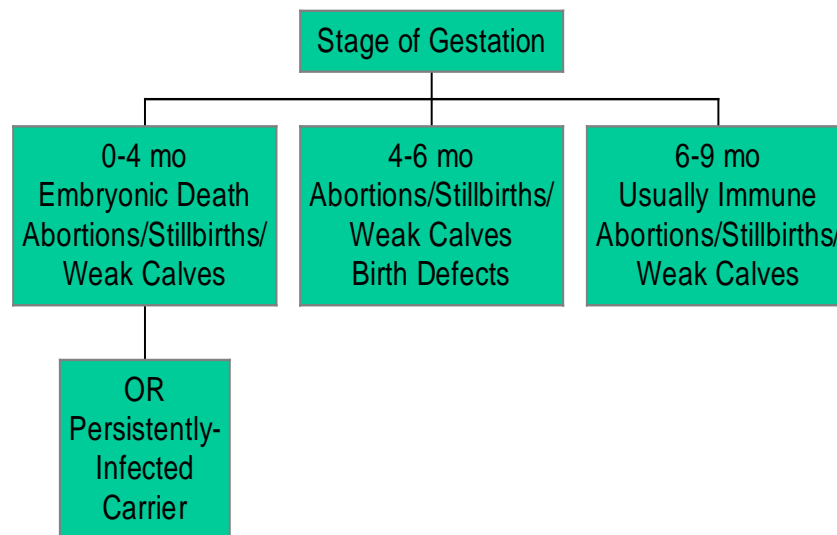


## ERADICATION SCHEME FOR BVD IN BEEF HERDS

We now know that there are dozens of strains of BVD virus. These strains are divided into two distinct types (Type 1 and Type 2) based on their genetic makeup (genotypes). In addition, two biological types or biotypes occur-- cytopathic (cp) and noncytopathic (ncp). Cytopathic viruses kill cells in laboratory tissue culture, while noncytopathic viruses do not. Whether a strain is type 1 or 2 and whether a strain is cp or ncp does not indicate virulence or its ability to cause disease. Do not be confused with misleading advertisements from vaccine manufacturers. Just because a virus strain is ncp in laboratory cultures does not mean that it cannot kill cells in a fetus or calf. Indeed, most isolates from aborted fetuses are noncytopathic and all carrier animals are infected with a ncp strain.

### Fetal Infections

The outcome of in-utero infections vary widely, dependent on the stage of pregnancy. Early embryonic death or abortions may occur at any time during gestation, but most infections occur before the fetus develops its own immune system. Late term infections often are eliminated by the fetal immune system. Birth defects can occur with infections during critical times of fetal development. Finally, if the infecting strain does not kill the fetal host and occurs in the first 4 months of pregnancy, there is the opportunity for the host and the virus to co-exist; in these cases, a persistently-infected (PI) carrier animal can occur.



### Origin of Persistently Infected Carriers

PI's occur in the first 120 days or so of gestation before the fetal immune system develops and can recognize foreign matter. As the immune system develops in these fetuses, the virus is already present and recognized as "self" and as a normal component of the body. In essence, the cells of the immune system that would normally recognize the virus as foreign are eliminated and no rejection attempt it made. PI animals are permanent carriers of the virus and serve as the main source of the disease in beef herds. Because the BVD virus is quite immunosuppressive, most PI animals do not live long and die of various infections. Many are quite stunted. However, a few can be very normal in appearance and may be retained as replacement heifers or bulls.

For the cow-calf producer, PI animals are the main source of the disease within the herd. Introduction of outside animals that are experiencing an acute infection also can be a source of virus.

### **Tests to Identify PI's**

#### **FOR ANIMALS OLDER THAN 4 MONTHS:**

**Microtiter ELISA blood test.** For animals older than 3-4 months, this test is very sensitive. Serum samples are cultured in microplates and the virus is grown and detected using antibodies that have a linked enzyme. A color reaction indicates presence of virus. The test goes by other names such as microculture ELISA, immunoperoxidase monolayer assay, etc.

#### **For animals younger than 4 months:**

**IHC skin test.** The BVD virus has a predilection for rapidly growing cells and can be found in hair follicles. Using formalin-fixed ear notches or biopsies, the virus can be detected using immunohistochemistry (IHC) whereby antibodies against the virus are added and then detected microscopically by a color reaction in the tissues. This test is reported to be equally sensitive to virus culture, but independent verification over time is still lacking. . Producers should be aware that BVDV mutates rapidly and a possibility exists that the skin test will not pick up every single field strain of the virus. It has its greatest application for calves less than 3-4 months of age; in young calves, antibody against the virus is often present in the cow's colostrum and can interfere with culture of the virus, such as needed in the ELISA test. Ear notches obtained at branding are ideal, but must be handed in special ways for best detection.

**PBS ELISA skin test.** This is the *preferred test* in that it does not require fixed tissue and is comparable with the IHC skin test in sensitivity. Ear notches are placed in phosphate buffered saline for submission and then an ELISA test is performed at the laboratory.

**A new but expensive test: PCR test.** The polymerase chain reaction is a very sensitive and rapid test for the nucleic acid (genetic code) of the virus. Currently, the test is expensive and this makes it impractical for screening large numbers of animals. This test will, however, work on calves and adults of any age.

## **An Eradication Scheme**

Early eradication efforts often were unsatisfactory because only the cows and replacement heifers were tested in attempts to find the carrier animals. New research reveals that calves nursing pregnant cows during the breeding season are the most likely carriers. They are the primary source of virus and expose cows during the nursing season when cows are in early pregnancy. This is the reason that BVD continued to be a problem in some herds even though all adult carriers had been eliminated.

Because calves from PI cows are always infected, this scheme relies on skin testing all calves rather than testing all dams with nursing calves. Then, only the dams of PI calves and animals without calves need to be tested. Most dams of PI calves are not PI's themselves but simply lacked sufficient immunity to prevent transmission to the fetus.

However, by testing dams of PI calves, any PI cows can be identified and eliminated. The traditional ELISA test on blood can be used on dams of infected calves plus the replacement heifers, cows without calves, and the bull battery. This ensures that all animals in the herd are essentially tested and eliminates the cost and hassle of testing the majority of the cows in the herd.

Testing of calves and animals without nursing calves must be done before the breeding season to break the cycle of transmission. Vaccination of open cows and heifers at that time with a MLV vaccine will increase overall herd immunity should they be exposed to outside animals that are shedding the virus.

**Note:** this scheme is based on the best science available at this time. It is subject to change as we learn more about the reliability of the various tests and the impact that various strains and mutations have on test variability.

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