

## Environmental Survival of the BVD Virus

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Bovine Viral Diarrhea Virus (BVDV) is a pathogen that is known to cause a multitude of problems in cattle. These problems include: persistent infection, immunosuppression, respiratory disease, diarrhea and reproductive losses. While the knowledge base on BVDV has been expanding at a rapid rate in recent years, little is known about how long the virus survives in the environment. Transfer of the BVD Virus from one animal to another is best accomplished by direct contact. However, it is widely believed that indirect contact, such as through shared water tanks or contact with the feces of a transiently infected or persistently infected animal also provides a tremendous opportunity for transmission of the disease. In a commercial cattle-feeding operation, cattle are often unloaded from a truck and placed in a "receiving" pen for a short period of time prior to processing. After processing, they are moved to their "home" pen, where they may spend the entire feeding period. When a pen of cattle is sold to slaughter, the pen in which they resided may be re-filled with cattle within 24 hours. With these simple traffic patterns in mind, it is very easy to see that if BVDV survives in the environment for even 24 hours, transmission of BVDV to several new pens of cattle through indirect contact could occur. For these reasons, it is very important to determine how long the virus can survive in the environment. The following study is proposed to ascertain the longevity of BVDV in the environment, as well as to determine if there is any difference in longevity between genotypes.

### Materials and Methods

**Study site** – The study will take place in a large commercial cattle feeding operation in Southwest Kansas. This cattle feeding operation is currently testing incoming cattle for persistent infection (PI) of BVDV. Once a PI animal is found, it is removed from the general feedyard population and placed in a quarantine pen, along with other PI animals. Many of the PI animals in the quarantine pen are of known genotype, with type Ib being the most prevalent. This dirt-floor pen is outfitted with a concrete, constant-flow water tank that is representative of typical industry use.

**Sample collection** – The supply valve to the water tank in the quarantine pen will be shut off and the contents of the tank will be drained into several clean plastic buckets. These contents will be immediately moved to an empty tank (that is not in use) of identical construction. At approximately 7:00 AM everyday for five days, a 20 ml sample of water from the host tank will be taken and frozen. All five samples will be shipped on ice overnight to the Texas Veterinary Medical Diagnostic Laboratory (Dr. Richard Mock) for virus isolation. A large fecal sample will be taken from animals persistently infected with a known genotype (i.e., a fecal sample from a Type Ia, a fecal sample from a Type Ib and a fecal sample from a Type II). Each fecal sample will be labeled according to its genotype and will be placed outside the quarantine pen, so as not to disturb the sample, but also to allow it to be exposed to the feedyard environment.

Samples from each of the fecal pats will be taken each day at the same time the water samples are taken and these will be shipped the same way as the water samples are shipped.

**Virus Isolation** – The water and fecal samples will be cultured and, if recovered, the virus will be genotyped. This will occur on a daily basis for ten days. Once a virus is no longer able to be recovered/cultured, that day will be considered the virus's environmental lifespan.

### **Results**

No virus was cultured from any of the samples at any time. This indicates that the BVD virus survives in the environment for, at best, less than 24 hours.

### **Discussion**

Weather conditions were cool and moist during the collection period (overnight lows in the 40s, daytime highs in the sixties). In the author's opinion, this should have been supportive of viral survival. The virus may have died in transit to TVMDL. In discussing this with Dr. Mock, he suggested repeating the trial and sending the samples everyday, cooled instead of frozen. Once the samples arrived at the laboratory (7/21/05), they were frozen at -70° F until all the samples were received. The submitted water samples were ultracentrifuged for concentration and tested on primary bovine fetal kidney cell cultures for virus isolation. Both the original water samples, the ultracentrifuged water samples and fecal samples were passaged three times on 25cm(2) flask of bovine fetal cell cultures. Each passage was tested for BVD virus by inoculation of the cell culture passages on bovine fetal kidney cell culture Leighton tubes and tested by using a polyclonal anti-BVD fluorescent antibody conjugate. The water samples and the fecal samples were contaminated with bacteria and required filtration for passage on cell culture.

### **Results**

No virus was isolated.

### **Discussion**

Weather conditions were dry and hot during the collection period. This may have hindered survival of the virus. Apparently, the BVD virus does not survive long in the environment.