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UCD VET VIEWS  
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### **Bovine Virus Diarrhea: Part I**

Bovine Virus Diarrhea (BVD) continues to be a problem for the beef cattle industry. This applies to both the feedlot sector of the industry and to the cow/calf sector. Not only does the virus that causes BVD have the possibility of changing, we are continually changing our management practices. The BVD virus makes a lot of "mistakes" when it replicates and thus there are "new" biotypes appearing from time to time. Also, our terminology regarding this virus is changing and becoming more complicated. In this article I will outline what we know about the BVD virus and the diseases caused by this virus.

#### *What is meant by cytopathic and non-cytopathic BVD biotypes?*

These terms refer to a recognizable characteristic of BVD viruses in the laboratory. The BVD virus (like all mammalian viruses) does not grow or reproduce without living cells. In the laboratory we have developed cell lines that will grow in test tubes (actually we use tissue culture plates). These cells growing in the laboratory can be inoculated with samples to see if there are virus particles in the sample, i.e., we attempt to "isolate" a virus. The cytopathic (CPE) BVD biotypes cause visible damage to the cells in cell culture vials in the laboratory. The non-cytopathic (non-CPE) biotypes do not cause any **visible** damage. This does not mean the non-CPE strains are less damaging to cattle, in fact in some respects the non-CPE BVD strains cause more problems. The non-CPE viruses are the biotypes or strains that cause persistently infected (PI) cattle and this is one of our biggest problems in controlling the spread of BVD.

#### *What is the difference between Type I and Type II BVD viruses?*

Again, this is a difference between strains or biotypes of this virus. Certain parts of the virus's genetic code are different between type I and type II BVD. This difference does not equate to virulence or the ability to cause disease or death. There are type II BVD viruses that cause severe disease and those type II viruses that cause very mild disease. The same holds for type I BVD virus strains. As more research is done to sequence the genetic code of BVD biotypes, this type of classification may become too complicated to use. It is also important to understand that both type I and type II BVD viruses have CPE and non-CPE forms, and in both instances the non-CPE form is the more natural and more common situation in cattle.

#### *When BVD infects an animal, what are the possible outcomes?*

Here is where the story gets complicated. The outcome depends on the BVD biotype and the "resistance" of the cattle involved. In the simplest case, if the cattle are adult, non-pregnant cattle and have been vaccinated against the infecting biotype previously—nothing happens. No disease, no death loss, nothing more than if they received a vaccine booster. Also, the age of the cattle is important, particularly the age of the fetus. If the fetus is exposed to a non-CPE BVD virus prior to day 120 of gestation it is possible the calf born will be an immunotolerant carrier of the virus. That is to say, the fetus may not be killed by the virus (aborted), will not mount an immune response to the virus, will shed large numbers of the non-CPE virus into the environment for as long as it lives. These immunotolerant carriers are called persistently infected (PI) cattle and usually live less than one year before dying. They are not only immunotolerant to the BVD virus, their immune system is permanently damaged putting them at risk for all other infectious diseases. Table 1 is a list of possible conditions that can result from BVD infection.

Table 1. Possible outcomes to BVD virus infection in cattle.

Fetal Infection	1. Early Embryonic Death
	2. Abortion
	3. Stillbirths
	4. Congenital Birth Defects (eye defects, brain defects)
	5. PI Calves (immunotolerant and persistently infected shedders)
	6. Normal Calves born with antibodies to the BVD virus

Acute Infection	<ol style="list-style-type: none"><li>1. Subclinical—no signs of disease</li><li>2. Severe BVD signs with diarrhea and lesions in the gut (mouth to anus)</li><li>3. Hemorrhagic Syndrome (failure of blood to clot normally)</li><li>4. BVD infection and respiratory disease (pneumonia)</li><li>5. Venereal disease</li></ol>
Mucosal Disease	<ol style="list-style-type: none"><li>1. Infection of PI calves with a CPE virus which causes severe diarrhea, weight loss, damage to the gastrointestinal system, and death.</li></ol>

This table is simplified from what is known to occur in nature; however, it does point out the tremendously complicated nature of disease caused by the BVD virus.

***What is the difference between a PI calf and a normal calf with antibodies to BVD?***

In a word, timing! If a fetus is infected after about 180 days its immune system is developed to the point it can "fight off the virus". Thus this fetus will make antibodies to the virus and develop immunity. On the other hand, if the fetus is infected at day 80 of pregnancy with a non-CPE BVD virus, it may be born as immunotolerant and persistently shedding large numbers of this BVD virus into the environment. This shedding occurs through every secretion from the body (saliva, tears, feces, etc.). This is why the PI calves are such a problem for the herd.

Next month we will discuss some of our current tools available to diagnose BVD infections in cattle.

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