

# Bovine Viral Diarrhea (BVD) in Cattle: PADLS Testing Strategies

Bovine viral diarrhea (BVD) is an important cattle disease and causes significant economic losses to both the dairy and beef industries. The disease is caused by a pestivirus within the Flaviviridae family and results in clinical signs ranging from subclinical to severe or fatal mucosal disease. Viral infections, resulting in acute disease, often manifest as transient episodes of diarrhea or pneumonia. In many cases, clinical signs may go unrecognized. Infections of pregnant cattle can cause early embryonic death, abortions, still births, congenital defects, or apparently normal calves. A proportion of calves born to infected dams become persistently infected (PI). Symptoms in PI animals can range from being unthrifty and weak to showing no symptoms at all. PI animals act like “Typhoid Marys” in spreading the infection to susceptible animals. They are a risk to herd mates and can spread the infection very efficiently through the herd. Transmission of BVD virus mainly occurs from contact with excretions and secretions of infected animals either by ingestion or inhalation.

One of the most important methods for reducing BVD incidence is identification of the PI animals in the herd. Other important control methods include the implementation of good biosecurity and an effective vaccination plan to protect against the infection challenge. For identifying BVD infections, the Pennsylvania Animal Diagnostic Lab System (PADLS) offers several test choices (See accompanying Table). Availability of test options include pooling of serum or ear notches and use of bulk tank milk testing, thereby offering affordable test choices to our clients. Once BVD infections have been identified both acute and persistent cases of the infection require identification and monitoring. To eliminate the virus from a herd all positive PI calves must be identified. Along with this, rigorous testing should be conducted to find any or all other sources of infected animals. Routine surveillance should be implemented to check newborns and other entrants into the herds. Following an outbreak, this typically involves testing the entire crop of calves for the next 9 to 12 months.

BVDV is classified into two main genotypes BVDV types 1 and 2. Some strains of BVDV type 2 have been found to be very virulent causing hemorrhagic syndromes, enteric disease, high fevers and sudden death. However, other BVDV-2 strains cause less obvious disease and behave more like the classic subclinical BVDV-1. Available laboratory assays can detect both BVDV genotypes successfully. PADLS currently does also offer BVD genotyping through PSU. Many vaccine labels claim to offer cross-protective immunity for both the genotypes. Practitioners should carefully evaluate labels and label claims as part of their vaccine protocol in herds experiencing BVD problems. Besides offering testing services, PADLS through its outreach services also

provides access to a network of field investigators. These veterinarians are available for consultation with private practitioners for assistance in dealing with the difficult herd health problems related to management, vaccination and biosecurity issues.

Listed below are some of the important suggestions from the National BVD working Group for BVD elimination:

- Determine if your herd is at high or low risk for having persistently infected (PI) cattle.
- Identify and eliminate any PIs from your herd.
- Prevent other PIs from entering your herd.
- Vaccinate to reduce the risk of the disease.
- Monitor your herd for the presence of the BVD virus.
- Don't sell PI animals except for slaughter.
- Don't mix purchased pregnant cattle with your herd until they and their calves have been tested for existence of PIs.
- Don't buy bred heifers unless they test PI-negative and are properly vaccinated.
- Don't use animals of unknown BVD status as embryo transfer recipients.
- Don't rely on vaccination alone for BVD control.

Please contact the PADLS labs for further testing guidance.

## PADLS Laboratory Locations

**Penn State University Animal Diagnostic Laboratory**  
 Wiley Lane, University Park, PA 16802  
 Phone: (814) 863-0837; Fax: (814) 865-3907  
[adlhelp@psu.edu](mailto:adlhelp@psu.edu)

**Pennsylvania Veterinary Laboratory**  
 2305 North Cameron Street, Harrisburg, PA, 17110  
 Phone: (717) 787-8808; Fax: (717) 772-3895  
[pvl@pa.gov](mailto:pvl@pa.gov)

**New Bolton Center Veterinary Laboratory**  
 382 West Street Road, Kennett Square, PA 19348-1692  
 Phone: (610) 925-6725; Fax: (610)925-6822  
[Vet-nbcccontact@vet.upenn.edu](mailto:Vet-nbcccontact@vet.upenn.edu)

# PADLS Test Choices for BVD Testing



Test/TAT/Lab	Fee*	Advantages	Disadvantages	Specimens
<b>Virus Isolation or Microplate-PI test</b> 4-14 day TAT (set on Monday) (send directly to PSU with next day delivery number)	\$10.00	<ul style="list-style-type: none"> <li>The Gold standard for BVDV diagnosis</li> <li>High specificity</li> <li>Virus is available for study at a later date</li> </ul>	<ul style="list-style-type: none"> <li>Slow lab turnaround</li> <li>Labor-intensive</li> <li>Specimens must be shipped on ice to keep virus viable</li> <li>Potential false negative from interference by maternal antibodies</li> <li>To distinguish between PI and transient infections (TI), must retest positives</li> </ul>	<ul style="list-style-type: none"> <li>1 ml sterile (red top) serum</li> <li>Send in insulated container with ice packs</li> <li>Age: calves &gt;3 mo</li> </ul>
<b>Immunohistochemistry (IHC) of skin</b> 7-14 day TAT (available through PVL and NBC)	\$35.00	<ul style="list-style-type: none"> <li>High sensitivity</li> <li>Usually identifies persistent infections (PI) only</li> </ul>	<ul style="list-style-type: none"> <li>Labor-intensive</li> <li>Formalin usage</li> <li>Will generally not identify transiently infected animals</li> </ul>	<ul style="list-style-type: none"> <li>Skin samples (1/4-1/2") usually taken with an ear notcher</li> <li>Send in 10% neutral buffered formalin</li> <li>Samples should be shipped within 1 week of collection</li> </ul>
<b>Antigen – capture ELISA for serum</b> 1 – 5 day TAT (available through PSU and PVL) Milk testing at PVL	\$5.50	<ul style="list-style-type: none"> <li>High sensitivity</li> </ul>	<ul style="list-style-type: none"> <li>Potential false negative due to interference by maternal antibodies</li> <li>To distinguish between persistent and transient infections, must retest animal in 3 weeks</li> </ul>	<ul style="list-style-type: none"> <li>Serum 1 ml or milk 10 ml</li> <li>Send in insulated container with cold packs</li> <li>Age: calves &gt;3 mo</li> </ul>
<b>Antigen – capture ELISA for skin or ear notch</b> 1-5 day TAT (available through PSU and PVL)	\$6.00	<ul style="list-style-type: none"> <li>High sensitivity</li> <li>Usually identifies persistent infections (PI) only – transiently infected animals test negative</li> </ul>	<ul style="list-style-type: none"> <li>Will generally not identify transiently infected animals. Retesting is advised in 3 weeks.</li> </ul>	<ul style="list-style-type: none"> <li>Skin–(1 cm x 1cm)</li> <li>Usually taken from ear with an ear notcher.</li> <li>Send in insulated container with cold packs in red top tube.</li> <li>Do not allow to dry out.</li> <li>Ear notches should be submitted immediately after collection or frozen and shipped within 4 weeks.</li> </ul>
<b>Polymerase chain reaction (PCR)</b> 2-7 day TAT Individual serum, pooled serum, and individual ear notch (available through PSU and PVL)	\$35 for single serum sample blood, or tissue \$60 for pooled testing of serum up to 30 samples (\$30 for pooling 10 sera)	<ul style="list-style-type: none"> <li>High sensitivity</li> </ul>	<ul style="list-style-type: none"> <li>To distinguish between PI and TI, must retest positive cattle in 3 weeks.</li> <li>If vaccinating with modified live vaccine avoid submission for 3 weeks due to false positives.</li> </ul>	<ul style="list-style-type: none"> <li>Serum (2-3ml) or tissue, Whole blood (7-10 ml), or tissue Send in insulated container with cold packs.</li> </ul>
<b>Polymerase chain reaction (PCR)-Ear notch</b> 2-7 day TAT Ear notch pooled testing (available through PVL)	\$30 for pooled ear-notch testing for up to 20 samples	<ul style="list-style-type: none"> <li>High sensitivity</li> </ul>	<ul style="list-style-type: none"> <li>If vaccinating with modified live vaccine avoid submission for 3 weeks due to false positives.</li> <li>If suspect/ positive, all animals in the pool must be individually tested to find infected animals.</li> </ul>	<ul style="list-style-type: none"> <li>Clean Skin samples – usually taken from ear with ear notcher. (1cm x1cm).</li> <li>Send in insulated container with cold packs.</li> <li>Do not allow to dry out.</li> <li>Ear notches should be submitted immediately after collection or frozen and shipped within 4 weeks.</li> </ul>

<p><b>Polymerase chain reaction (PCR)- Milk</b> 2-7 day TAT Bulk Tank Milk (BTM) testing (available through PVL).</p>	<p>\$35 for BTM</p>	<ul style="list-style-type: none"> <li>• Good sensitivity</li> </ul>	<ul style="list-style-type: none"> <li>• If vaccinating with modified live vaccine avoid submission for 3 weeks due to false positives.</li> <li>• If positive, all animals in the string must be traceable and individually tested or with pools to find infected animals.</li> </ul>	<ul style="list-style-type: none"> <li>• 100 ml sent on ice</li> <li>• Recommended maximum herd size-200 animals for a bulk tank or a string sample.</li> </ul>
<p><b>Viral Isolation (VI)</b> 10-20 day TAT Nasal secretions, oral lesions, lung, spleen, whole blood, mesenteric lymph node, intestinal mucosa, vaginal secretions, fetal tissues</p>	<p>\$40</p>	<ul style="list-style-type: none"> <li>• High Sensitivity</li> <li>• Virus is available for later study</li> </ul>	<ul style="list-style-type: none"> <li>• Slow lab turnaround</li> <li>• Labor intensive</li> <li>• Specimens must be shipped on ice to keep virus viable.</li> <li>• Will generally not identify TI, retesting is recommended in 3 weeks.</li> </ul>	<ul style="list-style-type: none"> <li>• Submit in leak-proof container w/VTM or purple top</li> <li>• Ship overnight on ice directly to PSU (do not freeze).</li> </ul>
<p><b>Tissue (IHC)</b> 7-14 day TAT Lymphoid, skin, intestine. Fetus: chorion, lymphoid. (Available through NBC, PVL)</p>	<p>\$35</p>	<ul style="list-style-type: none"> <li>• Good sensitivity</li> <li>• Appropriate for calves &lt; 3 mo.</li> </ul>	<ul style="list-style-type: none"> <li>• Slow lab turnaround.</li> <li>• Labor intensive</li> </ul>	<ul style="list-style-type: none"> <li>• Leak-proof container with 10% formalin, unstained slide, or Paraffin embedded tissue.</li> </ul>
<p><b>Serum Neutralization (SN)</b> 4-14 day TAT (Available through PSU)</p>	<p>\$11</p>	<ul style="list-style-type: none"> <li>• Shows if an animal is producing antibodies to a vaccination program.</li> <li>• Comparing the change in acute and convalescent samples can indicate infection status.</li> </ul>	<ul style="list-style-type: none"> <li>• Will not identify a persistently infected animal.</li> </ul>	<ul style="list-style-type: none"> <li>• 1ml-Serum</li> <li>• If submitting both acute and convalescent samples, separating and freezing the acute sample is recommended until it is ready to ship with the convalescent sample.</li> <li>• No additional fee for testing convalescent samples (as long both acute and convalescent) samples are submitted at the same time.</li> <li>• Test is set on Monday and if the only test requested can be shipped directly to PSU.</li> </ul>