Bovine Viral Diarrhea (BVD) Management Practices and Detection in Bulk Tank Milk in the United States, 2007

In 2007, the U.S. Department of Agriculture's National Animal Health Monitoring System (NAHMS) conducted the Dairy 2007 study. The study collected data on dairy health and management practices from 17 of the Nation's major dairy States. These States represented 79.5 percent of U.S. dairy operations and 82.5 percent of U.S. dairy cows.

One objective of the Dairy 2007 study was to estimate the prevalence of BVD virus on U.S. dairies. During the study, producers were asked about their BVD management practices, and bulk-tank-milk samples were collected and tested for BVD using polymerase chain reaction (PCR).[1] Samples were collected from 527 operations from March through August 2007.

Persistently and transiently infected cattle

BVD infection in a dairy herd can result in large economic losses, primarily due to reproductive problems in infected cattle, decreased overall animal health, and decreased milk production.[2, 3] BVD causes two types of infections in cattle: persistent infection and transient infection. Persistently infected (PI) cattle are infected while in the uterus. These animals are infected for life and are the primary source of new PI animals, as they continually shed large amounts of virus throughout the herd. Transiently infected (TI) animals are exposed to BVD after they are born. These animals may have mild or severe signs of disease such as diarrhea or decreased milk production, but they will eventually clear the virus and recover. If a cow becomes transiently infected while pregnant, her calf may be aborted, born with congenital abnormalities, born with no abnormalities and not infected with BVD, or may be persistently infected. Calves born alive to PI cows are always persistently infected themselves. In this way, the next generation of PI animals is created, continuing the BVD cycle in the herd.[4]

BVD is usually introduced into a herd through the purchase and introduction of TI or PI cattle. Purchasing additions from BVD-PI test-negative herds reduces the risk of herd infection, but the herd can still become infected by test-negative cows carrying PI fetuses.

Producer familiarity

Recently, BVD educational campaigns administered by producer and veterinary groups have generated numerous articles about BVD in dairy industry publications. In the NAHMS Dairy 2007 study, almost one-third of producers (31.3 percent) were fairly knowledgeable about BVD, while nearly one-half (47.6 percent) of producers knew some basics about the disease. Only 2.5 percent had not heard of BVD (table 1).

Table 1. Percentage of Operations by Producer Level of Familiarity with BVD

Percent Operations			
Level of Familiarity			
Fairly Knowledge-able	Knew Some Basics	Recognized Name, Not Much Else	Had Not Heard of It
31.3	47.6	18.6	2.5

Producer testing

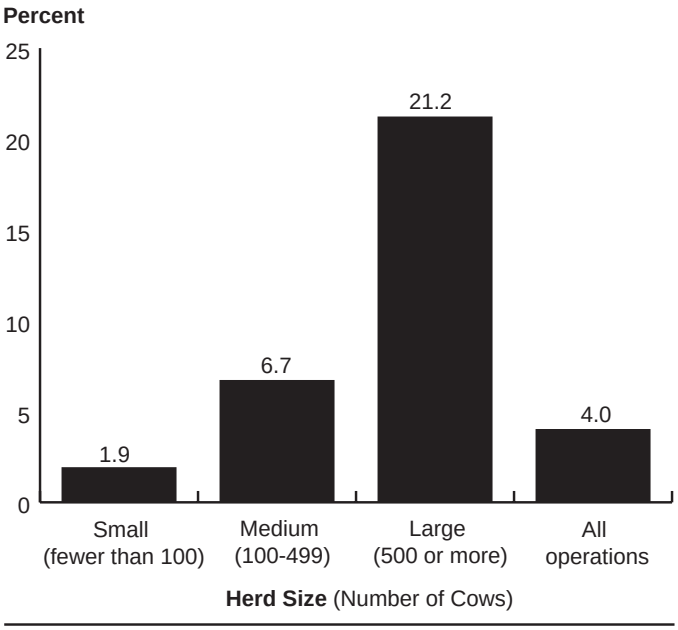
Identifying and culling PI cattle are critical steps in eliminating BVD from a dairy herd. Though some PI animals appear ill, many show no signs of disease. There are several testing options for identifying PI animals. One method of determining if a cow is PI with BVD is to test her calf. Since a PI cow will always produce a PI calf, neither the cow nor the calf is infected if the calf tests negative. However, a PI calf does not necessarily mean the cow is PI, since a transient infection in the cow can lead to a PI calf.

Ear notch testing is a popular and accurate method of identifying PI animals. Ear notch tests using either immunohistochemistry (IHC) or antigen-capture ELISA (ACE) can be used on cattle of any age. Alternatively, serum samples can be tested using virus isolation, ACE or PCR, although serum samples are not able to distinguish PI animals from TI animals with a single sample. Animals that test positive on the initial sample

must be retested in about 3 weeks to accurately determine their status. In addition, serum tests can be inaccurate in animals younger than two months. Testing via PCR on whole blood can be used with accuracy in young calves.[5]

Few operations (4.0 percent) routinely tested heifer replacements for PI with BVD. The percentage of operations that did test increased as herd size increased (figure 1).

Figure 1. Percentage of Operations that Routinely Tested Heifer Replacements to Determine if They were Persistently Infected with BVD, by Herd Size



Of operations that routinely tested heifers for PI with BVD, the majority (66.8 percent) used individual ear notch tests, while 21.1 percent tested individual serum samples (table 2).

Table 2. For Operations that Routinely Tested Heifer Replacements to Determine if They were PI with BVD, Percentage of Operations by Testing Method Used

Testing Method	Percent Operations
Individual ear notch	66.8
Pooled ear notch	11.4
Individual serum sample	21.1
Pooled serum sample	6.0
Other	6.5

Cattle identified as PI with BVD should be removed from the herd. If not removed, the virus will continue to circulate within the herd and the probability of infertility problems and the creation of new PI cattle will continue or be increased. PI cattle should ideally be sold with full disclosure of their status and sent directly to slaughter, since introducing or exposing PI cattle to noninfected cattle or herds will lead to the spread of the virus.

Producer confirmation of disease

Overall, 2.8 percent of operations confirmed BVD on their operations during the previous 12 months. About 1 of 10 large operations (9.6 percent) confirmed disease, compared with 1.1 percent of small operations and 5.9 percent of medium operations. BVD was confirmed on 5.3 percent of operations in the West region and 2.5 percent of operations in the East region (see table 3, next page, for region breakout).

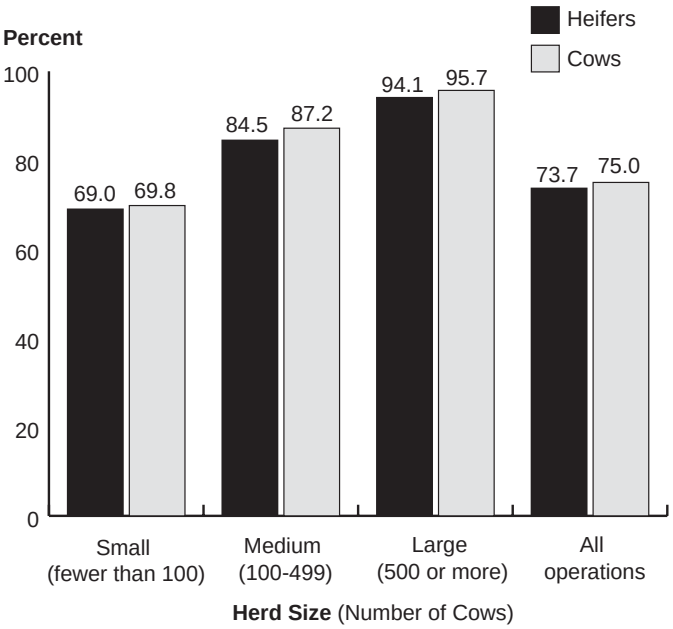
The most commonly submitted samples were blood (47.5 percent) and ear notches (41.3 percent). Additionally, tissues at necropsy and aborted fetuses were used to confirm disease by 15.7 and 13.9 percent of operations, respectively.

Vaccination

Vaccination is an important management tool for controlling BVD and should be implemented in tandem with a plan to test and remove PI cattle.

About three-fourths of operations vaccinated heifers and cows for BVD (73.7 and 75.0 percent, respectively). The percentage of operations that vaccinated for BVD increased as herd size increased (figure 2).

Figure 2. Percentage of Operations that Normally Vaccinated Heifers and Percentage that Normally Vaccinated Cows Against BVD, by Herd Size



A higher percentage of operations in the West region vaccinated heifers and cows against BVD compared with operations in the East region (table 3).

Table 3. Percentage of Operations that Normally Vaccinated Heifers and Percentage that Normally Vaccinated Cows Against BVD, by Region

	Percent Operations	
	Region*	
	West	East
	Percent	Percent
Heifers	85.6	72.8
Cows	82.2	74.4

***West:** California, Idaho, New Mexico, Texas, and Washington
East: Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Vermont, Virginia, and Wisconsin

In general, the two types of BVD vaccines available contain modified-live and killed virus. The most notable advantage of modified-live virus vaccines is that they provide quicker, stronger, and longer lasting immunity than killed vaccines. The biggest advantage of killed virus vaccines is their overall safety, especially when administered during pregnancy. Although vaccination of the dam provides some degree of fetal protection, no vaccine has been shown to completely protect the fetus from becoming persistently infected with BVD if the cow is exposed to the BVD virus during pregnancy.[6, 7, 8]

A higher percentage of operations administered killed BVD vaccines than modified-live vaccines to cows (56.3 and 48.9 percent, respectively). The opposite was true for heifers, where a higher percentage of operations administered modified-live BVD vaccines than killed virus vaccines to heifers (62.2 percent and 43.1 percent, respectively) [table 4].

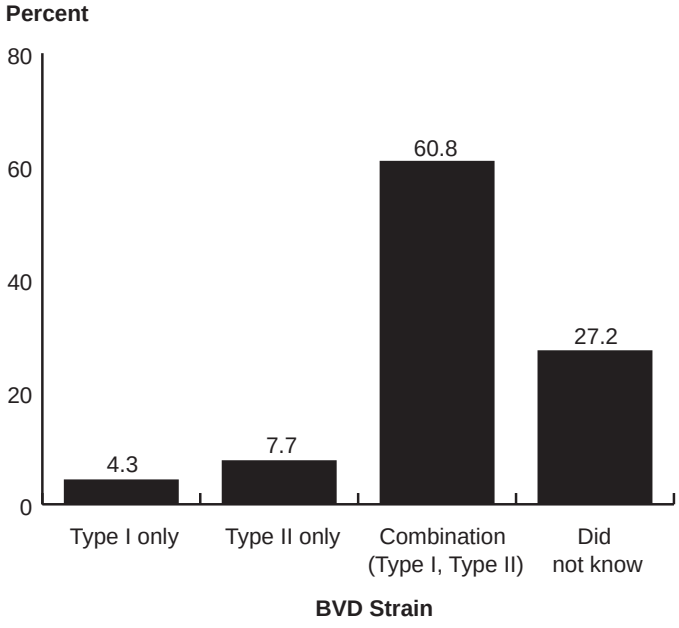
Table 4. For Operations that Vaccinated Heifers or Cows Against BVD, Percentage of Operations by Type of BVD Vaccine Given

	Percent Operations	
	Heifers	Cows
Type of Vaccine	Percent	Percent
Killed	43.1	56.3
Modified live	62.2	48.9

Two different genetic groups (genotypes) of BVD virus are recognized. Historically, vaccines only contained Type I BVD, but many vaccines now contain both type I and type II. Although a Type I vaccine will provide some cross-protection against Type II infections,[9] a vaccine that contains both Type I and Type II is recommended.

For operations that administered BVD vaccine to heifers or cows, 60.8 percent reported that the vaccine used contained both Type I and Type II strains. Approximately one-quarter of operations (27.2 percent) did not know what strain(s) was included in the vaccine administered (figure 3).

Figure 3. For Operations that Vaccinated Heifers or Cows Against BVD, Percentage of Operations by Type of BVD Vaccine Administered



More than four of five operations that administered BVD vaccine to cows (80.2 percent) gave annual booster vaccines.

Bulk-tank-milk testing

Bulk-tank-milk samples can be tested for the presence of BVD virus using PCR. Bulk-milk testing is primarily intended to detect the presence of PI cows in the lactating herd. TI cows will shed a small amount of BVD virus in their milk for a short period (several days), but PI animals continually shed larger amounts of virus.[10] Although bulk-milk testing is useful as a screening tool for the lactating herd, it will not fully screen the operation for the presence of BVD since PI animals are more likely to be found in the young stock than in the lactating herd. Additionally, all cows are not represented in a single bulk-tank sample. If the operation's only PI cow is dry or her milk is not entering the bulk tank at the time of sampling she would not be detected.

No small operations tested positive for BVD in bulk milk, whereas about one of eight large operations (12.8 percent) tested positive (table 5).

Table 5. Percentage of Operations in which Bulk-Tank Milk Samples Tested Positive for BVD, by Herd Size

Percent Operations			
Herd Size (Number of Cows)			
Small (Fewer than 100)	**Medium** (100-499)	**Large** (500 or More)	**All Operations**
Percent	**Percent**	**Percent**	**Percent**
0.0	3.5	12.8	1.7

A higher percentage of operations in the West region (7.7 percent) tested positive for BVD bulk milk compared with operations in the East region (1.1 percent).

Summary

Almost 80 percent of producers at least knew some basics about BVD, and approximately three-quarters of operations vaccinated heifers and cows against the disease. BVD virus was found on more than 10 percent of large dairy operations and 1.7 percent of all operations. However, the actual prevalence of BVD is likely higher, since all cattle on the operation are not included in a single bulk-tank-milk sample. BVD is an important disease to the dairy industry. It is recommended that dairy producers consult their veterinarians to develop a customized plan for BVD testing and vaccination.

To review complete reports from the Dairy 2007 study, visit the NAHMS Website at: http://www.aphis.usda.gov/nahms

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