Milk Watch

The latest information concerning milk testing for animal disease. *Vol 5* *Issue 1*

Triple Threat To The Immune System

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How important is an immune system in a dairy cow? You only need to look as far as Johne's, leukosis and Bovine Viral Diarrhea (BVD) to answer that question. All three of these diseases remain prominent because their associated microorganisms flourish by attacking the cow's primary defensive weapon, the immune system.

Not only does attacking the immune system allow Johne's, leukosis and BVD to silently propagate in a herd, this strategy also interferes with successful vaccination programs, generally a very useful tool for the maintenance of animal health and well being. Large investments are made in vaccination programs that rely on an active and healthy immune system to combat disease and infection. So, can you really be sure that your vaccination programs are as effective as they could be in the face of this triple threat?

AntelBio, through our affiliation with NorthStar Cooperative's DHI services, developed milk analysis for Johne's and leukosis. By using the convenience of the DHI milk sampling and analysis system and AntelBio's milk tests, veterinarians and producers have been able to implement successful testing strategies with absolutely no interference to the cows or daily farm operations.

AntelBio is now gearing up to add BVD to the lineup of milk tests for this triple threat. Let's discuss BVD and the important role of milk testing to assist in its control and elimination from a herd.

Bovine Viral Disease

BVD is caused by a virus that is able to infect a variety of physiological systems in cattle. Its effect on an animal's immune system leads to the greatest concern. Animals of any age are susceptible to infection, most of which lead to relatively mild, short-term ailments such as fever, depression and diarrhea until the immune system recovers and clears the virus from the animal. Infected animals simultaneously exposed to other routine infections such as pneumonia, mastitis and salmonella are not so fortunate. Unable to mount an effective immune response, many of these animals succumb to secondary infections. Often, diagnosis identifies only the secondary infection, which couldn't have gotten a foothold without BVD already in existence. Therefore, the possibility of BVD should always be considered during outbreaks of infectious disease in a herd.

Prevention of BVD in the United States involves vaccination with various strains of modified live and killed virus. Most animals that have healthy and active immune systems will be effectively protected against strains of BVD virus represented in the current vaccination program. Unfortunately, the number and variety of BVD strains are unknown, and viral mutation continues to produce new strains on an ongoing basis. The greatest risk with BVD is the introduction of new strains either through new herd additions or persistent infection. The new strain then propagates through geographical regions via unprotected herds, weeding out susceptible animals until immunity to the new strain is developed in the population. Several countries have chosen to eradicate BVD rather than vaccinate because of this ability to escape the latest version of vaccine. Continued outbreaks of BVD in the United States are evidence of this uncanny ability, with calves and cows succumbing to BVD or secondary infections that take advantage of a BVD-compromised immune system.

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This continued nuisance of strain evolution with BVD virus is also related to the immune system. Cows exposed to new strains of virus during pregnancy can give rise to persistently infected (PI) calves. If exposed as a fetus, the calf's immune system may recognize the virus as "normal" and will not mount an immune response to it. If the calf survives to adulthood, it becomes a virus factory, capable of mass producing virus as a source of new infections and potentially new strains of virus not represented in the current immunization program. Depending on the strain of BVD, outbreaks can range from subtle drops in herd performance and overall health to severe fetal, calf and cow mortality.

In effectively vaccinated herds without persistent infection, the source of new strains of BVD is purchased cattle or those cattle that leave and re-enter the herd, such as heifers. Cattle that bring in acute BVD infections can start the cycle of acute infections in pregnant cows leading to persistent infection of their calves, causing further infections of pregnant cows and calves. In addition to suffering the consequences of the acute BVD infection itself, infected animals are unable to mount effective immune responses to other infectious microorganisms. While the classic signs of BVD (fever, depression, diarrhea, reduced appetite) are caused by erosion of oral and gastrointestinal linings, it is often signs from infection by Salmonella, Pasturella, Haemophilus, rotavirus, coronavirus, etc., that dominate during infectious BVD outbreaks.

Combating BVD

Beyond maintaining a sound BVD vaccination program, other management steps are critical to BVD prevention and control. First and foremost, avoid the introduction of BVD into existing herds. Limit the purchase of untested animals or otherwise, isolate and test all incoming cattle by ear notch or blood sample. In animals older than four months of age, both sample types can be used and results obtained within a week. Animals testing positive to BVD can be retested in three weeks to differentiate acute infection from persistent infection. Most animals with acute infection will clear the virus in this time, as indicated by a negative follow-up test, and can be

commingled with the rest of the herd. Persistently infected cattle will not clear the virus and will follow up with another positive test; these animals should be culled immediately.

If BVD has been recently diagnosed or is strongly suspected in the herd, a screening program should be developed. There are various methods of screening for persistent BVD infection. Bulk milk analysis by DNA test is an important tool for screening the milking herd for PI animals. The DNA test is sensitive enough to find one PI animal in a group of 200-300 animals, a very cost effective screen for the whole milking herd. For herds with greater than 300 head, in-line milk samplers can be used to sample separate groups of cows as they pass through the parlor. Alternatively, DHI milk samples can be saved and pooled in the laboratory for testing.

DNA testing is a cost effective screen, sensitive enough to find one PI animal in 200 - 300 animals.

Individual animals represented in any positive pools need to be tested by ear notch or blood sample to find the infected individual(s). Currently, individual sampling is a costly procedure in terms of materials, time and effort however, AntelBio will soon be able to use ELISA testing to analyze individual DHI milk samples rather than ear notch or blood samples, allowing producers to once again, take advantage of their affiliation with DHI to screen for disease with minimal effort.

As might be suspected, because BVD infected animals are at such an immunological disadvantage, relatively few PI animals make it into the milking string. Therefore, the absence of PI cows in the milking herd does NOT exclude BVD from a diagnosis. Any testing program initiated for BVD must include a testing protocol for calves, in fact a PI negative calf must have a PI negative dam (ie., two results for the price of one). Ear notches (from birth) or blood samples (after four months of age) can be submitted to the laboratory for the detection of BVD antigen, the presence of which is strongly indicative of persistent infection.

The immune system is a cow's primary defense against pathogenic microorganisms that reduce the production and quality of milk. Diseases that continue to plague the dairy industry are able to dismantle this primary defensive mechanism, and in doing so, affect the animals ability to resist and recover from more mundane infections. The continued presence of BVD highlights how this strategy of dismantling the immune system is not only able to aide in the maintenance of this microorganism in the dairy population, but is also able to bypass otherwise effective vaccination strategies dependent on a competent immune system. While vaccination programs will continue to be instrumental in protecting the dairy population, it should be apparent from some of the most prevalent diseases today that eradication using test and cull strategies are also required to maintain herd health and improve the production and quality of milk.

AntelBio currently offers DNA analysis on pooled (bulk tank or group) whole milk samples, as well as antigen capture ELISAs on blood and ear notch samples. **For more information on BVD testing strategies contact me at byremt@antelbio.com or call 1.800.631.3510.**

BVD Testing Strategies

Screen calves < 4 months
- ✧ Ear notches for antigen capture ELISA

Older calves > 4 months and adult cattle
- ✧ Ear notches for antigen capture ELISA
- ✧ Whole blood (EDTA) for antigen capture ELISA
- ✧ Whole blood (EDTA) for DNA can be pooled

Screen milk cows in groups or herds
- ✧ Pooled whole milk (bulk tank or groups) for DNA analysis

Test milk cows in positive pools
- ✧ Ear notch or whole blood (EDTA) for DNA analysis or antigen capture ELISA
- ✧ PENDING VALIDATION: DHI milk samples for antigen capture ELISA

Differentiate acute and persistent infection
- ✧ Whole blood (EDTA) obtained four weeks after initial test for DNA analysis

What's attacking your herd's immune response?

Return Service Requested

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