Beef Cowherd BVDV Management – A Practitioner's Perspective

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Abstract

Bovine viral diarrhea virus (BVDV) has a history of detrimentally affecting beef cattle production. Beef cattle veterinarians have an opportunity to utilize tools such as the veterinary decision making process to minimize the negative effects that BVDV has on profitability within individual cowherds. Herd history, health and performance information can serve as the framework for assessing current BVDV status. Basic biosecurity principles can be implemented to cost-effectively manage the virus within the beef herd.

Introduction

Bovine viral diarrhea virus (BVDV) has long been recognized as an important infectious agent of beef cattle. The industry has suffered significant losses from the effects of the virus on beef herds. The economic importance of bovine virus diarrhea (BVD) to the beef cattle industry is difficult to estimate because of insufficient data.[1,6]

Although the economic losses, to the entire industry are unknown, losses within individual herds can be measured. The veterinarian and cow-calf producer can use the veterinary decision making process to measure the BVDV economic effects of BVDV on the cowherd.[13] Basic biosecurity principles may then be implemented to develop a cost-effective BVDV control/eradication program.[10]

Literature Review – BVDV Basics

The cow-calf veterinarian must understand BVD and how the virus can affect herd production performance. This is critical to the development of a cost-effective control/eradication plan. BVD can cause clinical and subclinical losses throughout the entire production system.

BVDV can cause reproductive losses, including decreased pregnancy rates, delayed conception and embryonic loss.[4,15] Losses can occur from increased herd and individual calf morbidity, and/or mortality from birth to weaning. The virus can also affect feedlot performance and carcass value.

The ability of the BVDV to mutate rapidly has resulted in many different viral strains being present within herds.[3] Different strains have developed tissue and organ specificity, thus producing many different disease syndromes.[4]

The respiratory syndrome may appear in calves from a few days of age to older cattle in the feedlot.[4] The immune compromising effect of BVDV predisposes beef calves to respiratory problems in the presence of other pathogens.[6,12,14]

The thrombocytopenic syndrome results from the virus attaching to platelets, causing increased destruction of thrombocytes. The end result is severe hemorrhage from multiple organs.[4]

The reproductive syndrome is one of the most common and economically significant BVD syndromes.[4,12] Embryonic death, abortion, mummification or development of persistently infected (PI) calves may result if a non-immune cow is infected in the first trimester of pregnancy. Exposure during the second trimester may result in abnormal development of the neuromuscular system resulting in birth defects, including cerebellar hypoplasia, congenital cataracts, brachygnathism, musculoskeletal abnormalities and abortions. Occasionally, production of a persistently infected (PI) calf may occur. Third trimester exposure may result in abortions or birth of weak calves. Most calves will be born healthy and immunocompetent.[4,12]

Understanding the mucosal disease syndrome is valuable when establishing BVDV control/eradication programs.[4,15] Mucosal disease can occur when a persistently infected (PI) calf is exposed to a cytopathic BVD virus.[2,5] It can occur at any age, resulting in death. The presence of live PI animals, by shedding large amounts of BVD virus, may overwhelm herd immunity.[3,6,12,14] The end result is increased morbidity and/or mortality and reduced herd production.

The severity of the disease syndrome is dependent on several factors including the 1) virulence of the viral strain, 2) immunocompetency of the host, 3) level of exposure (challenge), 4) presence of other infectious organisms, and 5) presence of other stress factors.

Veterinarians must understand the BVD syndromes and how they affect beef cowherd health and production performance.

BVD Decision Making Process

The veterinary decision making process is useful for establishing a cost-effective BVDV management plan.[13] The process involves four important steps including 1) subjective data collection, 2) objective data collection, 3) assessment of the situation, 4) developing a plan to deal with BVDV.

1) Subjective data collection includes the owner's and veterinarian's observations. A complete herd history should be collected and potential BVDV risk factors identified. The next step is to identify individual animals that might be infected with BVDV. Complete herd examination should be performed to evaluate overall health and nutritional status. Inadequate nutrition may result in herd immune deficiencies and increased BVDV susceptibility. Examination of the beef cowherd calving and breeding environment must be performed and BVDV environmental risk factors identified.

2) Objective data collection can be utilized to reinforce initial observations and to completely define the BVDV status of the cowherd. Individual animal data, including blood work and postmortem samples, should be collected. The next step is to collect herd health information, including nutrition and vaccination programs. Feedlot health and performance data can provide valuable information about the cowherd BVDV status.

Herd production performance records (using the SPA guidelines) can be used to measure the economic impact of BVDV and how BVD management decisions affect profitability.[11] SPA herd production measures include reproduction, production, purchased feed, raised feed and grazing. Table 1 shows production performance (SPA-P) trends for a Nebraska sandhills ranch.

- SPA reproduction measures include **pregnancy rate**, which is an indicator of breeding performance.[11] Low rates may indicate inadequate nutrition, inadequate bull power or fertility, early embryonic death or mismatch between herd and environment. Inadequate nutrition may predispose the herd to disease such as BVD. BVDV can cause reduced pregnancy rates and early embryonic death.[6,15]
- **Pregnancy loss percentage** is a good indicator of reproductive performance.[11] Disease causing pathogens, including BVDV, and nutritional problems can cause pregnancy loss to be higher than normal.
- **Calving percentage** is a good indicator of breeding performance and pregnancy management.[11] Low calving percentages may indicate inadequate nutrition, embryonic death due to infectious disease, such as BVD, or the cowherd may not be matched to the environment.
- **Calf death loss** helps evaluate the herd health program, nutrition program, calving environment and genetic selection.[11] Inadequate vaccination programs, inadequate nutrition and poor calving environmental management are all predisposing factors to increased death loss from BVDV.
- **Calf crop** (weaning percent) is the most important production performance measure in the

Table 1. Production performance (SPA-P) trend for FR ranch.

	1995	1996	1997	1998	1999	2000	2001	2002
Pregnancy %	89	95.2	95.6	94.1	97.2	93.3	94	93.4
Pregnancy Loss %	1.1	0.8	1.2	0.8	1.2	1.7	0.8	0.2
Calving %	87.9	94.5	94.5	92.4	96	91.3	93.3	92.8
Calf death loss based on exposed females	2.4	1.6	2.6	2.2	3.7	4.7	4.7	1.2
Calf crop or weaning %	85.4	92.9	93	90.6	92.3	86.8	88.6	91.6
Female replacement rate %	17.7	16.1	22.5	14.1	37.3	13.4	13	13
Calf death loss based on no. of calves born	2.8	1.7	2.7	2.3	3.9	5.2	5	1.2
Actual wean wt-steers	514 lb	511 lb	437 lb	504 lb	476 lb	471 lb	466 lb	464 lb
Actual wean wt-heifers	478 lb	491 lb	423 lb	484 lb	447 lb	452 lb	450 lb	452 lb
Average wean wt	496 lb	500 lb	430 lb	494 lb	462 lb	463 lb	469 lb	459 lb
Pounds weaned per exposed cow	426 lb	465 lb	400 lb	447 lb	425 lb	402 lb	400 lb	426 lb
Average age at weaning	179 days	193 days	176 days	197 days	188 days	173 days	177 days	160 days
Total cow number*	353 HD	278 HD	248 HD	245 HD	346 HD	328 HD	337 HD	313 HD
Ave cow weight	1148 lb	1171 lb	1131 lb	1186 lb	1113 lb	1130 lb	1138 lb	1127 lb
Ave cow condition score	5.3	5.4	5.3	5.4	5.3	5.4	5.4	5.2
Ave adjusted wean wt	533 lb	513 lb	512 lb	529 lb	525 lb	563 lb	542 lb	582 lb

cowherd.[11] A low weaning percent may indicate that there are herd disease or nutrition problems. The cowherd may not be matched to available resources.

- **Calving distribution** is a good indicator of reproductive performance.[11] It helps evaluate herd health, nutrition, bull power and heifer development. BVDV can affect the distribution by causing infertility and early embryonic death resulting in a higher percentage of cows calving later in the calving season.[4]
- SPA production measures include **weaned calf age** and **actual weaning_weights**.[11] Actual weaning weights are a good measure of productivity and performance. BVD virus can cause increased herd and individual morbidity resulting in decreased weaning performance.[6]
- **Pounds weaned per-exposed female** is the best measure of cowherd production performance and reflects the reproductive rate, calf growth rate and death loss.[11] BVDV can affect pregnancy rate, pregnancy loss, calf growth and death loss resulting in decreased cowherd production performance.[4] This measure allows veterinarians to determine what the BVDV economic impact is on the herd.
- **Raised feed, purchased feed and grazing** measure allows us to evaluate the herd nutritional status and nutrition program.[11] Inadequate nutrition may cause herd immunodeficiencies, the end result being increased susceptibility to BVDV.

3) Assessment. A current assessment of the beef cowherd BVDV status should be performed based on all objective and subjective data collected. Individual cowherds are then classified as low risk if BVDV is not affecting herd health and production performance; high risk if the virus is affecting herd productivity and economic performance.

4) Plan. The final step in the decision making process is to devise a plan to deal with BVD virus in the beef cowherd.[8,9] The goal is to utilize biosecurity principles to cost-effectively control and/or eradicate BVDV.[4,10] BVDV biosecurity principles include:

1. Increasing host resistance by implementing quality vaccination and nutrition programs
2. Prevent effective contacts by maintaining low animal density, minimizing dose load and exposure time
3. Remove/prevent entry of the virus.[10]

For low risk herds a BVDV monitoring and control program has been designed (Table 2). A BVDV testing and control program has been established for high risk herds[8,9] (Table 3). Seedstock producers are classified as low risk or high risk based on the herd history and the current biosecurity program[7] (Table 4).

Table 2. BVDV control program – low risk herds.

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Herd History

Normal herd production performance

Raise own replacement females

Purchase replacement bulls from reputable purebred herds which use biosecurity principles

Limited exposure to herds of unknown BVD status

Production performance and individual records do not show any evidence of persistently infected (PI) animals in the herd

- Pregnancy rates, pregnancy loss percent, calf morbidity and mortality are within normal range

Replacement heifers are on a complete vaccination program

Feedlot performance, morbidity and mortality are normal

Laboratory tests have shown no evidence of BVD problems

Plan for low risk herds include:

Maintaining herd immunity through vaccination and nutrition

Replacement heifers receive 3 doses of modified-live vaccine prior to first breeding

Vaccination is effective for controlling risk when exposure is present – vaccination does not prevent birth of all persistently infected (PI) calves

Preventing effective contacts

Develop calving and breeding management plans to reduce exposure

Minimize fence contact with herds of unknown BVD status; establish cattle flow to minimize risk for exposure if fence-line contact is unavoidable

Prevent entry of BVD into the herd

Test all purchased additions to the herd prior to entry

Herd Monitoring

Herd testing and eradication plan is most likely not cost-effective

Monitoring is used to determine the BVD status of the herd and what economic effect the virus is having on the herd

Monitoring will allow us to evaluate our BVDV control program

Monitor individual and herd production performance and health

Monitor feedlot performance

Perform postmortem exams and test individual problem animals. This will allow us to determine if persistently infected (PI) animals are in the herd.

If monitoring detects PI animals or if herd production declines because of suspected BVDV, implement a high risk control and eradication plan

Conclusion

Beef cattle producers are going to stay in business by delivering a superior quality product to consumers

Table 3. BVDV control program - high risk herds.

Herd History

Decreased cowherd production performance

Increased calf morbidity, mortality, decreased weaning performance

Decreased conception rates and increased pregnancy loss

Postmortem exams and lab results have shown that persistently infected (PI) animals are present in the herd

Plan for high risk herds include:

Testing and removal of all persistently infected animals

(See Fig. 1 – Flow chart for beef herd BVDV testing and removal of PI animals)

Is the primary focus for effective BVD control

Testing should include all calves born, all replacement heifers, cows without calves, and bulls

Test the dams of positive calves

All positive animals should be removed from the herd prior to the next breeding season

Cowherd BVDV resistance needs to be improved through proper vaccination and nutrition

Replacement heifers – 3 doses of modified-live vaccine prior to first breeding

Purchased and home-raised females should receive a yearly booster of modified-live BVD vaccine after calving

Establish a balanced cowherd nutrition program to improve pregnant cow and nursing calf immunity

Prevent effective contacts to minimize the economic effect that BVD virus will have on the cowherd

Maintain low animal density-keep cattle spread out during calving and breeding

Decrease contact time – pair out quickly to large areas and clean ground at calving time

Minimize fence contact with herds of unknown BVD status – establish cattle flow to minimize risk for exposure if fence-line contact is unavoidable

Prevent BVDV introduction into the herd

Eliminate contact with other herds

All herd additions need to be tested and isolated prior to entry into the herd

Purchased pregnant females need to be maintained as a separate herd for the first calving and breeding season.

- They should receive a modified-live BVD vaccination after calving.
- Calves born to all purchased pregnant females need to be tested for PI status. The dams of positive calves need to be tested. All positive animals need to go to slaughter.

Purchased open replacement heifers need to be tested for PI status and vaccinated with two doses of modified-live BVD vaccine before breeding the first time

Purchased bulls need to be tested for PI status before entry into the herd

Utilize a monitoring program after testing and removing PI animals

Monitor herd health and production performance

Monitor feedlot health and performance

Test BVDV suspect animals – perform post-mortem examinations and do live animal testing on suspect cattle

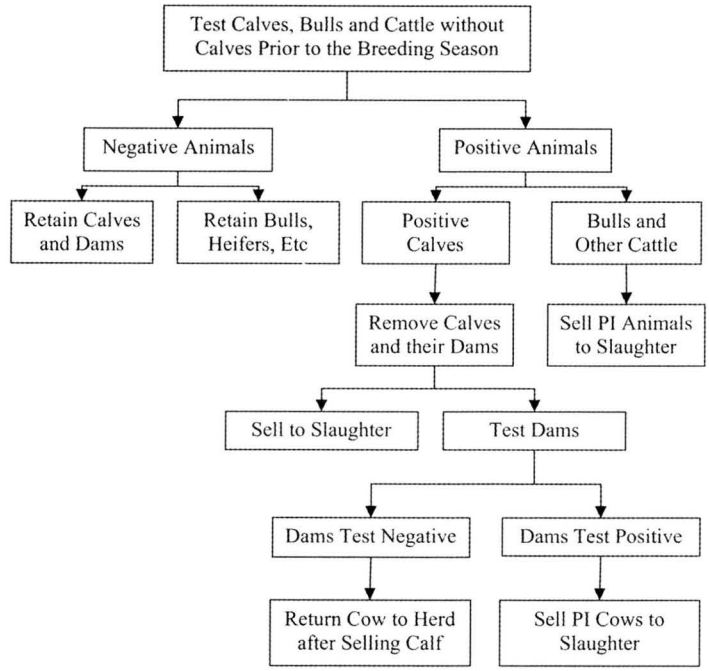

Figure 1. Flow chart for testing a beef herd prior to breeding to identify and remove BVDV PI carrier cattle. *Adapted from Kelling CL, Groteluschen DM, Smith DR, Broderson B.W: Testing and management strategies for effective beef and dairy herd BVDV biosecurity programs. *The Bovine Practitioner* 34 (1):13-22., 2000.

Table 4. BVDV control – special considerations for seedstock producers.

Are classified as low or high risk herds based on history, current biosecurity and monitoring program, and available laboratory information.

Develop appropriate low risk herd monitoring or high risk persistently infected (PI) elimination/control program as previously outlined

Goals for seedstock producers are to:

Maintain biosecurity in own herd

May want to eliminate BVDV from the herd and implement a monitoring program

Establish criteria for embryo transfer recipients – use only PI tested recipients

Test all herd additions for PI status, including offspring of purchased pregnant animals

If PI animal is confirmed, herd is classified as high risk and herd test approaches are recommended as in high risk plan

Maintain reputation by testing and selling healthy PI free animals to other producers

Criteria for bulls to A.I. studs

Sell only BVD tested semen

PI – free bulls to A.I. studs

in a cost-effective manner. Producers will need to improve production and financial practices and marketing skills if they are to survive the difficult times when profit margins are slim.

Veterinarians have the opportunity to utilize the veterinary decision making process to help producers determine how diseases, such as BVD, are affecting cowherd production and financial performance. Biosecurity principles can then be used to implement cost-effective disease (BVDV) management programs.

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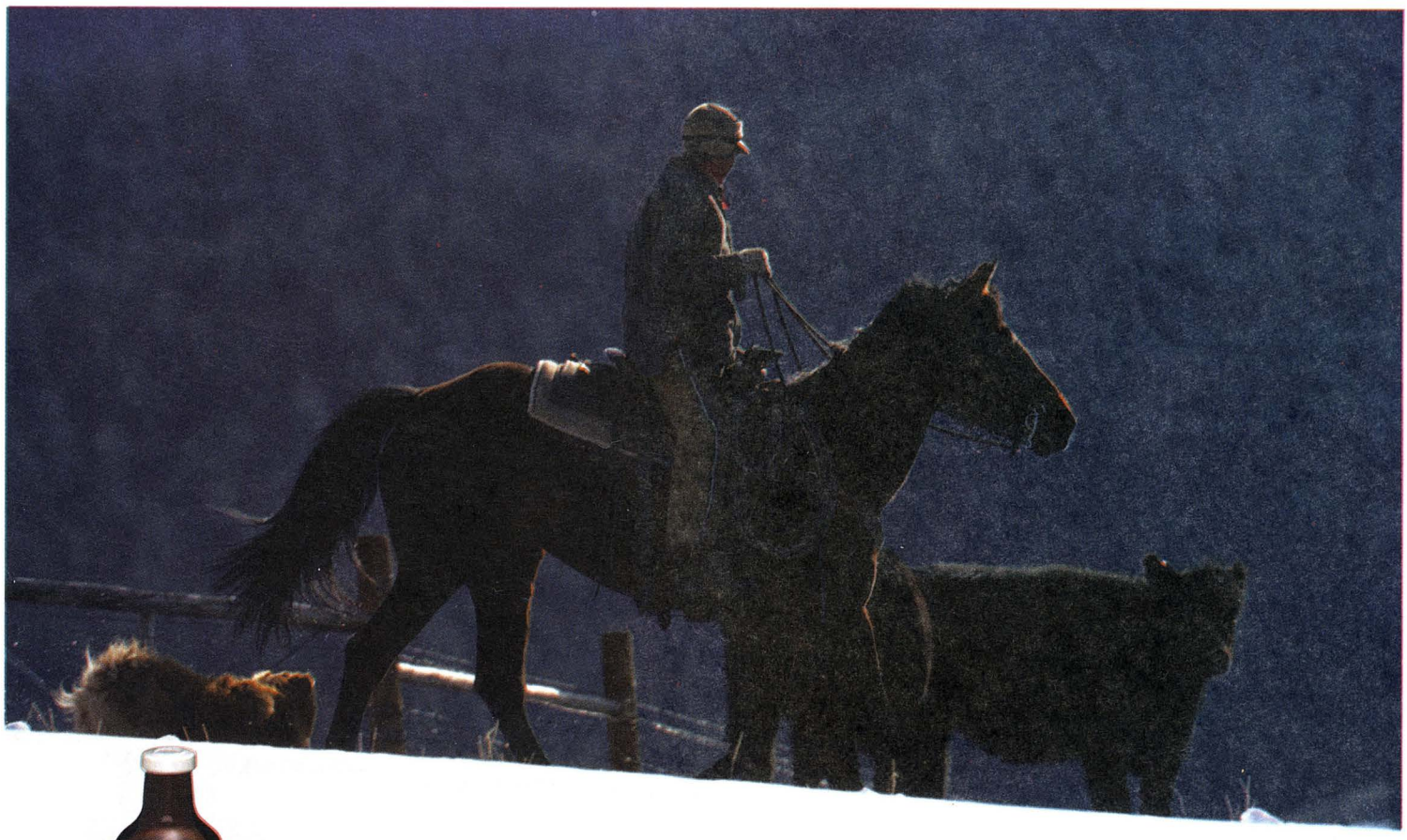

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