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MONTANA BVD-PI HERD BIO-SECURITY PROJECT

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Bovine viral diarrhea (BVD) virus is an important infectious disease agent of cattle that can potentially have a negative effect on all phases of reproduction. Reduced conception rates, early embryonic deaths, abortions, congenital defects, and weak calves have all been associated BVD virus infection of susceptible females. In addition, the birth of calves persistently infected (PI) with BVD virus as a result of uterine fetal exposure is extremely important in the perpetuation of the virus in an infected herd or spread to other susceptible herds. Bulls acutely infected or PI with BVD virus may be a source of viral spread through either natural service or semen used in artificial insemination.

The Montana BVD-PI Herd Biosecurity Project was initiated to improve the overall health of Montana's cattle herd and add value to the state's calf crop. The project continues efforts begun in 2006 by providing technical assistance and limited financial support to Montana ranchers who want to screen their herds for BVD virus. The focus of this project is to assist ranchers in adopting an array of biosecurity practices that will prevent transmission of BVD virus from PI animals within and between cattle breeding herds.

Management and control of BVD as a disease in cattle herds must consider two ways the virus passes from one animal to another. The first is *horizontal transmission* – when a transiently (temporarily) infected animal releases the virus in its nasal and other secretions and the virus enters a susceptible animal through the mouth or respiratory tract. The second is *vertical transmission* of BVD virus from an infected dam's bloodstream to her fetus during pregnancy.

Persistent infections are the result of a fetal infection reported to be between about 45 and 150 days of gestation. Infections prior to about 45 days of gestation may result in early embryonic death. Infection between 45 and 130 days of gestation may produce fetal death or PI calves may result. Congenital defects such as cerebellar hypoplasia, contracted tendons, hydranencephaly and hydrocephalus may form when infection takes place between 100 and 150 days of gestation. Abortions may occur with infection from 100 to 270 days of pregnancy. This is also the time frame for congenital infections to occur. Stillbirths occur with infections during the last week or so of pregnancy. BVD virus can affect estrogen production of the cow and may cause infertility in this manner. This may affect the estrous cycle of the cow due to altered estrogen production.

Fetal infection can lead to the birth of a normal calf, or the birth of a PI calf – meaning the infection lasts the entire life of the animal. It's important to note PI females of breeding age not only are a source of horizontal transfer of BVD virus, but will always produce a PI calf themselves. The primary source of BVD virus is PI cattle; with transiently infected cattle considered a less important source.

The cost of the presence of at least one PI animal in a beef herd has been reported to range from $14.85-$24.84 per cow/year. The economic value of screening for PI animals

in cow-calf herds is influenced by the likelihood of finding at least one PI animal in the herd, the negative production effects when PI animals are present, the cost of inputs and the value of animals sold. Because of the low prevalence of PI animals, not all producers can justify diagnostic screening for PI cattle. However, if ranch history, a significant breech in biosecurity or changes in production practices increases the risk of PI cattle being present in the herd, a protocol to screen the herd can be defended based on the likelihood to improve economic return.

Support for this project comes via federally earmarked funds associated with the Montana Beef Network and provided by the Montana Stockgrowers Association (MSGA). Screening services and technical assistance are supplied by Animal Profiling International (API), Portland Ore. The project is also supported by Intervet, Inc.

Montana BVD-PI Herd Biosecurity Project Goals

- Gauge the incidence of BVD-PI in Montana.
- Demonstrate overall livestock biosecurity practices.
- Demonstrate innovative disease screening/diagnostic techniques.
- Investigate the economics of BVD-PI elimination on a herd-by-herd basis.
- Develop templates for BVD virus exposure risk at the ranch level.

The Four Components of the Project

Education

Understanding how the virus originates and spreads on a cow-calf operation and how it affects production efficiency throughout the beef chain. It's important scientific research information is shared among education professionals, veterinarians and producers; and this information is applied under a wide array of field conditions by ranchers and cattle feeders acting alone or under the guidance of an attending veterinarian. Systems have been developed to help producers and veterinarians assess to a degree of reasonable assurance the BVD-PI status of individual animals within their herds or under their care.

Diagnosis

Recent innovations in diagnostics allow us to screen cattle herds for the BVD virus at a relatively minimal cost through reverse transcriptase polymerase chain reaction (PCR) technology using pooled animal tissue samples. A reverse transcriptase–PCR assay on pooled fresh tissue samples is a sensitive and specific method of screening cattle for persistent infection with BVD virus. Diagnosis must be coupled with an animal identification system that allows efficient and accurate identification of BVD-PI animals so they can be removed from the herd. Also critical to the success of this project is rapid turn-around time of screening results. Once samples are received from participants, the contracting laboratory must deliver "next-business day" screening results and documentation.

Biosecurity

Biosecurity is an integral part of preventing transmission of the BVD virus and overall BVD-PI control. Biosecurity addresses all aspects of livestock movement and handling, mixing and sorting, identification, record keeping and documentation. The general principles of biosecurity and biocontainment as applied to BVD virus include increasing resistance of the host individuals to transient infection.

Producers with the help of their veterinarians must make decisions about the biosecurity tolerance levels they will accept based on the chances of disease transmission and the expected risks and losses from disease.

Benefits

Any health management program must reward producers for their time and investment. While in the initial phases of the Montana BVD-PI Herd Elimination Project rewards may or may not come in the form of pricing advantage; later any rewards are more likely to come through increased production efficiency, reduced health management costs and overall improved beef quality. We will continually review the outcomes of this program through systematic economic and production evaluation.

Montana BVD-PI Project Screening Protocol

The Montana project's systematic screening protocol guides the producer through a series of steps to identify PI animals in the herd and in screening new arrivals to the herd. The focus is on "whole herd" screening of cattle herds for PI status. This generally involves screening which begins with breeding bulls, open replacement heifers and new crop calves – with all samples taken well in advance of the breeding season.

Using the contracted services of Animal Profiling International, Inc., Portland, OR, the Montana project screening process is based on polymerase chain reaction (PCR) analysis of fresh "ear notch" samples from individual animals submitted by the producer or attending veterinarian. Fluid from the samples is "pooled" (usually 28 or fewer tissue samples/pool) and analyzed for presence of the BVD virus. If the BVD virus is detected in the "pool" the individual tissue samples making up the pool are tested using the Antigen Capture ELISA method. Thus we can determine the individual tissue sample(s) contributing BVD virus to the pool. Therefore, individual animals carrying the BVD virus can be identified by matching the tissue sample using the animal identification number.

Once an animal is identified as a carrier of the virus, the livestock owner/manager is notified. We suggest the animal (and its dam, if still nursing) be segregated from the herd and held for re-sampling 3-4 weeks later. The second tissue sample should be submitted to the lab for a "re-test" in order to segregate *transiently infected* animals from PI animals. If the second sample is positive for the virus, the producer can be reasonably assured the animal is PI-positive. In the case of an extremely valuable animal, a third sampling may be warranted.

Applying General Principles of Biosecurity

By their very nature, infectious agents have built-in mechanisms for evolving very rapidly to evade animal defense mechanisms. Many disease agents very effectively take advantage of new opportunities inadvertently presented by changes in livestock management and environmental stress. To prevent or control BVD virus at the ranch we're stressing ranchers begin with proper vaccination prior to breeding – along with screening for PI animals. But a major mistake when developing a health program for a specific herd is to focus on a single component, such as a vaccination.Vaccination alone is not a herd-health program and should not be considered as the sole safeguard to control infection by the BVD virus.

In the case of the BVD virus, the tremendous amount of virus secreted by a PI calf can overwhelm a level of immunity protective under less severe exposure. It is also very important to note while vaccination can increase the resistance of the susceptible animal, other factors under management control are often considerably important. Often overlooked in animal health management programs is the role of nutrition. The immune system is compromised if cattle are deficient in critical nutrients. If an animal is deficient in critical nutrients such as protein, energy and/or certain minerals or vitamins, it may not respond fully to vaccination.

The single largest risk factor for acquiring infection is the purchase of animals carrying the infectious agent. The most important piece of information a purchaser can have is honest, sound knowledge about the status of the herd of origin. Obviously, the primary question is whether or not the presence of the particular infection has been identified on the premises of origin during the past several years. It is only fair for buyers to ask if the animals have been managed in such a way the infection could have been introduced recently but not yet manifested the clinical form.

Sometimes these risks are overlooked. For example, have animals such as embryo transfer recipients of unknown origin or the calves born to them recently exposed the herd? How many diagnostic tests have been run that could have detected the presence of the infection?

Clearly one of the most serious biosecurity concerns is bringing in new animals that will expose newborn calves. The most dangerous animal to bring in under these circumstances is the baby calf brought in to "graft" onto nursing cows. For some agents, the risk of transmission from mixing older animals with susceptible younger animals, particularly the practice of holding back slower-growing but otherwise normal-appearing animals, must be examined.

Rather than continual mixing and sorting of groups, all-in/all-out group management, such as is used in the swine industry, reduces the potential for disease transmission from carriers to susceptible animals. Continual sorting and mixing also markedly increases stress as animals challenge each other to reestablish social dominance hierarchies.

This project recognizes the prevention of BVD virus centers on the identification and elimination of PI cattle before they're introduced to a ranch's breeding herd. But, in a larger sense, this project demonstrates how general principles of biosecurity and biocontainment can be applied at the ranch and feedlot level as an integral part of preventing disease transmission. Biosecurity addresses all aspects of livestock movement, health management, record keeping and planning. The general principles of biosecurity

as applied to BVD virus include increasing resistance of the host individuals to acute infection through a sound vaccination program.

A biosecurity program is like an insurance policy for the health and productivity of the herd. Producers with the help of their veterinarians must make decisions about the herd health risk tolerance level they will accept based on the chances of a disease occurring and the expected economic losses from the disease. When the risk tolerance level is determined then appropriate management measures should be initiated. We *highly recommend* that all ranchers and cattle feeders work with their attending or consulting veterinarians to incorporate appropriate components of a biosecurity program as part of overall herd health management.

Key BVD-PI Biosecurity Points

- PI calves can develop in the uterus of the dam if the heifer or cow is exposed to the BVD virus during the early gestation.
- Cows do not need to be sampled and tested for PI status unless they have a positive PI calf.
- The main negative health effect of BVD is it can inhibit conception and/or cause abortion in susceptible females.
- BVD also suppresses the immune system, making infected animals susceptible to other diseases.
- Individual identification is critical to match all samples with the animal tested and match the calf with its dam.
- If an animal tests negative for PI status, there's no need to ever retest that animal because it can never become PI.
- PIs that live to be breeding females can horizontally transfer the virus to other animals in the herd – and they will always produce a PI calf.
- Bulls should be purchased as BVD PI free. If not, bulls should be tested prior to the breeding season.
- A plan should be developed to eliminate PI's from the herd. Remember, once a PI calf, always a PI calf.
- No PI animal should enter commerce.

Montana BVD-PI Herd Biosecurity Project Results

2006 Pilot Project

- 65 herds screened
- 6 herds with PI's (9.2%)
- 32,535 head screened
- 24 PI's (0.074%)
- 0.74 PI's per 1000 head
- 22 new crop calves
- 2 cows (incl. heifer of "PI Pair")

2007 Project (as of July 30, 2007)

- 366 herds screened (*Five herds were "repeats" from 2006)
- 30 herds with PI's (8.2%)
- 90,270 head screened
- 89 PI's (0.099%)
- 0.99 PI's / 1000 head
- 68 new crop calves
- 15 '06 "fall" calves
- 5 yrlg rep heifers
- 1 yrlg bull

Total to Date (as of July 30, 2007)

- 431 herds screened
- 36 herds with PI's
- 122,805 head screened
- 113 PI's (0.092%)
- 0.92 PI's / 1000 head
- 105 new crop calves
- 5 yrlg heifers
- 2 cows
- 1 purebred yrlg bull

In 2006, the "pilot" year of this project, each participant received $1,000 in cost share assistance to help off-set the cost of screening. In 2007, the cost share was reduced to $250 per participant. The project will be continued in 2008 and 2009. Cost-share assistance in 2008 will include $100 per participant. By 2009, assistance will be limited to screening supplies/kits.

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