

By Susan Forman

### ■ New Research in Alpaca BVDV

To help the alpaca community and the veterinary medicine arm of our industry learn more about Bovine Viral Diarrhea Virus (BVDV), the Alpaca Research Foundation recently awarded Jason Johnson, DVM of Auburn University, a grant to study the effects of BVDV in alpacas. Auburn University annually conducts many studies of BVDV in cattle, making their facility an ideal location. In addition, Dr. Johnson has been involved in some of those bovine studies, making him extremely well-versed on this particular virus. The research that he is now undertaking will undoubtedly advance our knowledge about this disease as it applies specifically to alpacas.



Dr Jason Johnson

As a refresher, or for the newer breeder who may not yet be aware of this virus, the most serious consequence a herd contracting this disease faces is the loss of crias. An acute infection of BVDV in an otherwise healthy adult alpaca most generally does not seem to produce serious health consequences for that particular animal. However, should a pregnant female contract the disease during an early phase of her gestation<sup>1</sup>, the consequence is deadly for her cria. Her unborn cria will be Persistently Infected (PI) and not recognize the BVDV virus as an “invader.” The PI cria may be considered a “poor doer” or, as in the case of some cattle, look perfectly normal and live a normal lifespan, making identification of the disease difficult.

The PI cria will never produce antibodies to BVDV and will remain infected (and infectious) throughout its life. In effect, the virus becomes a part of the cria. As such, the virus remains active and continually “sheds” itself through the cria’s body fluids. Urine, feces, nasal secretions, saliva, tears, milk – all contain the virus in its active form that can infect other animals. Throughout its life, the PI cria is leaving active and infectious virus wherever it goes. Any other alpaca coming into contact with the active virus is at risk for contracting the disease. Consider that the cria will likely be housed with other crias and females who are either newly bred or soon to be bred; the PI cria is then constantly exposing dams to the infection who will then in turn create PI crias.

“Also to be noted,” says Dr. Johnson, “is that if we follow the cattle model, exposure of a PI to a pregnant dam can also cause abortions (miscarriage), congenital abnormalities such as joint fusion, hydrocephalus, hair problems, and brain abnormalities.” Thus, the PI cria’s economic impact on the entirety of its herd can be significant. In the end, the PI cria is euthanized unless it is fortunate enough to find its way into a specific (and rare) study group.

Following the cattle model, PI animals can appear perfectly normal and healthy and Dr. Johnson emphasizes, “The same could be happening with any PI alpacas that exist. The presence of the PI 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 interviews with the researchers carrying on this important work.



Photos courtesy of Dr. Jason Johnson

one of the major factors that make it hard to control the disease in the cattle population. Owners may think they don't have a problem at all because everyone in the herd looks healthy, when, in fact the abortions, decreased reproductive performance, or immunosuppression leading to secondary disease they had in the last few months were due to the presence of the PI exposing everyone on the farm.”

Identification of the PI cria is only possible through specific blood tests such as a virus isolation or PCR (Polymerase Chain Reaction). Even when these tests are performed, there is a small chance of a false negative result. Therefore, all breeders need to be working closely with their veterinarians regarding the best testing protocol for their particular farm.

In terms of the prevalence of BVDV, one research study shows that in both North and South America, alpacas and llamas that have grazed with cattle and sheep have tested positive for the antibodies to BVDV, indicating exposure to the virus. Two ARF-funded studies of prevalence in North America are currently being conducted. Preliminary results are available on the ARF website [www.alpacaresearchfoundation.org](http://www.alpacaresearchfoundation.org).

An additional point of note: BVDV appears to be infective to many species of animals. To wit, the virus has been isolated in pigs, sheep, deer,

Old World camelids, llamas, and alpacas. Another important fact that Dr. Johnson points to is that the disease has been isolated in Irish sheep herds, demonstrating that BVDV is not strictly a North or South American disease. It would appear that BVDV is a disease that may be much more widespread than previously believed and therefore, a greater risk to our herds.

The study will involve using the three different genotypes of BVDV, designated as Type 1a, 1b, and 2. Dr. Johnson will endeavor to study these three genotypes of BVDV in separate groups consisting of six alpaca geldings in each group. Dr. Johnson stresses, “All experimentation will be conducted under strict guidelines from the Institutional Animal Care and Use Committee. Once again, following the cattle model, we do not foresee significant disease or distress to occur.” It is also worth stating that at this time, the only genotype of BVDV isolated in alpacas is type 1b. Therefore, using all three genotypes will show the ability of each to produce disease in alpacas.

Prior to the start of the study, Dr. Johnson will assess each animal for its overall health. In addition to a complete physical examination, each animal will undergo a complete blood count as well as blood tests (virus isolation and virus neutralization) to assess current or past exposure to BVDV. Each

## ARF Investigator Profile

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Photos courtesy of Dr. Jason Johnson

group will then be infected with either BVDV 1a, 1b, or 2 using a nasal mist protocol, a route of infection that more closely resembles the manner in which we could expect our own animals to come into contact with the disease. The alpacas will then be closely monitored for 30 days, receiving frequent physical examinations as well as various types of blood work.

Dr. Johnson's research will be broken down into three primary categories: virologic, clinical, and serologic. Blood tests will be utilized during the research phase and consist of complete blood counts (CBC) conducted approximately every two days for the first half of the study, then weekly; virus isolation (VI) tests performed at about the same

intervals; then virus neutralization (VN) tests conducted prior to the study and then beginning about mid-way through the testing period. Nasal swabs will be collected and tested on a daily basis until about midway through and then weekly.

The virologic findings will focus on collecting and analyzing both blood samples and nasal swabs to determine the onset and duration of nasal virus shedding. This information will more firmly establish the length of time that each type of BVDV requires to incubate as well as how long the virus will be shed in nasal secretions.

The clinical findings consist of daily physical examinations and will include heart rate, respiration, and temperature. Additionally, complete blood counts will be performed and evaluated. Clinically, any differences in the three genotypes of BVDV will be identified and yield a firmer clinical picture of acute BVDV infection in alpacas.

Lastly, serologic findings will discover the time and magnitude of seroconversion (the point at which the active virus ceases to replicate and antibodies to the virus are formed). Tests will also be performed to assess cross-reactivity between genotypes which will provide more precise information to laboratories across the nation and world. Cross-reactivity results will also prove beneficial in any future research.

The work that Dr. Johnson is doing will go a long way to firmly establish key data regarding BVDV infection in alpacas. Knowing the clinical manifestations, the amount of time between exposure to the onset of viral shedding, the duration of nasal infective virus shedding, and the time period to antibody formation post-infection will eventually help us to more fully protect our herds. Having these key time frames will provide the data needed to establish guidelines for quarantine and other bio-security measures. In the end, the results of this study will provide the alpaca community with hard facts upon which to build future knowledge and protection for our animals. This new found information will also provide a very important basis upon which additional research can be conducted. In Dr. Johnson's words, "My hope is that this study will lay a foundation for future BVDV research in alpacas."



Dr. Johnson hopes to have the results of this study analyzed and released by July 2009. Regarding the value of his research to the individual alpaca breeder, Dr. Johnson states, "I believe that sound bio-security principles will prove to be the mainstay of preventing propagation of BVDV in alpacas. With the information obtained from this study, we will be better able to implement scientifically-based bio-security plans, testing strategies, and isolation protocols to prevent propagation of BVDV. Furthermore, this study will enable owners and breeders to recognize the clinical signs associated with acute BVDV infection in alpacas."

The alpaca community looks forward to the resultant data and thanks Dr. Johnson for his commitment and work.

In closing, Dr. Johnson states, "I would like to extend my thanks to the Alpaca Research Foundation for the grant to conduct this research project. They truly care for the producers, scientists, and alpacas that their organization stands to represent."

**Endnote:** The geldings used in this study will be returned to life in the Auburn herd where they will continue to provide their valued services to students learning how to perform physical exams and other procedures. They will test positive for the antibodies to BVDV, but will pose no health threat to the rest of the herd.

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