

EXTENSION

**UtahState**  
UNIVERSITY

Logan, UT 84322-4900

Utah State University, Utah Counties and the U.S. Department of Agriculture Cooperating

September 2006

# Beef



## **CHALLENGE WITH BOVINE VIRAL DIARRHEA VIRUS BY EXPOSURE TO PERSISTENTLY INFECTED CALVES: PROTECTION BY VACCINATION AND NEGATIVE RESULTS OF ANTIGEN TESTING IN NONVACCINATED ACUTELY INFECTED CALVES**

Calves persistently infected (PI) with Bovine viral diarrhea virus (BVDV) represent an important source of infection for susceptible cattle. We evaluated vaccine efficacy using calves PI with noncytopathic BVDV2a for the challenge and compared tests to detect BVDV in acutely or transiently infected calves versus PI calves. Vaccination with 2 doses of modified live virus vaccine containing BVDV1a and BVDV2a protected the calves exposed to the PI calves: neither viremia nor nasal shedding occurred.

An immunohistochemistry test on formalin-fixed ear notches and an antigen-capture enzyme-linked immunosorbent assay on fresh notches in phosphate-buffered saline did not detect BVDV antigen in any of the acutely or transiently infected calves, whereas both tests had positive results in all the PI calves.

The results of this study reaffirm the requirement to properly identify isolated viruses by subtyping or gene sequencing to determine if the isolates are identical to the challenge strains. In this study 3 isolates (2 BVDV1a, 1 BVDV1b) were different from the BVDV2a challenge strain. It is especially important to distinguish isolates when the calves are from the regular marketing system (auction markets), where exposure to BVDV is likely.

In summary, although the current study did not detect acute BVDV infection by IHC and ACE testing of ear notches after exposure to PI calves, there will likely be some caution about using only 1 test to differentiate acutely infected and PI calves. **A**

**negative IHC or ACE ear-notch result appears to offer a substantial basis for eliminating a calf as PI, but a positive result poses a dilemma, as a confirmatory test may be in order for such situations as breeding and purchases.** For some facets of the cattle industry, such as purchased stockers and feedlot entry, 1 test is economical in terms of labor, time, and finances. However, such calves should perhaps be segregated until a confirmatory test is performed.

Can J Vet Res

April 2006 Vol. 70, No. 2, pp. 105-114

## **BOVINE RESPIRATORY DISEASE IN FEEDLOT CATTLE: ENVIRONMENTAL, GENETIC, AND ECONOMIC FACTORS**

The objective of this study was to characterize genetic, environmental, and economic factors related to the incidence of bovine respiratory disease (BRD) in feedlot calves. Records from 18,112 calves representing 9 breeds (Angus, Braunvieh, Charolais, Gelbvieh, Hereford, Limousin, Pinzgauer, Red Poll, and Simmental) and 3 composite types (MARC I, MARC II, and MARC III) over a 15-yr period (1987 to 2001) were evaluated. Disease incidence was observed and recorded by station veterinary and technical staff.

The incidence of BRD varied across years, with the annual observed incidence ranging from 5 to 44%. From 1987 to 1992, the annual average incidence generally exceeded 20%. However, in later years the annual incidence did not exceed 14%. The epidemiological pattern indicated that BRD infection increased dramatically after 5 d on feed and remained high until approximately 80 d on feed. Previous BRD infection during the preweaning period did not influence subsequent BRD infection in the feedlot. Steers were more likely to become sick with BRD than heifers;

castration before entry in the feedlot may be a predisposing cause.

Few significant differences among breeds were detected for BRD incidence. Adjusted solutions from mixed model analyses indicated that Herefords were generally more susceptible to BRD infection ( $P < 0.05$ ) than MARC I and III composite types. Composite breed types had similar susceptibility compared with other purebred breeds. Mortality associated with BRD was greatest in Red Poll calves (9%) compared with the average over all breeds (4%). Estimates of heritability for resistance to BRD ranged from 0.04 to  $0.08 \pm 0.01$ . **When the observed heritability was transformed to an underlying continuous scale, the estimate increased to 0.18. Selection for resistance to BRD could be effective if phenotypes for BRD resistance were known.** Thus, development of an inexpensive and humane method of challenging animals with BRD to determine resistance would be an important step in reducing the incidence of BRD.

This study also demonstrated that producer-collected field data could be used for selection against this disease. The economic loss associated with lower gains and treatment costs for BRD infection in a 1,000-cattle feedlot was estimated as \$13.90 per animal, not including labor and associated handling costs.

This study contributes to knowledge of environmental and genetic factors influencing bovine respiratory disease. The population characteristics and epidemiological pattern found in this study should be useful for prevention and management of respiratory disease. Beef cattle producers also are provided with evidence that **relatively small differences for resistance to bovine respiratory disease exist between breed types.** There is no strong evidence that composite breeds are less susceptible to bovine respiratory disease. Although the estimate of observed heritability for incidence of respiratory disease was low, the estimate of heritability for the underlying scale was moderate, which **suggests that selection for disease resistance could be effective.** Future research is needed to determine how best to identify resistant animals.

J Anim Sci, August 2006, Vol. 84, pp. 1999-2008

#### EVALUATION OF THE RETENTION OF ELECTRONIC IDENTIFICATION BOLUSES IN THE FORESTOMACHS OF CATTLE

A total of 1,203 beef calves were used to evaluate 2 series of electronic identification boluses. Calves were intensively fattened and slaughtered at approximately 1 yr of age. Series 1 ( $n = 576$  calves) consisted of 10 types of boluses with the same external dimensions (o.d. x length: 21 x 68 mm) but varying in weight (11 to 75 g) and specific gravity (0.63 to 3.36). Six boluses were made of ceramic (5 prototypes and 1 commercial bolus) and 4 were tubes made of plastic filled with concrete.

Series 2 ( $n = 627$  calves) consisted of 3 prototypes and 5 commercial boluses of different ceramic materials varying in external dimensions (o.d.: 15 to 21 mm; length: 39 to 78 mm), weight (20 to 73 g), and specific gravity (3.00 to 3.87). Boluses were administered to milk-fed calves (2 to 5 wk of age) by using adapted balling guns.

To determine the anatomical limit for a bolus passing through the gastrointestinal tract, the size of the reticulomasal orifice was measured in 90 male and 62 female fattened calves at slaughter. Three calves in series 1 (0.3%) could not swallow the 21-mm (o.d.) bolus at the first attempt and received the bolus 1 wk later. No problems for early administration were found with thinner boluses (o.d.  $< 20$  mm) in series 2, and no signs of disease or growth alteration were detected in any bolused calves.

Retention rate until slaughter varied according to bolus features and ranged from 0 to 100% (series 1), and from 69.7 to 100% (series 2). Inadequately dimensioned boluses were regurgitated or passed through the gastrointestinal tract and were excreted with the feces. The diameter of the reticulomasal orifice differed between male and female yearling calves (32.5 and 29.9 mm, respectively;  $P < 0.01$ ) and was greater than the o.d. of the retained boluses.

Retention rate was predicted from bolus weight and volume by a logistic regression ( $R^2 = 0.99$ ,  $P < 0.001$ ), in which the minimum bolus weight estimated to reach a 99.5% retention rate was 61 g when volume and specific gravity were 22.4 mL and 2.72, respectively.

To achieve an effective retention rate of electronic identification boluses in the forestomachs of fattening calves, bolus volume and specific gravity, in addition to weight, should be optimized. No boluses of specific gravity lower than 3.0 and thicker than 20 mm o.d. are recommended for identification of cattle from early rearing ( $< 20$  d of age) to slaughtering.

In conclusion, **bolus weight and volume are key dimensions for the electronic identification of cattle to achieve their maximum retention rate in the reticulorumen** and to avoid losses by regurgitation or by passage through the reticulomasal orifice. **With the recommended bolus design, it should be possible to obtain the permanent identification of cattle from early rearing (< 20 d of age) to slaughtering.**

J Anim Sci, August 2006, Vol. 84, pp. 2260-2268

### **USING IONOPHORES IN REPLACEMENT HEIFER DIETS**

In an effort to insure a higher percentage of replacement heifers are bred to calve early in their first calving season, ranchers should consider using a supplement containing an "ionophore" in the growing diet of the heifers. "Ionophore" is the generalized name for the feed additives such as monensin (Rumensin<sup>TM</sup>) and lasalocid (Bovatec<sup>TM</sup>). Both are presently approved for use with growing programs for replacement heifers.

Research conducted in Texas and Wyoming indicated that **growing heifers fed an ionophore at label dosage reached puberty at an earlier age than did similar heifers fed similar diets containing no ionophore.** Most stocker cattle research has indicated that the addition of an ionophore will increase average daily gain by .1 to .2 pound per day. Over a 150 day growing period of a replacement heifer, this means an additional 15-30 pounds in average weight improvement of the heifers by breeding time.

<http://www.cattlenetwork.com/content.asp?contentid=68943>

### **EFFECTS OF MODIFIED-LIVE BOVINE VIRAL DIARRHEA VIRUS VACCINES CONTAINING EITHER TYPE 1 OR TYPES 1 AND 2 BVDV ON HEIFERS AND THEIR OFFSPRING AFTER CHALLENGE WITH NONCYTOPATHIC TYPE 2 BVDV DURING GESTATION.**

**OBJECTIVE:** To compare the efficacy of modified-live virus (MLV) vaccines containing either type 1 bovine viral diarrhea virus (BVDV) or types 1 and 2 BVDV in protecting heifers and their offspring against infection associated with heterologous noncytopathic type 2 BVDV challenge during gestation.

After inoculation with a placebo vaccine, 1 or 2 doses of an MLV vaccine containing type 1 BVDV, or 1 dose of an MLV vaccine containing both types 1 and 2 BVDV, heifers were bred naturally and challenge exposed with a type 2 BVDV field isolate between 62 and 104 days of gestation. Pregnancies were monitored; after parturition, virus isolation and immunohistochemical analyses of ear-notch specimens were used to determine whether calves were persistently infected. Blood samples were collected at intervals from heifers for serologic evaluation and virus isolation.

Persistent infection was detected in 18 of 19 calves from heifers in the control group and in 6 of 18 calves and 7 of 19 calves from heifers that received 1 or 2 doses of the type 1 BVDV vaccine, respectively. **None of the 18 calves from heifers that received the type 1-type 2 BVDV vaccine were persistently infected.**

Results suggest that the incidence of **persistent BVDV infection among offspring from dams inoculated with 1 dose of the MLV vaccine containing types 1 and 2 BVDV was decreased,** compared with 1 or 2 doses of the MLV vaccine containing only type 1 BVDV.

Pfizer Animal Health  
601 W Cornhusker Hwy, Lincoln, NE 68521, USA.

M.D. Ficken, M.A. Ellsworth, C.M. Tucker,  
V.S. Cortese.

J Am Vet Med Assoc. 2006 Jun 15;228(12):1904.

### **SEVEN GENERAL RULES FOR TREATMENT IN THE FEEDYARD**

In the feedyard, questions arise daily concerning medication programs for respiratory disease. It's the single biggest disease problem.

When faced with a history of no response to medication, we spend very little time on the actual medications. The more important consideration is determining management procedures aimed at prevention and treatment of diseased cattle.

Some rules of treatment follow that we as consulting veterinarians look for when evaluating a feedyard health program. They also are good guidelines when training new personnel to pull and treat sick cattle, or to use on your own ranch or farm.

#### **1. Pull Sick Animals Early**

The first and foremost rule of treatment is to pull sick animals early, pull appropriately and treat aggressively.

If sick animals are not pulled from the pen before respiratory disease becomes an advanced problem, medication response will generally be very poor.

Good pen riders are able to spot animals just as they are breaking with pneumonia. This corresponds to the latter stages of the incubation period of disease and is before the animal actually shows clinical signs. It takes a certain eye to be a good pen rider; some cowboys seem to have it instinctively, others develop it over the years.

## **2. Pull Animals Properly**

Animals must be pulled for sickness appropriately. If sick animals are not pulled properly, they will not get the hospital care they need, hospital pens will become needlessly overcrowded, and the doctor crew will become overworked.

Heavy pulls do not always coincide with proper pulls. Sometimes, heavy pulls from a pen occur, leaving some sick animals and pulling some with no obvious signs of illness. **If heavy pulls occur in a pen (greater than 25 percent), then steps should be taken toward mass medication.**

## **3. Treat Aggressively**

What does treating aggressively mean? It means that when an animal is pulled initially for respiratory disease, it is treated with strong therapeutic agents (antibiotics) that will stop pneumonia at its earliest stages and not allow further progression of the disease. This will effectively decrease total treatment days, decrease the number of re-treatments and, of course, prevent high death losses.

With good therapeutic agents and supportive care, sick animals will not have to be rested between treatments, if additional treatment is deemed necessary. Antibiotics are stressful on the animal's system, so supportive measures are used to stabilize the adverse changes that occur following treatment, as well as treat the disease.

## **4. Supportive Care**

Supportive care includes such drugs as (1) B-complex vitamins to stimulate the appetite and replenish body loss, (2) antihistamines to open swollen, narrowed airways, and (3) electrolytes to replace body water loss, as well as body electrolyte loss.

The primary objective of supportive care is to counteract the serious side effects of disease and subsequent changes referable to antibiotic usage. Supportive care also includes nutritional support in the form of fresh hay and high-energy rations, plus hospital management aimed at prevention of overcrowding and further stress.

All drugs used in beef cattle, including antibiotics and supportive medications, have a specific purpose and use. Your consulting veterinarian is the best source of information on proper use of these drugs. The feedyard health crew must be well versed on the proper use of drugs because a drug used improperly is sometimes worse than no medication at all.

## **5. Visual Inspection**

Visual inspection of sick animals in the hospital is absolutely necessary. Occasionally feedyard personnel will look at the thermometer and forget to look at the animal.

To prevent this oversight, all animals should be given a severity code, such as severely sick, moderately sick or mildly sick. This simple system encourages the health crew to assign a uniform code to the sickness of all animals.

This coding system allows sequential assessment of sick pulls and progress through the hospital treatment program. Secondary benefits of this system allow various persons to treat the animal on subsequent days and assess response to treatment. Also, it allows assessment of sick animal pulling.

## **6. Three-Day Treatment**

If you are using an antibiotic that requires daily administration, treatment of sick animals should be continued for at least three successive days. This can be accomplished with one injection or administration with products that maintain a longer therapeutic blood level for 3-5 days or with three successive days of treatment with products that maintain only a 24-hour therapeutic blood level. In the end, this (3 day products) will decrease the treatments and the pen deaths following treatment.

Research and experience have shown with products that only have the 24-hour therapeutic blood level, only one or two days of treatment have detrimental side effects. However, with products that have been designed for a 3-5 day moratorium and with the early, appropriate pulls a single injection has been beneficial.

Alternate routes of administration or increased dosages can be used on the second day of treatment when added response is needed on this treatment day. If treatment response is inadequate after two days of therapy, then alternate treatments or increased dosages should be considered.

You never want to give up on the treatment of an animal, but you should realize the limitations of antibiotic therapy and strike a happy median between cost-benefit and continued treatment. It is very discouraging to treat an animal day after day, only to have it die after an extended treatment period.

As a general rule, treatment should not exceed three to eight days, based on products that provide a three-day treatment regime. Continued treatment often will result in a chronically sick animal or a dead animal.

### 7. Accurate Records

The last rule of treatment is keep clear, concise and accurate records. The feedyard runs on paperwork. Because of the large numbers of cattle that any feedyard handles and the many sick animals that are treated, records are absolutely essential. These records will not only provide bookkeeping services, but will allow you to assess treatment response. Records must be (a) easy to fill out, (b) supply the appropriate information, and (c) be easily compiled for further evaluation.

Records are available from state Quality Assurance coordinators.

These rules are formulated from sound medical practice and experience. Some of them vary depending on your particular antibiotic or medication program. But they will, in most cases, result in a successful medication program.

D.T. Bechtol, DVM

National Cattlemen, Summer 2006, pp50-51

## WHAT IS A VACCINE SWEAT?

For some people, making vaccine decisions depends on the number of antigens put together at one time. Breck Hunsaker, DVM, PhD, has done several safety studies where feedlot cattle were vaccinated so they could look for lumps and bumps and systemic reactions. “We’ve found surprisingly few,” says Hunsaker. “I think, in general, manufacturers are cleaning up those vaccines. They know that’s a criterion for testing and approval through USDA. That becomes less of an issue as vaccines are distinguished and selected.”

What is an issue, Hunsaker says, is this phenomenon called a vaccine sweat. “We see these animals back off feed,” he explains. “We see them go through this post-vaccination syndrome where they seem to drop in feed intake and so on. Among practitioners and feedyard managers, there’s a perception that some vaccines sweat cattle more than others. But if you go across the road, it’s a different vaccine that causes the sweat than it is on your side. I’m pretty sure it’s driven by perception and we don’t have data that clarifies this syndrome. I’d like to see some post-vaccination-effect work done comparing some of these vaccines because I think that would be a distinguishing feature in the decision as to which vaccine to use based on the perception of sweat.”

### Why the sweat occurs

Vaccines have to induce pro-inflammatory cytokines in order to induce an immune response. The pro-inflammatory cytokines decrease appetite if there’s a high enough concentration. They have to be produced at the site of injection and the local lymph node, or the vaccine doesn’t work. But if you get enough of those cytokines produced that they start circulating in the blood and go to the brain, they reduce appetite and cause fever, depression and lethargy.

“When you have a fever, you feel lethargic and you’re not hungry; that’s due to pro-inflammatory cytokines,” says Jim Roth, DVM, PhD. “The vaccines induce low levels of those. If you’re using just one vaccine and it’s been safety tested, it should be pretty minor. **But if you use four or five vaccines, every one of them induces some of these cytokines.**”

Endotoxin induces the exact same cytokines, so if you have endotoxin in your vaccine, you’re going to get more. And if the cattle already have a low-grade infection and they have some cytokines being produced, if you vaccinate and you get more cytokines, you start seeing the sweat. “So you have to consider what’s happening to those animals to begin with, and what you’ve added and how much you’ve added,” notes Roth.

Hunsaker agrees and believes it’s a threshold situation. “That has always been my suspicion because I have not been successful in reproducing the clinical sweat in a research setting. We bring these animals in and we acclimate them for 14 days, then we vaccinate them with vaccine A. Clinically, looking across the fence, we don’t see what we would call a sweat until we add all the risk

# UtahState UNIVERSITY

5600 Old Main Hill  
Logan UT 84322-5600

factors for a sweat that Dr. Roth mentioned. You can see it in a few animals, or typically the pen looks like they've all been beaten up."

### **Vaccine handling contributes**

As noted previously, a variety of factors are at play. Vaccine handling is one of them. Gram-negative bacterins have whole dead bacteria in them, and dead bacteria are coated with endotoxin. As long as the endotoxin stays in the bacterial membrane, it's not toxic. **It's the free endotoxin that is capable of causing the sweat.**

"When the manufacturer releases the vaccine, it's going to have low free endotoxin," says Roth. "But over the one-year shelf life of that vaccine, **as those bacteria start breaking down,**

**they release endotoxin.** So the amount of free endotoxin when it's manufactured could be much lower than a year later, especially if it got frozen and thawed or shaken up or sat in the hot sun. **The free endotoxin is a dynamic. It can increase over time and can change with the life history of that bottle of vaccine.**"

"The industry needs to define this perception of sweat because a lot of decisions are based on the assumption that X vaccine causes a sweat and Y doesn't, yet across the street the perception is just the opposite," says Hunsaker. "We get in fist fights over this issue."

Bovine Veterinarian, September 2006, pp 22-23



Clell Bagley, DVM  
Extension Veterinarian