

■ Bovine Viral Diarrhea Virus (BVDV) in Camelids

Bovine viral diarrhea virus (BVDV) has recently been recognized as a source of disease in alpacas, resulting in reproductive loss and illness. Although BVDV is currently a rare alpaca disease, there is clear evidence indicating that the disease has been present in the North American alpaca herd since at least 2001 and likely originated from BVDV-infected cows. Camelid owners, caretakers, veterinarians, and diagnostic laboratories need to become familiar with this emerging threat to alpacas.

As of this writing (Feb 1, 2006) at least 40 persistently infected (PI) alpacas have been identified in North America. Ongoing research and testing is being funded by the Alpaca Research Foundation (ARF) to determine the prevalence of BVDV in North American alpacas. This virus has potential to spread within the alpaca industry under specific circumstances. The cattle industry has been battling BVDV for decades.

ARF is providing this information to alpaca breeders so that informed decisions can be made in consultation with their veterinarians. These include recommendations on education, testing, bio-security, and management. We feel certain these are the keys to prevent and then to control this disease. Perhaps with unity and dedication, we can curtail the disease in our alpaca industry.

Clinical Information

1. Acute Infection in Non-Pregnant Alpacas:

Healthy alpacas can get the virus from infected alpacas and cows. This virus is fought off by

that alpaca's immune system, is acute (short lived), and results in an induction of the ability of that alpaca's antibodies to neutralize the virus during this infection and when exposed to the disease again at another time. Potential symptoms in an alpaca infected with BVDV include, but are not limited to, a fever, decreased appetite, and rarely diarrhea, but animals may show no symptoms.

- 2. Acute Infection in Pregnant Alpacas:** The BVDV infection in a pregnant alpaca can be a completely different matter. The infected pregnant dam's immune system reacts just as described above - virtually no symptoms and no consequences to her. However, the consequences of infection on the developing fetus can be serious. These range from no effect, to abortion, to birth of a persistently infected (PI) cria, and probably depends on when the fetus was exposed to the virus in the mother's blood.
- 3. Persistent Infection:** The PI state results because the fetal immune system accepts the virus as its own. The fetus is unable to fight the virus and never develops antibodies to that strain of virus for its entire life. Note that a PI animal does not get the infection outside the womb. The only way to become a PI alpaca is through viral exposure in utero (before birth).

Many PI crias are "poor doers." However, some PI crias grow to adulthood with no signs of any clinical disease. The reason PI animals are such a problem is

The Alpaca Research Foundation (ARF), in conjunction with Morris Animal Foundation (MAF) and other groups in the llama and alpaca communities, provides funding grants to veterinarians and scientists engaged in research that has the potential to improve the health and well-being of our animals. *Alpacas Magazine* is pleased to bring you another in a series of articles to update alpaca owners on the research being conducted by these organizations.



that they shed huge quantities of infectious virus through respiration and all body fluids into the environment every day with some of them looking and acting perfectly normal. One PI alpaca is nearly three years old and appears completely healthy.

Understand that not every “poor doer” or small or aborted fetus has BVDV infection or is a PI. Repeated testing for the virus by a diagnostic laboratory that is experienced in alpaca BVDV testing procedures and consultation with your veterinarian is necessary before concluding that an alpaca is persistently infected with BVDV.

Since there is no treatment for BVDV infection, once an animal is identified as PI, it must be euthanized or completely quarantined. The reason for these drastic measures is that the unrecognized PI alpaca can spread this disease in the North American alpaca herd.

Control Measures

A combination of show testing, on-farm bio-security measures, on-farm herd testing, and careful attention to taking animals from one farm to another should reduce the incidence of BVDV in the North American alpaca herd.

- 1. Testing for Shows:** BVDV can be spread by PIs that are unknowingly brought to shows. The disease could be brought back to the farm by an alpaca that has been infected at a show. If that animal is pregnant, there is a possibility she could then deliver a PI cria, thereby propagating the disease. Testing and eliminating all alpacas that are persistently infected with BVDV before show entry will make a tested show safer for all participants. A negative result on a whole blood virus test at one time in the life of the animal is proof that your animal is not persistently infected with BVDV, but does not preclude the possibility that the animal could become acutely infected with BVDV at a later date.

Demonstration of a negative BVDV viral state can be done with either the polymerase chain reaction (PCR) test or the virus isolation/identification (VI) test on whole blood. Your local state animal diagnostic laboratory may prefer one test over another. The blood is submitted through the owner's local veterinarian in a purple top non-clotting (EDTA) tube with the animal's ARI number, owner name and animal name on the label. Have your veterinarian check with the diagnostic laboratory for the proper amount of blood needed for testing and any specific procedures that the testing laboratory may require. The sample should be sent overnight delivery.

- 2. On-Farm Bio-security:** Appropriate on-going farm bio-security has been and will continue to be an important tool that owners can use to prevent BVDV from getting onto the farm. Quarantine all alpacas that come to the farm or return from another untested location (shows, breedings, etc.) for a minimum of thirty days. Test all existing and new alpacas before they come to the farm for BVDV with a viral whole blood test. Add a clause to all contracts that provides for testing and full refund if the alpaca is PI.
- 3. On-Farm Testing:** PI animals propagate further infection. To control the emerging problem, PI animals must first be identified and then be permanently removed from the herd. Testing will therefore significantly decrease both the incidence and spread of BVDV. If you receive any positive BVDV report, it is essential that you discuss this with your veterinarian. Determine the necessary follow-up testing and contact any farms that may have had contact with your animals so that they can take action to limit the spread of BVDV.
- 4. Vaccination for BVDV:** The killed vaccines that are currently available have not prevented the birth of PI's in cattle. There is no information available about their effectiveness in camelids. Under no circumstances should live BVDV vaccine be administered to alpacas. The best advice at this time is to consult with your veterinarian and keep abreast of new developments in vaccine research and development before choosing to vaccinate your herd.

Specific Testing Methods

The alpaca BVDV testing recommendations that follow are based on comparative medicine, are derived from those currently used for cattle, but with regard to alpacas are currently incomplete. The ELISA, using serum or skin biopsies, appears to be unreliable for alpacas at this time. Research is ongoing. Consult with your veterinarian and note that updates will be appearing on the ARF website.

Because every state laboratory has different sample requirements, it is critical that you work with your local veterinarian to insure that samples are submitted properly.

- 1. Testing for the presence of virus:** There are three excellent and widely accepted BVDV tests: the polymerase chain reaction (PCR) test, the virus isolation/identification (VI) test and the IHC (immunohistochemistry) test. Blood for either the PCR or VI test can be collected in an EDTA (purple/lavender top) tube. IHC

is done on a tissue sample. A negative blood viral test would indicate that the alpaca is not PI for the life of that animal when run at a laboratory experienced with alpaca BVDV testing. A negative IHC test also rules out a PI status.

Your veterinarian should contact a veterinary diagnostic laboratory that is experienced with BVDV testing in alpacas to find out which viral tests are offered for the detection of BVDV.

Some diagnostic laboratories have viral testing preferences using PCR vs. VI (virus isolation) testing on whole blood or IHC on a tissue sample. With proper sample submission and testing procedures, all three tests are valid for the detection of active viral infection in alpacas.

- 2. Who Should be Tested for the Virus:** All aborted and stillborn fetuses, crias that die, and any unexplained deaths should be necropsied by a veterinarian or sent intact to your state veterinary diagnostic laboratory. Tissue samples and blood can be sent to this diagnostic lab and tested for disease agents, including BVDV. Low birth weight crias, poor-doing crias, “failure to thrive,” very premature crias, and alpacas with unexplained illness should be tested for BVDV.

Any pregnant females who may have been exposed to BVDV during their pregnancy should have their crias tested for BVDV soon after birth, using a whole blood viral test or IHC test. Until results are known, these animals should be quarantined. The only valid tests for these crias (up to three months) is a viral blood test done on the blood “buffy coat” (PCR or VI submitted in an EDTA tube) or IHC on a tissue sample.

- 3. Interpretation of Virus Tests:** If the test in a live animal is positive for BVDV, this may only represent an acute (short-lived) viral infection. A second sample must be collected three to four weeks later and tested to indicate that the animal is or is not PI. A negative viral result on the second test shows the animal was simply exposed to BVDV and fought the infection. Quarantine after a second positive whole blood PCR, VI (virus isolation) or IHC, is very important. This requires veterinary consultation to determine the need for further testing.

If a viral test identifies BVDV in any blood/tissue sample submission, then the herd could be strategically tested (BVDV herd screening) to see if there is a PI animal present in the herd as the source of the infection.

- 4. Testing for the Presence of Antibody:** The serum neutralization test may be used to demonstrate antibodies to the virus. After doing viral testing, use the serum neutralization (SN) test as a subsequent screening tool to evaluate if any alpaca may have ever been exposed to BVDV. If an alpaca has been vaccinated for BVDV, then the SN test cannot distinguish between the vaccine and natural exposure to the virus, thereby making a positive test uninterpretable. Note that the SN test is NOT useful to detect PI animals. Submit blood for SN analysis (red topped clot tube) to test for antibodies to BVDV. If the SN test for antibody is negative or low, further testing is required and a veterinarian should be consulted. Recall that the PI alpaca may have few or no antibodies to BVDV.

Continuing Education

ARF will remain in close contact with AOBA in an effort to keep the alpaca community updated on new information, research findings and educational opportunities associated with BVDV. *[Updates will be published in Alpacas Magazine – Ed.]* The First Annual ARF Lecture entitled “Bovine Viral Diarrhea Virus in Alpacas: Control Through Testing and Bio-security” will be presented by Edward J. Dubovi, PhD, Director – Virology Section, Diagnostic Laboratory, New York State College of Veterinary Medicine, Cornell University at the AOBA National Conference in Louisville, KY; May 18, 2006.

The following websites have additional information on BVDV testing and terminology:
www.vetmed.wsu.edu/depts_waddl/bvdcamelids.asp
www.alpacaresearchfoundation.org

Conclusion

In summary, although presently rare, BVDV is a potential threat to the alpaca industry. It is imperative that all alpaca owners become familiar with BVDV terminology/science, the potential for animal losses, prevention of viral contamination, and testing procedures to identify infected carrier animals (PIs) as well as identification of exposed, but non-infectious alpacas.

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— Board of Directors
Alpaca Research Foundation