

# A Survey of Bovine Viral Diarrhea Virus Testing in Diagnostic Labs in the United States from 2004 to 2005

E.A. Driskell, DVM and J.F. Ridpath, PhD

*Virus and Prion Diseases of Livestock, National Animal Disease Center/ARS/USDA, Ames, IA*

## Introduction

Bovine viral diarrhea virus (BVDV) associated diseases have great economic impact on the United States cattle industry. BVDV infection in pregnant animals exposes the fetus to the virus and can result in the birth of a persistently infected (PI) calf. PI cattle serve as a main reservoir for BVDV infection in a herd, and most diagnostic testing is geared toward detection of PI animals. Diagnostic labs serve as the investigative arm for veterinarians because they are used as an authority for testing for PI animals. Therefore, results of BVDV testing and communication of these results from diagnostic labs have a direct impact on the control of BVDV. The objectives of this survey were to determine the testing methods for BVDV commonly in use by diagnostic laboratories, percentage of laboratories that provide follow up information following positive BVDV test results and the impact of testing strategy on detection.

## Materials and Methods

The survey was sent in an electronic format to 46 diagnostic laboratories identified as accredited laboratories by the American Association of Veterinary Laboratory Diagnosticians. Respondents were instructed to report data acquired in a 12-month period beginning October 1, 2004 and ending October 1, 2005. Design of the survey questions were fill-in-the-blank (numerical) or multiple-choice from a list of options to be marked. The survey consisted of ten questions covering the broad topics of type of BVDV testing offered and utilized, types of samples used for BVDV testing, total number of BVDV tests performed including number of BVDV-positive tests, and whether follow-up information was provided following notification of positive test results.

## Results

Replies were received from 26 diagnostic laboratories representing 23 different states. Although one laboratory provided data for the fiscal 2004 year which was out of the parameters for dates requested, this laboratory processed many BVDV samples and it was felt this data was relevant, so it was included. Twenty laboratories returned completed surveys and six laboratories returned partially completed surveys. Data were

used from partially completed surveys when an independent series of questions were complete. Most laboratories (77% of 26 labs) offered a variety (four to seven different types) of testing methods. There was no strongly favored testing method offered among the responding laboratories. Prevalence of tests offered was:

- 85% of laboratories (n=26) offered virus isolation;
- 73% of laboratories (n=26) offered a form of PCR;
- 69% of laboratories (n=26) offered serum antigen

### ELISA

- 65% of laboratories (n=26) offered ear notch antigen ELISA; and
- 88% of laboratories (n=26) offered a form of immunohistochemistry (IHC) with 69% offering ear-notch IHC.

All laboratories offered individual sample testing, while 46% of laboratories (out of 24) offered sample pooling. The 11 laboratories that offered sample pooling had highly variable upper limits for number of samples to be pooled; the mean upper limit was 40 samples, the median was 14 samples and the range was two to 120 samples. Some laboratories specified different upper limits for different test types.

The total number of BVDV tests run during this year period by the 26 reporting laboratories was 445,648. A wide range of BVDV sample numbers was processed by the responding laboratories: mean number of tests run per laboratory during the reporting period was 19,376, median was 7,482 and the range was 90 to 59,728. Antigen ELISA tests accounted for 44% of total combined tests. However, if the data is normalized on a per-laboratory basis, antigen ELISA on ear notches (24% of all tests out of 22 labs) and ear notch IHC (25% of all tests out of 22 labs) were used with nearly equal frequency.

Mean number of positive tests was 4.3%, median was 1.1% and the range was 0.3%-26.1% (data from 23 labs). Of the 22 laboratories that responded to the question, 55% offered written and/or oral follow up information to those who submitted positive tests. Some 65% of laboratories (data from 23 labs) recommended re-testing positives. When queried as to major reason samples were submitted for testing, the 22 responding laboratories were split 50%/45% between the majority of samples being submitted for screening purposes (75-95% of the requested BVDV tests) and the majority of samples submitted due to clinical presentation suggestive of BVD

(70-100% of the requested BVDV tests). The rate of positive tests found by those laboratories receiving the majority of their samples as the result of BVDV screening efforts was 1% (mean) and 0.6% (median). The percentage of positive tests was higher in those laboratories that received the majority of their BVDV test requests as the result of clinical presentations suggestive of BVD. These labs had a 6.6% mean and 1.3% median percent positive. One laboratory was not included in these results, as they did not indicate a clear majority reason for BVDV test request.

### Significance

A large number of BVDV tests (445,648) are represented by this survey so the information is a good representative sample of diagnostic labs across the United States. Results of this survey indicate there is no clear consensus on a standard method for BVDV testing; there was no consistency on types of BVDV testing offered and no standard policy on allowance of pooling (46% of labs) of samples for tests, as well as inconsistencies on upper limit of samples allowed for pooling. Currently, diagnostic laboratories are offering an array of BVDV test types, most likely because no one test is considered perfect in all situations. Diagnostic laboratory customers consider an array of test characteristics including cost, speed, ease of sample collection and sensitivity. Unfortunately, there is little information available to help them make their selection. The ramifications of their choices can impact disease control, as favoring sensitivity over speed (increased time to results) could lead to a PI being sold to a new herd before test results are known. By the same token, favoring cost over reliability (increased pooling) could lead to false-negative results for a herd, resulting in continued presence of a PI.

The ear-notch antigen ELISA was clearly a favored test to run on samples based on both total percentage and normalization based on individual laboratories. The reasons for this preference are not revealed by this survey but are most probably influenced by recommendations of the testing laboratory and veterinarian and by management practices of the producer. Further investigation is required to determine who and/or what influences the choice of test and to determine how often reliability is compromised in favor of cost.

Only 55% of diagnostic laboratories surveyed were providing follow-up information to producers with BVDV-positive tests during the testing period. Education of people involved with BVDV-positive herds is an essential step to BVDV control. Removing PI animals is the crux of a successful BVDV control program, and discussing the implications of positive test results with involved veterinarians and producers should be standard protocol. The finding that only slightly more than half of laboratories provide follow-up information reveals a large opportunity to provide better education to producers.

This paper reports the number and types of tests performed but not the proficiency of the laboratories performing these tests. The large array of tests offered by laboratories results in a confusing menu of options to the producer. Because proficiency testing and validation documentation are not built into BVDV testing in the US, there is little information to support the producer his or her in their choice of options. This is something the research and diagnostic communities need to consider as we advance toward the goal of BVDV reduction and eventual eradication.