Infectious Diseases of Cattle
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INFECTIOUS DISEASES OF CATTLE

■ Infectious Bovine Rhinotracheitis (IBR)
■ Bovine Virus Diarrhea (BVD)

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A nasal discharge such as exhibited by this heifer is often seen with the respiratory form of IBR ("Rednose").

Infectious Bovine Rhinotracheitis

Infectious bovine rhinotracheitis (IBR) is a virus disease of cattle which causes several different clinical conditions. The disease is widespread in the United States and causes serious economic loss to the livestock industry.

CAUSE

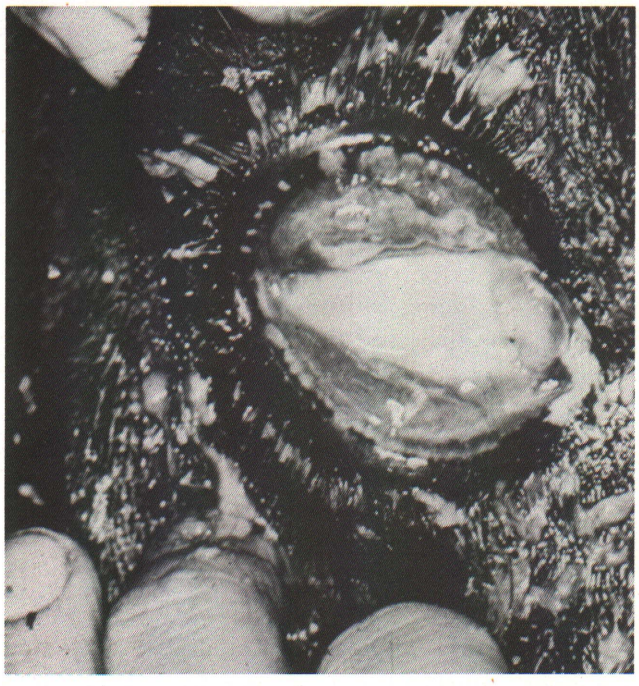
The infectious bovine rhinotracheitis virus is readily transferred by contact and contamination. It is most often introduced to a herd by the addition of infected animals. It can be spread by obviously sick cattle or by cattle shedding virus in the absence of clinical signs. Intermittent recurrence of virus shedding occasionally occurs long after apparent recovery, indicating that healthy appearing cattle can be carriers.

FORMS OF THE DISEASE

Six clinical syndromes, in addition to the inapparent form of the disease, are known to be associated with IBR virus infection.

"Rednose": The respiratory form of IBR. This upper respiratory infection is characterized by fever, profuse nasal discharge, distressed breathing, decreased appetite and depression. Outbreaks vary from mild to severe.

The eye discharge seen in this photograph was caused by the conjunctivitis form of IBR (the conjunctiva are the pink tissues which surround the eyes).



Note the severe inflammation and swelling of the mucous membranes which surround the eye in this case of the eye form of IBR (conjunctivitis). ["-itis" on the end of a word means inflammation of that tissue.]

Conjunctivitis: The eye form of IBR. This form of the disease is characterized by inflamed mucous membranes of the eyes, tearing, and pus in the corners of the eyes. White discoloration of the cornea occurs in some cases. Conjunctivitis may be the only manifestation of the disease, or it may be seen with the respiratory form.

Infectious pustular vulvovaginitis (IPV). The pustules and inflammation of the vulva and vagina cause a swollen vulva, vaginal discharge, tail switching and depressed appetite. Lesions similar to those in the vagina occur on the penis and prepuce of infected bulls. This form of IBR may be transmitted by natural breeding.

Encephalitis. Not a common form of the disease, inflammation of the brain is seen in calves up to the age of yearlings and causes depression, circling, progressive incoordination, coma and death.

Neonatal septicemia: Systemic infection of the newborn. Calves less than one month of age may develop a fatal, generalized disease characterized by fever, nasal discharge and lesions of the upper gastrointestinal tract.

Abortion. Abortion may be produced by either natural infection or by vaccination with some vaccines. Abortions typically occur three to six weeks following vaccination or the clinical signs of the disease, but may occur during an outbreak or up to 90 days following an outbreak.

DIAGNOSIS

The clinical signs and post mortem lesions of IBR are often sufficient for a tentative diagnosis. The laboratory may be able to confirm the diagnosis from the following specimens:

- Nasal, ocular or vaginal swabs for virus isolation attempts.
- Paired serum samples. One blood sample is collected early in the course of the disease and a second one is collected three weeks later.
- Aborted fetus and placenta.
- Frozen tissues from post mortem examination for fluorescent antibody studies.

TREATMENT

Antibiotic therapy to prevent or treat secondary bacterial infection (virus infections are not susceptible to antibiotics) and supportive treatment may be helpful.

PREVENTION

Three types of vaccine are available for the prevention of IBR. Each vaccine has distinct advantages and disadvantages, and there are situations in which only one of the three might be feasible. The advice of your veterinarian is invaluable in establishing a vaccination program. He is familiar with your herd history, the local problem and the vaccines currently available.

Modified Live Virus (MLV)—an intramuscular vaccine. *Pregnant cattle should not be vaccinated because this vaccine can cause abortion.* If adult vaccination is necessary, it should be accomplished following calving and not later than three weeks prior to breeding.

Beef calves may be vaccinated between two weeks of age and three weeks prior to weaning. They may be vaccinated upon arrival in the feedlot or after they have become acclimated to the feedlot for two or more weeks. Individual veterinary advice and supervision is recommended.

All calves vaccinated prior to 6 months of age should be given a second vaccination in the feedlot. The reason early vaccination may not produce satisfactory immunity and a second vaccination is necessary is that colostrum from immune dams produces a passive immunity in the calf which may last until 4 to 6 months of age.

Replacement heifers should be vaccinated or given a second vaccination between six and twelve months of age *and not later than three weeks prior to breeding.* A single vaccination at 6 months of age or older probably confers immunity for the lifetime of most cattle.

Do *not* vaccinate in the face of severe stress. Vaccination and handling are an additional stress. Circulating antibodies are not present in the blood until 9 days following vaccination; it takes at least this long for immunity to develop.

Many veterinarians prefer to maintain vaccinated animals separate from pregnant cattle for three weeks following vaccination.

Intranasal IBR vaccine—a modified live virus vaccine which is sprayed into the nose. A local response to the vaccine in the nasal passages results in early immunity. Calves may be vaccinated as early as 2 days of age. This vaccine has been approved for use in pregnant cattle. The duration of immunity is not known; annual revaccination is recommended.

Inactivated IBR vaccine—a "killed" vaccine. This vaccine eliminates the possibility of abortion, vaccine-caused illness and shedding vaccine virus. Two injections are required and the duration of immunity is unknown so annual revaccination is necessary. In a very small percentage of vaccinated cattle, severe, sometimes fatal allergic reactions have occurred.

Bovine Virus Diarrhea

Bovine virus diarrhea (BVD) is an acute or chronic virus disease of cattle characterized by fever, diarrhea and erosions of the mucous membranes of the digestive tract. This disease is seen throughout the United States, and the likelihood of exposure is high; however, most exposed cattle have a mild or unobserved infection (rarely recognized as BVD) which results in immunity. If first exposure occurs during pregnancy, abortion or fetal damage can result.

CAUSE

Bovine virus diarrhea is caused by a hardy virus readily transferred on contaminated boots, feed sacks and equipment. The BVD virus spreads rapidly, and all animals in a herd may be exposed by the time the disease is first recognized.

FORMS OF THE DISEASE

Cattle infected with BVD virus may respond with a variety of clinical signs and lesions. An inapparent or mild infection is common.

Bovine virus diarrhea usually occurs as a sudden outbreak infecting most of the herd. However, only a small percent of the herd may have clinical signs such as:

- Fever, depression and decreased appetite.
- Nasal discharge, ocular discharge, rapid respiration and cough.
- Excessive salivation.
- Diarrhea.
- Erosions of the lips, mouth and gastrointestinal tract.

Less common clinical signs include:

- Lameness
  - Cracking between the toes (interdigital lesions)
  - Swelling and erosions at the top of the hoof (coronary band)
  - Chronic founder following recovery
- A corneal opacity (as in pinkeye) occurring several days after the onset of illness.
- A rough, dry scruffy skin (hyperkeratosis).
- Erosions or scabs on the vulva.

Bovine virus diarrhea is frequently diagnosed as a respiratory disease, with clinical signs of fever, rapid respiration, cough, nasal discharge and crusted nose. There may be no oral lesions and diarrhea may be minimal or absent.

A sporadic fatal form of mucosal disease is believed to be the result of the inability of the infected animal to produce antibodies (immunity) to the BVD virus. This form of the disease may also rarely occur following vaccination. The fatal form of mucosal disease may progress slowly, taking weeks to months in its course through a herd. Only a few animals are sick at any one time. Early signs include a mucous ocular and nasal discharge, depression and loss of appetite followed by severe erosions of the muzzle and mouth, a watery diarrhea and dehydration. Death usually occurs within ten days, but chronic cases may linger several months.

The BVD virus has a severe effect upon the fetus even though the infection may be so mild as to go unnoticed in the pregnant cow. Abortions may occur three to six weeks or longer following infection or vaccination. Newborn calves may show weakness, incoordination, lesions of the mouth, eye defects, diarrhea, stunted growth and high mortality. Defective development of the cerebellum of the brain and cataracts of the lens of the eye are often seen in calves born from dams infected at mid-gestation.

DIAGNOSIS

The clinical signs and lesions often suggest bovine virus diarrhea, but post mortem examination and laboratory tests may be necessary to establish a definite diagnosis. The following specimens are used in laboratory diagnosis:

- Blood samples taken at the time of the acute disease and again three weeks later (paired serum samples).
- The aborted fetus and placenta.
- Ocular (eye), nasal (nose) and rectal swabs, and citrated blood for virus isolation.
- Frozen tissue sections examined utilizing a flourescent antibody technique.

Bovine virus diarrhea must be differentiated from conditions which cause mucosal erosions or necrosis (rinderpest, the vesicular diseases, malignant catarrhal fever, bovine bluetongue, bovine papular stomatitis), conditions which cause diarrhea (rinderpest, winter dysentery, salmonellosis, coccidiosis, and some toxicoses) and conditions which cause nasal discharge and rapid breathing (rinderpest, vesicular diseases, malignant catarrhal fever, bovine bluetongue, and IBR).

This calf was unable to stand or walk normally. It was born with a condition called cerebellar hypoplasia (defective development of a part of the brain) as a result of its mother being infected with BVD during the middle of pregnancy.

This calf was blind at birth. Note the cataract (opacity of the lens of the eye) caused by BVD infection of the dam during mid-gestation.

TREATMENT

There is no specific treatment for BVD; however, antibiotics, sulfonamides, astringents and supportive therapy may be indicated.

PREVENTION

Prevention of BVD is dependent upon developing an immune cow herd. The only product currently available is a modified live virus vaccine for intramuscular use.

BVD virus spreads rapidly, and vaccination is *not* recommended during an acute outbreak.

Pregnant cattle should not be vaccinated. If adult vaccination is necessary it should be accomplished following calving and *at least three weeks prior to breeding.*

Calves may be vaccinated between one day of

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What are Vaccines?

Vaccines are preparations containing killed or modified disease-producing agents administered for the prevention of disease.

Bacterin

Bacterins consist of suspensions of *killed bacteria.* The only live bacterial products used at the present time in cattle are Strain 19 Bangs Vaccine and Anthrax Spore Vaccine. Bacterins require 21 days to stimulate the maximum antibody level (immunity) in the animal inoculated. The animal produces its own antibodies in response to the inoculation of the bacterin (active immunity).

Antiserum

Antiserum is the blood serum from hyper-immunized animals; it is made by removing the red blood cells from blood drawn from animals which have been repeatedly immunized to stimulate a high antibody level in their blood.

Antiserum confers a *passive immunity* (an immunity borrowed from another animal). A calf gets this type of immunity from the antibodies transferred to him in the colostrum (first milk from the cow). Antiserum confers *immediate protection* (it starts to work within a few hours). Antiserum normally confers immunity for only 14 days.

Toxoid

Toxins are produced by some bacteria and cause conditions such as lock-jaw (tetanus) and overeating disease (enterotoxemia).

Toxoid is produced by harvesting protein-base toxin (bacteria are *not* in a toxoid). The harvested toxin, after inactivation or detoxification, makes up the toxoid. Toxoid stimulates the body to produce anti-toxin. It takes time to develop this "immunity".

Antitoxin

Antitoxin is a serum from animals gradually exposed to the toxin or poison. Antitoxin inactivates the toxin. Antitoxin confers immediate protection. Injection of antitoxin results in passive or borrowed detoxification. Antitoxin does *not* affect the bacteria that produce the toxin. Antibiotics must also be used to kill the bacteria producing the toxin in the clinically sick animal.

Modified Live Virus (MLV)

There is no product currently available that will treat most virus infections. The virus is in the cell of the animal. Antibiotics, sulfonamides, etc., do not affect the virus, although they do help in that they control secondary bacterial infection.

A modified live virus is a modified strain of the virus which as the result of serial passages can no longer cause the disease, but does stimulate the animal to produce antibodies (immunity). Quality control is *important;* the producer must prove that the virus in the vaccine does multiply and does produce resistance without producing illness.

Intranasal vaccines are modified live virus (MLV) products. These vaccines are sprayed into the nostrils, while most vaccines are injected intramuscularly or subcutaneously.

Modified live virus vaccines must be properly handled. Successful vaccination with MLV products is dependent upon several factors:

1. A susceptible animal. Calves with passive immunity from serum or colostrum may not respond satisfactorily.
2. A viable vaccine. Exposure to time, heat, sunlight and disinfectants can inactivate the vaccine.
3. Natural variation. Not all animals develop a satisfactory immunity following vaccination.

Killed or Inactivated Virus

These products are suspensions of killed or inactivated virus which can no longer cause the disease, but do stimulate the animal to produce antibodies.

PHOTOGRAPHS were provided by Robert F. Kahrs, D.V.M., Associate Dean, New York State Veterinary College, Cornell University, Ithaca, New York, and David A. Morrow, D.V.M., Associate Professor, Department of Large Animal Surgery and Medicine, Michigan State University.

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age and three weeks prior to weaning. They may be vaccinated upon arrival in the feedlot or after they have become acclimated to the feedlot for two or more weeks. Veterinary consultation and supervision is important to a successful vaccination program. (Occasional severe post vaccination disease occurs, and there is some controversy over the use of this vaccine.)

All calves vaccinated prior to weaning should be given a second vaccination in the feedlot. Colostrum from immune dams produces a passive immunity in the calf which may last until 5–9 months of age. This is the reason early vaccination may not produce satisfactory immunity and a second vaccination is necessary.

Replacement heifers should be vaccinated or given a second vaccination between nine and twelve months of age and *not later than three weeks prior to breeding.* A single vaccination at this age, or older, probably confers adequate immunity for the productive life of most cows.

Do not vaccinate in the face of severe stress. Vaccination and handling are additional stresses. Circulating antibodies may not be present in the blood until 21 days after vaccination; it may take this long for immunity to develop.

Replacement dairy heifers should be vaccinated at 9 to 12 months of age. The heifer is old enough at 9 months of age so that she will no longer have any colostral immunity and a single vaccination will probably confer lifelong immunity. There is an increased margin of safety because vaccination at 12 months of age is still two months or more before the heifer will be bred.

Generalizations Which Affect IBR and BVD Vaccination Recommendations

1. IBR and BVD viruses are widely distributed and permanently established in cattle in this country.

2. Most cattle kept for breeding purposes will eventually be exposed to one or both of these viruses.

3. Infection may produce clinical illness, or it may be so mild as to be unobserved.

4. Infection can result in abortion, but all animals infected during pregnancy do not abort. Abortions and congenital anomalies (calves with abnormalities at birth) may follow subclinical infection.

5. Pregnant cattle will not abort if they are immune at the time of exposure.

6. *No vaccination procedure is completely safe or 100% effective.*

7. Immunity following successful vaccination with intramuscular modified live virus vaccine or natural infection with either IBR or BVD may be lifelong in many cattle. (Inactivated IBR vaccines require annual vaccination. Intranasal vaccine immunity trials will not be completed for several years and annual vaccination is recommended.)

8. Pregnant cattle or cattle about to be bred should not be vaccinated with intramuscular IBR or BVD modified live virus vaccines. (Intranasal IBR vaccine is approved for use in pregnant cattle.)

9. Passive immunity acquired by ingestion of colostrum from an immune cow can protect against early calfhood infections but may also interfere with successful vaccination of calves. (Intranasal IBR vaccine may be effective in calves as young as 2 days of age, even though they have colostral antibodies, but additional studies are needed.)

10. Vaccination during herd outbreaks is *not* recommended.

11. Vaccination of adult cattle with intramuscular modified live virus vaccine is generally *not* recommended.

12. Vaccination of cattle within three weeks of the time they are to be bred is *not* recommended.

13. Calfhood vaccination is recommended between 9 and 12 months of age. Colostrally acquired immunity disappears at varying ages: IBR: 4–6 months of age; BVD: 5–9 months of age.

The duration of modified live virus vaccine-induced immunity may be life-long in most cattle. Calfhood vaccination provides protection prior to breeding age and avoids vaccination just prior to breeding. A good calfhood vaccination program involving all replacement heifers will result in an immune herd without adult vaccination.

14. *Rely on the advice of your veterinarian.* Your herd history is not the same as your neighbor's. Different vaccination programs, even different vaccines, are indicated in different situations.

Summary

Replacement heifers for both dairy and beef cattle herds should be vaccinated for IBR and BVD with modified live virus vaccines between 9 and 12 months of age.

Your veterinarian is the best qualified person to give advice and help in diagnosing and treating infectious diseases, establishing a vaccination program, determining the feasibility of vaccination, and selecting a vaccine.