the effects on the fetus if the cow is pregnant. BVD testing and vaccination are integral components for BVD control, with culling of PI cattle being of upmost importance.

NAHMS BEEF 2017 STUDY

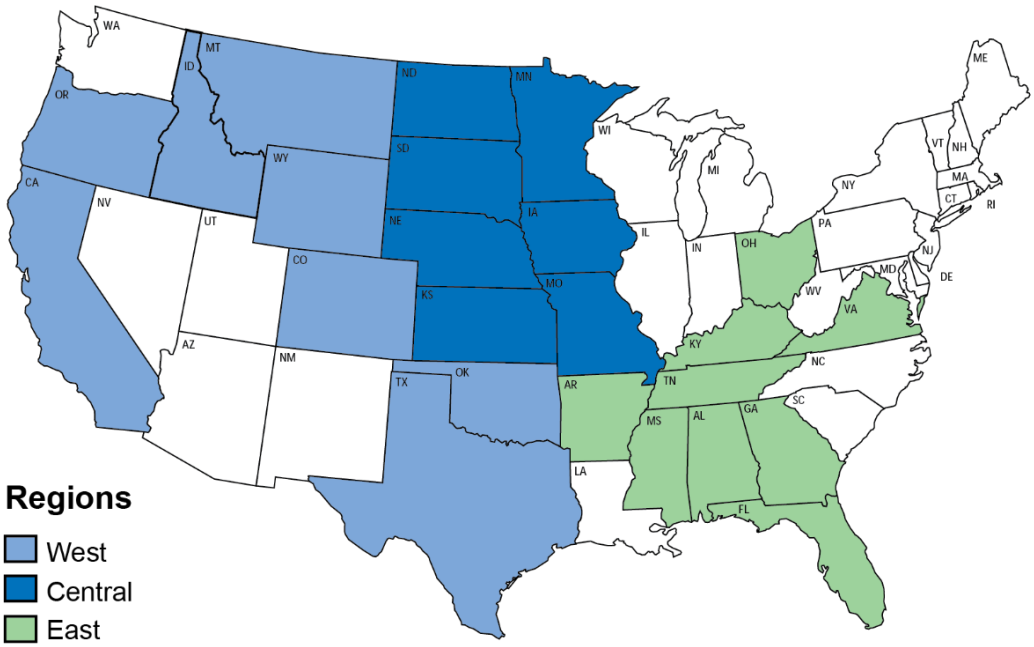
The Beef 2017 study was conducted in 24 of the nation's major cow-calf States (Figure 1).[1] In 2017, operations in these States accounted for 86.6 percent of the U.S. beef cow inventory and 78.9 percent of all U.S. operations with beef cows. All operations in these states with one or more beef cows as of January 1, 2017, were eligible for inclusion in the study. One of the study objectives was to estimate the prevalence of bovine viral diarrhea virus (BVDV) in calves on U.S. beef cow-calf operations.

[1] Alabama, Arkansas, California, Colorado, Florida, Georgia, Idaho, Iowa, Kansas, Kentucky, Minnesota, Mississippi, Missouri, Montana, Nebraska, North Dakota, Ohio, Oklahoma, Oregon, South Dakota, Tennessee, Texas, Virginia, and Wyoming

To test for BVDV, beef producers who expected to calve at least 70 percent of their cows and heifers from November 1, 2017, through July 15, 2018, were encouraged to collect two ear notch samples from all pre-weaned calves born during this period. Producers were instructed to freeze the ear notches after collection and to submit the samples after the calving season was completed, or in stages if a large calf crop was expected. The ear notches were sent to the Kansas State Veterinary Diagnostic Laboratory. One ear notch from each calf was tested according to the manufacturer's instructions with an IDEXX antigen capture enzyme-linked immunosorbent assay (ELISA) test. If the ear notch was positive for BVDV, the second ear notch was sent to the Agricultural Research Service's National Animal Disease Center in Ames, IA for genotyping to determine whether the calf was infected with BVD type 1a, 1b, or 2. Operations with a BVDV-positive calf were offered the opportunity to have the calf retested using a third ear notch sample collected at least three weeks after the original date of sample collection to determine if the calf was transiently or persistently infected with BVDV. Either the IDEXX ELISA or a polymerase chain reaction (PCR) test was used for retesting. The request to collect two ear notches per calf might have negatively affected participation rates for the study. When calves are sold, two notches from the ear might cause buyers to assume the calf tested positive for BVDV from the first ear notch and was then retested to confirm PI status. However, in practice, producers often do not retest calves that are positive on the first test since BVD is such a low-prevalence disease. Producers tend to assume the calf is PI if it is positive on the first test.

Results from the Beef 2007–08 study are also presented in this information brief. For the 2007–08 study, beef producers who expected to calve at least 70 percent of their cows and heifers from November 1, 2007, through June 30, 2008, were encouraged to collect ear notches from their entire 2008 calf crop. Ear notches were subsequently frozen until submission to the laboratory and then tested according to the manufacturer's instructions with an IDEXX antigen capture ELISA test. Operations with one or more positive calves were invited to submit blood samples for virus isolation to confirm PI status of calves positive on the ELISA test.

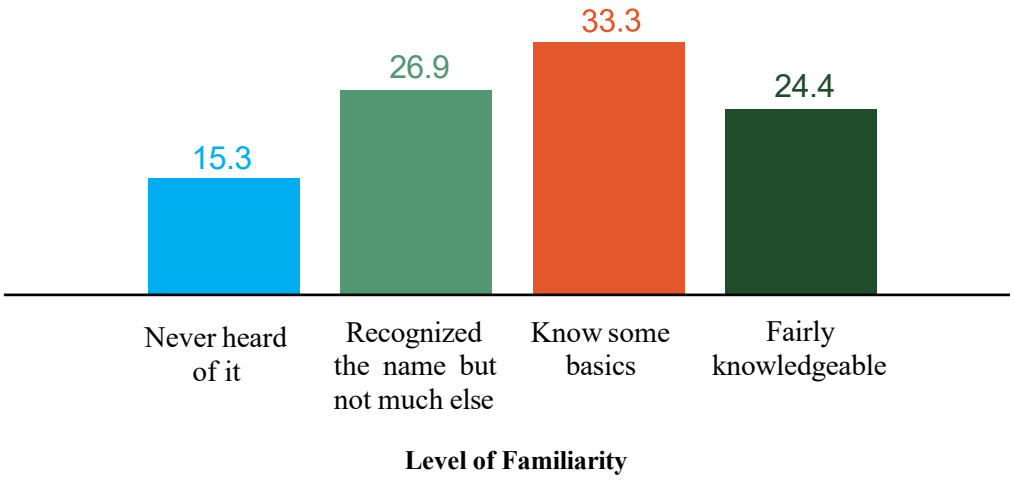
Figure 1. States/regions that participated in the NAHMS Beef 2017 study



LEVEL OF FAMILIARITY, VACCINATION, AND TESTING PRACTICES FOR BVD

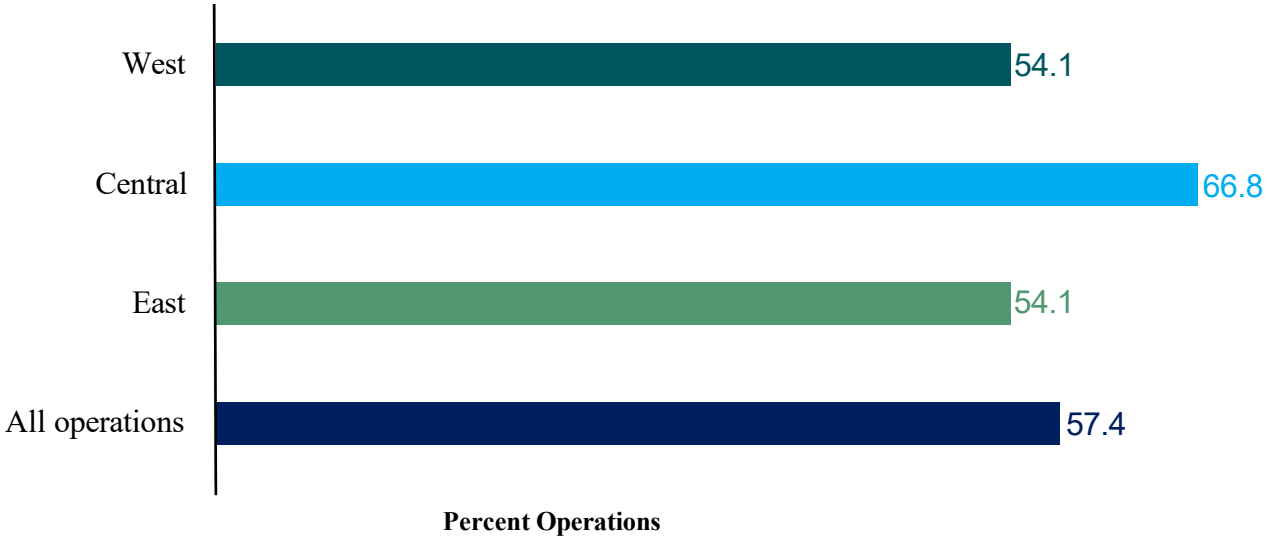
The more familiar producers are with the various diseases that affect beef cattle, the better they will be able to recognize the clinical signs of a newly introduced disease. About half of cow-calf producers (57.7 percent) reported they knew some basics or were fairly knowledgeable about BVD (Figure 2).

Figure 2. Percentage of operations by level of familiarity with BVD



Vaccination against BVD can prevent infection and thus lower the risk of producing PI calves. If the herd follows good biosecurity practices, such as not introducing new cattle other than breeding bulls, not allowing fence-line contact with cattle from other operations, and not taking cattle off the operation and then returning them to the operation (e.g., to fairs), the risk of BVD introduction will be low. On the other hand, if a herd repeatedly introduces replacement heifers or cows with unknown vaccination history, their risk for introducting BVD can be relatively high. The BVD vaccination strategy must be adapted to each herd while considering disease risks and management practices used on the operation. Overall, 57.4 percent of cow-calf operations vaccinated any cattle against BVD in 2017 (Figure 3). There were no regional differences in the percentage of operations that vaccinated any cattle against BVD.

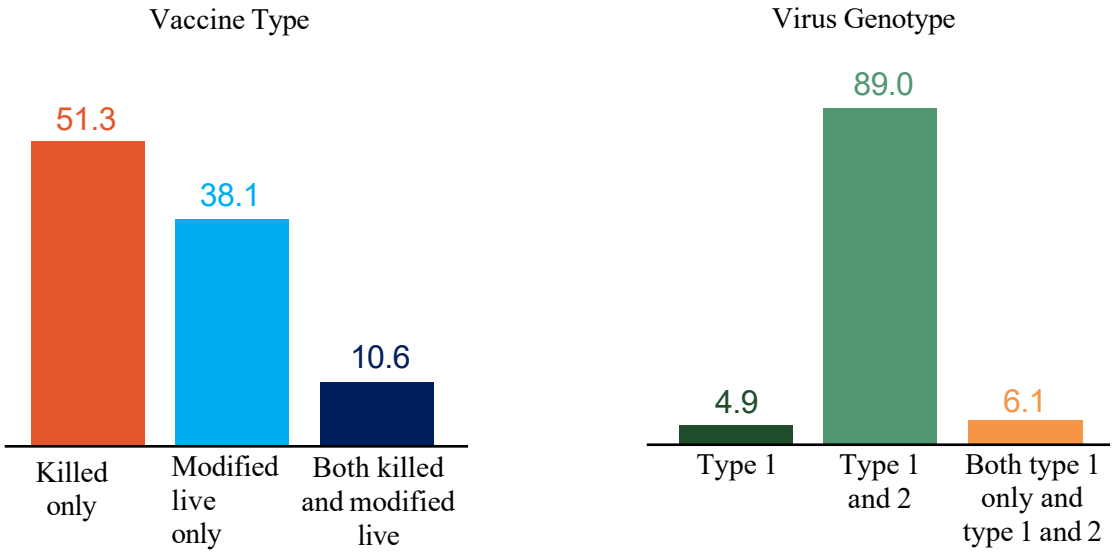
Figure 3. Percentage of operations that vaccinated any cattle against BVD in 2017, by region:



There are two main types of vaccines for BVD: modified-live (attenuated) and killed inactivated). Modified-live vaccines contain a living organism that has been modified such that it does not cause disease in an animal. In killed vaccines, the target organism has been inactivated and is no longer living. Modified-live vaccines generally offer better and longer-lasting immunity when compared with killed vaccines; however, some modified-live vaccines can cause abortions, so producers should examine the label to determine if the vaccine is safe for use in pregnant cows.

There are two genotypes of BVD: type 1 and type 2. Most BVD vaccines provide protection against both genotypes, although some older BVD vaccines might only provide protection against genotype 1. Both genotypes have been associated with clinical disease. For the 57.4 percent of operations that vaccinated any cattle against BVD in 2017, over half (51.3 percent) used only killed vaccines (Figure 4). In other words, any animal that received a BVD vaccine on these operations received only killed vaccines.

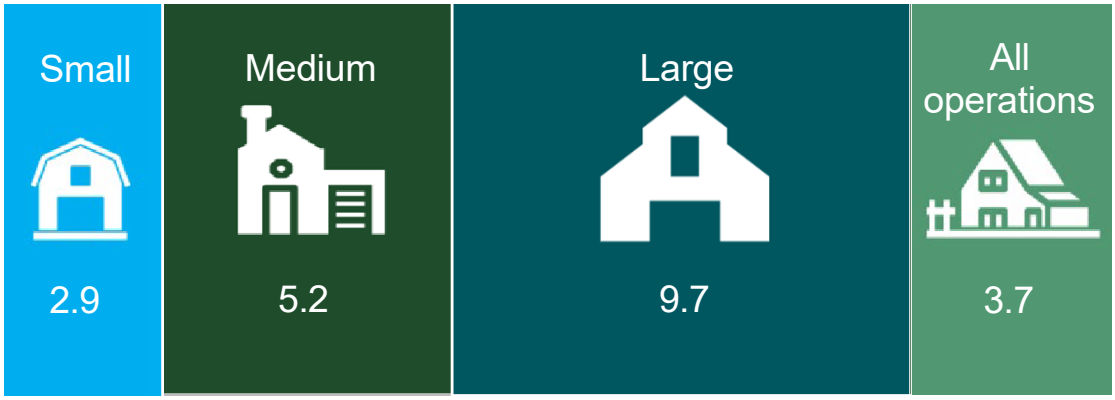
Figure 4. Percentage of operations by vaccine type used and by virus genotype targeted by vaccine for all operations



There are several different options for testing a calf for BVDV. One involves removing a notch from a calf's ear, and another involves drawing blood. There are kits available that allow producers to test ear notches on the operation. A positive test for BVDV can indicate either a transient or persistent infection. A calf that tests positive again 3 or more weeks after the first test indicates that the calf is PI.

A low percentage of operations (3.7 percent) tested any beef cattle for BVDV during the previous 3 years (Figure 5). There were no differences by herd size in the percentage of operations that tested any beef cattle for BVD-PI status. Note that in the questionnaire, producers were asked if they "tested any beef cattle for persistent infection with BVD virus in the previous three years." As previously mentioned, producers tend to assume the calf is PI if it's positive on the first test, so if producers are testing cattle for BVDV, they are testing them for persistent infection with BVD.

Figure 5. Percentage of operations that tested any beef cattle for persistent infection with BVD during the previous 3 years, by herd size



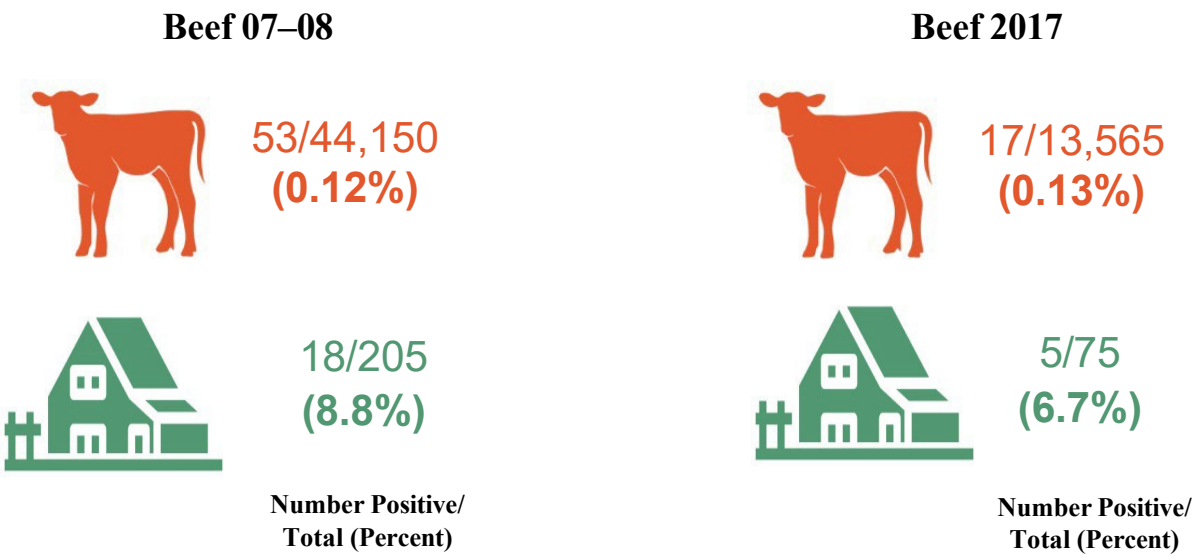
BVD TESTING RESULTS

In the Beef 2017 study, 75 operations participated in the voluntary BVDV sampling. The number of calves tested per operation ranged from 2 to 1,302. Of the 13,565 ear notch samples collected from these 75 operations, 17 individual samples were positive for BVDV, resulting in a calf-level prevalence of 0.13 percent (Figure 6). Five operations had at least one positive calf, resulting in a herd-level prevalence of 6.7 percent.

If the initial ear notch sample was positive for BVDV, the second ear notch collected at the time of initial collection was tested to identify BVDV genotype. All of the 17 positive samples were BVDV type 1b.

Of the 17 calves that tested positive, 13 came from one operation. The other four positives came from four separate operations. When a sample tested positive, operations were given the opportunity to submit a third ear notch at least 3 weeks after the first two ear notches were collected to confirm whether the calf was PI. A third ear notch was submitted for eight animals from three operations. Retesting confirmed that five of the eight were positive, indicating a PI calf. The three animals that were negative on confirmatory testing may have been transiently infected with BVDV when the initial ear notch was collected. The calf-level and herd-level prevalence of BVDV in the Beef 2017 study was similar to the Beef 2007–08 study (Figure 6). Of the 53 calves positive from the 2007–08 study, whole blood samples were submitted for 5 calves from 3 operations to confirm BVD-PI status. Four of these five calves were positive from virus isolation testing, indicating a PI calf. For both studies, because few of the ELISA-positive calves were retested to confirm that they were persistently infected with BVDV, further references to BVD-PI animals will be for all animals that were positive on the initial ELISA.

Figure 6. Number and percentage of calves and cow-calf operations positive for BVD, by study



CONCLUSION

The low prevalence of BVD-PI in beef calves found in the Beef 2017 study is consistent with findings from other studies. Despite the low prevalence at the calf level, approximately 1 in 15 operations had at least 1 PI calf, suggesting that a number of operations likely have BVDV circulating in their herds. Producers should work with their veterinarian to determine the likelihood that their herd has a PI animal, and if warranted, develop a testing strategy to determine the BVD status of their cattle. If persistently infected animals are discovered, they should be culled from the herd since they will continue to spread BVDV as long as they are alive.

REFERENCES

1. Center for Epidemiology and Animal Health. (2021). *Beef 2017, Beef Cow-calf Health and Management Practices in the United States, 2017.* U.S. Department of Agriculture, Animal and Plant Health Inspection Service. https://www.aphis.usda.gov/animal_health/nahms/beefcowcalf/downloads/beef2017/beef-2017-part2.pdf

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