PEER REVIEWED

BVD Decision / Management Guidelines for Beef Veterinarians

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Abstract

Characteristics of bovine viral diarrhea virus (BVDV), such as genetic diversity and ability to induce a persistently infected (PI) carrier state, make its control a challenge. The Academy of Veterinary Consultants (AVC) drafted and approved a position statement in 2001 resolving to adopt measures to control and target eventual eradication of BVDV from North America.

As part of this effort, the AVC formed an ad hoc committee to develop a document to provide guidelines for BVDV control based on the best current information. The final document was approved by the AVC in 2003, and provides management guidelines for control of BVD in beef cow-calf herds, stocker operations and feedlots.

Résumé

Les caractéristiques particulières du virus de la diarrhée virale bovine (BVDV), telles que sa diversité génétique et l'induction d'un état d'infection permanente (PI), en font un virus difficile à contrôler. L'académie des consultants vétérinaires (AVC) a ébauché et approuvé une politique en 2001 pour l'adoption de mesures visant à contrôler et éventuellement à éradiquer le BVDV en Amérique du Nord.

Dans le cadre de cet effort, l'AVC a formé un comité dont le but était de produire un document contenant des lignes directrices pour le contrôle du BVDV sur la base de l'information le plus à jour. Le document final a été approuvé par l'AVC en 2003 et fournit des lignes directrices dans la gestion du BVD dans les troupeaux de bœuf et de vaches-veaux (bovins allaitants) et dans les parcs d'élevage et d'engraissement.

Introduction and Overview

In response to significant biologic and economic loss due to bovine viral diarrhea virus (BVDV), the Academy of Veterinary Consultants (AVC) drafted and approved a position statement in November, 2001. The position statement reads:

BVD Position Statement by the Academy of Veterinary Consultants

> "The beef and dairy industries suffer enormous loss due to effects of bovine viral diarrhea virus (BVDV) infection. The highly mutable nature of BVDV and the emergence of highly virulent strains of BVDV contribute to limited success of present control programs. Also, persistently infected cattle are

the primary source of infection and effective testing procedures are available to identify those infected carriers.

"Therefore, it is the resolve of the Academy of Veterinary Consultants that the beef and dairy industries adopt measures to control and target eventual eradication of BVDV from North America."

Following adoption of the Position Statement, the AVC formed an ad hoc committee to develop strategies to support the statement's goals. The ad hoc BVDV committee began to create a document to provide guidelines for BVDV control based on the best current information. The committee was made up of practitioners as well as academic and industry specialists from the United States and Canada. Numerous additional experts attended committee meetings and provided guidance on the guidelines document. The final document, approved by the board of directors of the Academy of Veterinary Consultants on July 31, 2003, was created with the input of USDA scientists, pathologists, virologists, immunologists, epidemiologists, theriogenologists, cow-calf practitioners and feedlot consultants.

BVD Decision / Management Guidelines for Beef Cattle Veterinarians

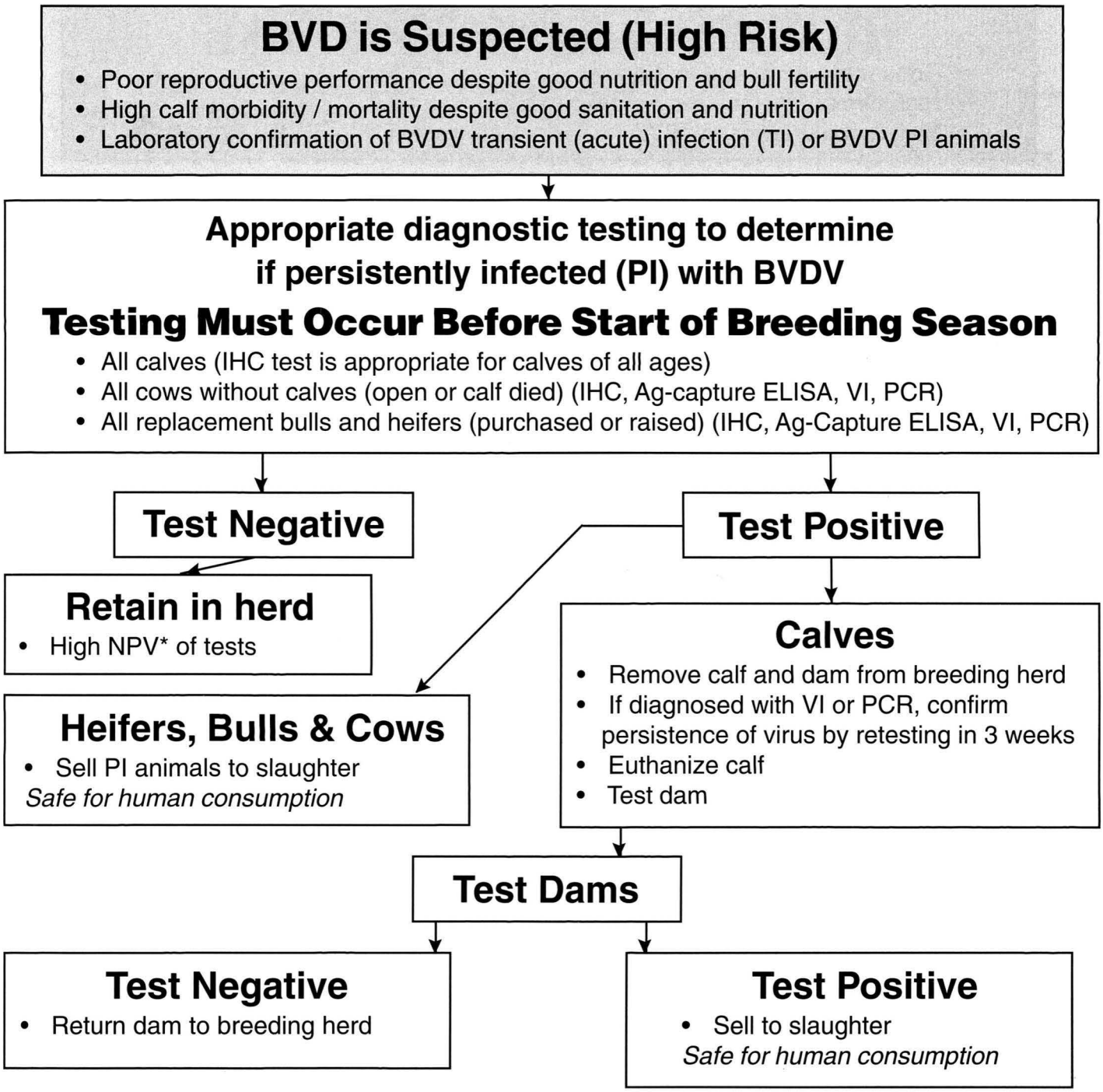
Academy of Veterinary Consultants

Adopted July 31, 2003

BVD Decision / Management Guidelines for Beef Cattle Veterinarians

- Bovine viral diarrhea virus (BVDV) can cause a variety of clinical and subclinical reproductive, enteric and respiratory syndromes, and immune dysfunction.
- BVDV is unique in that a fetus that is infected from its transiently or persistently viremic dam prior to formation of a competent immune system can become persistently infected (PI) with the virus.
- PI cattle will shed BVDV from body secretions throughout their lives.
- PI cattle are considered the primary reservoir for BVDV in both cow herd and feedlot situations.
- It is currently estimated that about 10% of beef cow herds have at least one PI animal, and about 0.25 to <1% of calves born are PI.
- Veterinarians should have a surveillance strategy to determine level of herd risk for the presence of PI animals (high vs. low risk).
- Herds that are considered high risk for having PI animals should utilize laboratory tests to do whole-herd screening to find all PI animals and then remove them.
- PI cattle should be removed from herds immediately and marketed directly to slaughter or euthanized. BVDV is not a human health risk, but PI cattle are a health risk to other cattle and are often in poor health themselves.

Cow-Calf Herd (BVDV-Suspect Herd)



- All cows still pregnant at time of testing must be removed from breeding herd because fetus is of unknown BVDV PI status
- Absence of confirmed PI calves does not guarantee absence of BVDV problem. If you are still suspicious, testing the next calf crop is recommended.
- Use IHC (immunohistochemistry), pooled PCR, ELISA of skin samples, or virus isolation (VI)
- Implement complete vaccination program prior to breeding in replacement animals and appropriate boosters in adults
- Prevent direct contact with cattle of unknown BVDV control status

*NPV = negative predictive value, i.e. likelihood that a test-negative animal is truly PI negative

Cow-Calf Herd (Healthy Herd)

BVD is Not Suspected (Low Risk)

- Good reproductive performance
- High percentage of cows exposed to a bull wean a calf
- No laboratory evidence BVDV transiently infected (TI) or BVDV PI animals

Surveillance Strategy I – Monitor production and health

- Low cost / low sensitivity strategy
- Slow diagnostic response to PI introduction (production must be negatively influenced before PI presence is detected)
- Monitor overall pregnancy proportion and percent pregnant in first 21 days
- Monitor stillbirths, neonatal morbidity, neonatal mortality, and weaning percent
- Necropsy and submit tissues (thymus, Peyer's patches, spleen, skin, blood) for laboratory analysis on high percentage of abortions, stillbirths and mortalities
- If unexplained suckling calf losses occur (pneumonia, scours, etc.) send appropriate samples to diagnostic labs to identify TI and PI calves
- Positive test results should be confirmed with other supporting evidence

Surveillance Strategy II – Serology (type I and II) of herd sub-set

- Low cost / low sensitivity strategy
- Serology of non-vaccinated, sentinel animals has been used to identify PI animals in dairies in published studies
- Differentiation of titers due to vaccination or field virus exposure (height of serologic titers) is difficult and subjective, and must include consultation with laboratory diagnosticians for interpretation assistance

Surveillance Strategy III – Pooled PCR of blood (entire calf crop)

- High cost / high sensitivity strategy
- Identifies PIs prior to breeding season if done before bull turn-out
- Delayed response to PI introduction if done after breeding season
- Pool samples of 20-30 with re-pooling and re-running of positive pools
- Positive PCR does not differentiate between TI and PI, therefore, must do other confirmatory testing (IHC)

Surveillance Strategy IV – IHC skin samples (entire calf crop)

- High cost / high sensitivity strategy
- Identifies PIs prior to breeding season if done before bull turn-out
- Must confirm positive tests if BVDV is not suspected because of poor PPV (positive predictive value) in herds with no prior evidence of PI presence

Cow-Calf Herd

Other Biosecurity Concerns

Purchased Open Females

- Heifers and cows must be PI test-negative (IHC, PCR, VI or other appropriate tests) prior to introduction to herd
- Quarantine for 30 days prior to introduction to herd

Purchased Bred Females

- Heifers and cows must be PI test-negative (IHC, PCR, or VI) and quarantined until after calving and calf is proven non-PI because PI status of fetus is unknown
- Introduce purchased pair to herd after calf is proven non-PI

Bulls

- Persistently and transiently infected bulls will shed BVD virus in semen as well as other body secretions
- Transmission of BVDV to the cow can occur following insemination with raw, extended or cryopreserved semen from viremic bulls
- Semen used for AI should be collected according to Certified Semen Service (CSS) guidelines
- BVDV-infected semen will not directly cause PI calves, but contact with BVDV-infected bulls by pregnant cows or heifers can cause fetal infection and PI calves
- Purchased bulls should be isolated for 30 days and PI test-negative prior to contact with cow herd

Fomites

- Virus can survive in fecal matter and other body secretions in the environment for hours to days depending on temperature, humidity, and exposure to sunlight
- BVDV has been experimentally transmitted from PI animals to susceptible animals via nose tongs, injection needles, and palpation sleeves

Embryo Transfer

- Donor and recipients should be PI test-negative
- Recipients should be quarantined for 30 days prior to transfer
- All laboratory fluids of bovine origin must be free of BVDV

Wildlife ? (significance of risk is unknown)

- BVDV has been isolated from or serologically identified to infect buffalo, pigs, sheep, deer, and elk.
- Deer and elk – experimentally infected deer and elk shed virus for several days
- Unknown if PI state can be induced in deer or elk (or other species)

Stocker and Feedlot Operations

Screening Incoming Cattle for BVDV PI animals

- Low prevalence of PI animals (<0.5%) makes single-test strategies (vs. test/confirm test-positive strategy) expensive for each true positive identified
- Low prevalence causes even a test with high specificity to have more false positives than true positives (test/confirm positive strategy has high PPV)
- More information about high-prevalence populations such as age, weight, and geographic origin may provide guidance for screening only higher prevalence populations
- Commingling and transportation of PI cattle prior to arrival at stocker or feedlot operation begins virus transmission and negative effects of BVDV infection prior to screening at arrival

Purchasing PI-Free Certified Cattle

- All cattle in group being test negative to IHC of skin samples or pooled PCR
- Economic benefit is determined by multiplying the cost of having a PI calf present (increased pen morbidity, mortality, treatment failure, and performance) by the expected prevalence for similar cattle
- *i.e. $2000 cost x 0.5% = $10 / head value over groups of unknown status*

Purchasing PI-Low Risk Cattle

- All cattle in group originating from farm(s) with complete vaccination program and BVD PI surveillance protocol

Purchasing Cattle of Unknown PI Risk

- Cost of unknown status is determined by multiplying the cost of having a PI calf present by the expected prevalence for similar cattle
- Cost of unknown PI risk is added to other costs for break-even calculation

Communication / Feedback for Cattle of Known Origin

- When cattle of known origin are identified as PI at a feedlot or stocker operation, the consulting veterinarian should notify the feedlot manager, herd owner, and herd veterinarian and should forward this document

BVD Misconceptions

• PI calves will be killed by MLV vaccination

Fact – Controlled experiments have not been able to induce morbidity or mortality in PI calves following MLV vaccination. However, case reports indicate that MLV vaccination can cause a PI animal to become moribund or to die - though far less than 100% are negatively affected.

• PI calves are thin, have rough haircoats and are poor-doers

Fact – While many PI animals are unthrifty, reports have indicated up to 50% will appear normal and may enter the breeding herd or feedlot pen in excellent condition. PI calves cannot be identified visually.

• Calves are PI because their dam is PI

Fact – Recent research showed that only 7% of PI calves' dams were PI, and the other 93% of calves had dams with a normal immune response to BVDV and were not persistently infected.

• The greatest cost associated with a PI calf is the death of that calf

Fact – The reproductive loss associated with lower pregnancy proportions, more abortions, and higher calf mortality are the greatest economic costs of exposure to PI animals. In addition, increased morbidity, treatment costs, treatment failure, and reduced gain in feedlot or stocker penmates greatly exceed the cost of PI death in feeder cattle.

• BVDV problems will always be obvious

Fact – If BVDV was introduced into the herd via a PI animal several years previously, after an initial period of noticeable losses, the herd could currently experience only low reproductive loss and BVDV-associated morbidity. This low loss however, may compromise economic sustainability.

• BVDV won't affect my herd because I vaccinate

Fact – The tremendous amount of virus secreted by a PI calf can overwhelm a level of immunity that is protective under less severe exposure. There are documented cases of herds with vaccination protocols in place for several years that have endemic BVDV because of the presence of PI animals. In addition, BVDV has tremendous antigenic diversity and vaccine efficacy is likely variable among wild viruses.

Vaccination alone will not solve BVDV problems

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