# Table of Contents

## Health
- Proper Usage of Drugs and Chemicals in Food Animals ........................................ Pg. 2
- Cattle Vaccines ........................................................................................................ Pg. 4
- Immunizing Beef Calves ........................................................................................ Pg. 6
- Basics of Cattle Immunity ...................................................................................... Pg. 10
- Recognizing and Managing Common Health Problems in Beef Cattle ............... Pg. 12
- Biosecurity for Beef Cattle Operations ................................................................. Pg. 20
- Foot Rot in Beef Cattle ......................................................................................... Pg. 24
- Bloat Prevention and Treatment in Cattle ............................................................. Pg. 25
- Clostridial Diseases ............................................................................................... Pg. 29

## Quality and Yield Grading
- Beef Quality and Yield Grading ........................................................................... Pg. 33
- Beef Quality Grades ............................................................................................... Pg. 34
- Beef Yield Grades ................................................................................................. Pg. 43

## Basic Management and Information
- Beef Performance Glossary ................................................................................. Pg. 49
- The Cow’s Digestive System ................................................................................ Pg. 55
- Texas Adapted Genetic Strategies for Beef Cattle X: Frame Score, Frame Size, and Weight ........................................................ Pg. 62
- Dehorning, Castrating, and Branding ................................................................ Pg. 66
- Growth-Promoting Implants for Beef Cattle ......................................................... Pg. 69
- Implanting Beef Calves and Stocker Cattle ........................................................ Pg. 73
- Value Added Calf (VAC) - Management Program ............................................... Pg. 81
- Cattle Handling Pointers ..................................................................................... Pg. 83
- BQA Cattle Care and Handling Guidelines ........................................................ Pg. 93
- The Facts about Optaflexx™: Ractopamine for Cattle ........................................ Pg. 117
- Feedstuffs for Beef Cattle .................................................................................... Pg. 120
- Mineral and Vitamin Nutrition for Beef Cattle .................................................. Pg. 132
Section 1:
Health
Federal regulations exist to ensure the proper distribution and usage of veterinary drugs and to prevent adulteration of the food supply with illegal drug residues through drug misuse in food producing animals.

The Food and Drug Administration (FDA) and the Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA) enforce regulatory laws under the Food, Drug and Cosmetic (FDC) Act, enacted in 1906 with subsequent amendments. Anyone who causes, by an act of omission or commission, violative residues in livestock and poultry (by irresponsible and illegal distribution and use of drugs) violates state and federal laws. When FSIS inspectors detect violative drug residues in food products derived from animals, they report the violation to the FDA, the producer and the state authorities. FDA then initiates an on-site investigation of the suspect producer. If the evidence shows a flagrant violation of the law, the producer may face criminal charges. The convicted producer can be fined and possibly imprisoned for this crime. Animals with residues above established tolerances are condemned by FSIS.

To be in compliance with the law, a producer must follow precisely the instructions on the drug or chemical label. This means the producer must use only those veterinary drugs, chemicals or feed additives approved by the FDA and administer them only by the recommended route, at the approved dosage rate, and for the specific usage(s) or treatment of condition(s) indicated on the label.

Even the use of approved drugs and chemicals within the established withdrawal times prior to marketing is illegal. Drug and chemical residues are human health hazards. There is no question that producers must be more judicious in the use of chemicals and drugs in food animals. Producers are advised to read and follow directions on all drug labels with respect to dosage and withdrawal recommendations as mandated by federal law. This will ensure that consumers receive safe, high quality animal food products.

Extra-label distribution, prescription and use of veterinary drugs in food producing animals are regulated by FDA. The FDA policy requires all extra-label drug usage to be under the control of a licensed veterinarian. Extra-label usage must be in accordance with a veterinarian/client/patient relationship; a careful medical diagnosis; and a determination by the attending veterinarian that available labeled products have been found clinically ineffective. There must be assurances that treated animals have been adequately identified and that extended withdrawal periods have been established before marketing. There must also be a procedure to ensure that these policies will be met. A legitimate veterinarian/client/patient relationship exists when the veterinarian has assumed the responsibility of making medical judgments, and the client has agreed to follow the instructions of the veterinarian.

Use of an unapproved drug in food animals by a producer without a legitimate veterinarian/client/patient relationship is extra-label drug usage and is
illegal. Use of an approved drug via a route of administration not specified on the label, or at a dosage rate not specified on the label, or for treatment of a condition not specified on the label without a legitimate veterinarian/client/patient relationship, is illegal.

An important role of the Texas Agricultural Extension Service is to educate and advise food animal producers on correct usage of drugs and chemicals, problems of drug and chemical residues, and the litigation that may result from intentional or unintentional abuse or misuse of these substances in food producing animals. All persons involved in the industry must work together to bring about proper usage of drugs and chemicals in food animals.
CATTLE VACCINES

Floron C. Faries, Jr.*

Veterinary biological products are antigen and antibody products, produced by laboratory techniques, that use microorganisms such as bacteria or viruses.

Vaccine products contain high numbers of modified [live] or inactivated [killed] organisms or subunits [portions] or inactivated toxins [waste products] of organisms known to cause a particular disease. These products deliver antigens that stimulate the body’s immune response through the production of antibodies. Antibodies also are found in biological products such as antiserum, antitoxins, colostral antibodies and monoclonal antibodies. Biological products can be administered to cattle before exposure to disease to provide protection and after exposure to disease to reduce spread of infection.

A vaccine containing inactivated toxins is called a toxoid. A toxoid is not a killed vaccine or a modified live vaccine.

A vaccine containing killed bacteria is called a bacterin. Adjuvants are added to bacterins to increase effectiveness of the antigens. Adjuvants slow the release of the antigen into the body and prolong the immune response. Antigen-adjuvant mixtures form tissue deposits at the injection site beneath the skin [subcutaneous] that are observed as knots in the skin. Also, injection site lesions in the muscle can be caused by intramuscular injections of vaccines containing an adjuvant.

NONINFECTIOUS VACCINES

Noninfectious vaccines include killed vaccines, bacterins, toxoids, leukotoxoids and chemically altered, body temperature sensitive, modified live vaccines that are injected intramuscularly. To be effective, two doses of a noninfectious vaccine administered at a 2- to 4-week interval are necessary. The first vaccination is a priming.
sensitizing dose that may provide no protection or a low protection for 1 to 4 months. The second vaccination is a required booster dose, recommended within 2 to 4 weeks but acceptable within 4 months after the first dose. Immunity following the second dose lasts from 6 to 12 months. To maintain immunity, the vaccinated animal should receive semiannual or annual boosters, depending on the type and risk of disease. The booster vaccine is a noninfectious vaccine.

**INFECTIOUS VACCINES**

The virulence of an organism in a live vaccine is modified or reduced (attenuated) so that it no longer causes disease, but it is able to infect and replicate. Some live vaccines may possess the ability to revert to a virulent organism and spread disease to unvaccinated cattle.

A modified live vaccine is an infectious vaccine that establishes a desired infection in the vaccinated animal. Immunity prevents the desired infection of a modified live vaccine from being established; therefore an infectious vaccine generally is not effective when administered after a noninfectious vaccine.

The infectious vaccine may give properly vaccinated cattle immunity for life. Repeated modified live infectious vaccinations are unnecessary. However, immunity of the vaccinated animal can be ensured by using a noninfectious vaccine booster every year or an infectious vaccine every 3 years.

Infectious vaccines include modified live vaccines that are not body temperature sensitive and modified live vaccines that are chemically altered, body temperature sensitive, and injected in the nasal passage.

**HANDLING VACCINES**

All vaccines should be refrigerated. Remove only briefly for dose measurement and administration. Do not expose the vaccine to direct or indirect sunlight for an extended period of time. Sanitary measures help to ensure the vaccine is free of blood, feces, hair and dirt. If handling a live vaccine, do not use chemicals to disinfect syringes, needles, skin or vaccine vials. The unused portion of a vial of vaccine must be properly discarded and not stored for later use.

**PROPER VACCINATION PROCEDURES**

Follow label directions for proper procedures in administering a vaccine. Use the correct dose and route of administration. The measured volume [dose] of a vaccine is in milliliters [ml] or equivalent in cubic centimeters [cc]. The routes of administration are subcutaneous or SQ (injected under skin), intramuscular or IM (inject in muscle), and intranasal or IN (inject in nasal passage). The recommended site for SQ or IM injections is in the side of the neck in front of the shoulder. Do not administer an expired vaccine. Follow the withdrawal time recommendations for slaughter printed on the label.

Systemic protection provided by colostral immunity in calves lasts from 2 to 12 weeks and depends on the quantity and quality of colostrum [ first milk] consumed, the disease, and the level of exposure. As this immunity decreases, young calves should be actively immunized by use of vaccines. However, maternal antibodies interfere with active immunity by reducing the effectiveness of administered vaccines. Because the exact time of colostral immunity loss cannot be predicted, young calves must be vaccinated at least twice, beginning at 2 months of age, to ensure successful active immunization.
Immunizing Beef Calves

A Preconditioning Immunization Concept

Floron C. Faries, Jr.*

Infectious diseases cause sickness and death in calves, before or after they are born. Unborn and nursing calves are at high risk to fatal diseases during the time of year when a beef rancher is calving cows, moving and mixing these cows, and bringing in bulls to them. Newborn calves can have low immunity and be highly susceptible to many diseases. They are exposed to germs shed by stressed cows, calves and bulls in the cow herd.

If sickness and death occur in weanling calves, the source of disease must be determined. Is the disease the result of dormant infections, now breaking out and shedding, in improperly immunized calves previously exposed in the herd? Is it the result of incubating infections in improperly immunized calves recently exposed in commingled, stressed and shedding calf groups? By properly vaccinating the entire herd, including pregnant cows, calves, replacement heifers and bulls, outbreaks caused by both dormant and incubating infections can be prevented.

This calf preconditioning immunization concept for beef herds provides protection against infectious diseases through passive and active acquired immunity for unborn, nursing and weanling calves. It involves giving immunizations before and after the calves are born. The immunizations for the vaccination schedules for a beef herd should be determined by a veterinarian.

Preconditioned weanlings are destined to be stockers, feeders and replacements.

Vaccinate Pregnant Cows, Replacement Heifers, Bulls

Unborn and nursing calves are protected against diseases by immunizing pregnant cows and pregnant replacement heifers during the last trimester of pregnancy. A cow herd that calves year around is vaccinated routinely every 6 months. Bulls and replacement heifers are vaccinated before introduction into the herd.

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These immunizations properly use noninfectious vaccines of various types: killed, subunit, inactivated toxins or intramuscular, temperature sensitive, modified live.

**Table I: Cow Herd Vaccines**

**Precalving Vaccination of Cows and Heifers**
(7 to 9 months of pregnancy or twice a year)
1. 4-way Viral BRD Vaccine
2. Pasteurella Bacterin & Leukotoxoid
3. Haemophilus Bacterin
4. 5-way Lepto Bacterin
5. 7-way or 8-way Blackleg Bacterin
6. Scour Vaccine
7. Vibrio Bacterin
8. Trich Vaccine

**Prebreeding Vaccination of Replacement Heifers and Bulls**
(3 to 6 weeks before breeding)
1. 4-way Viral BRD Vaccine
2. Pasteurella Bacterin & Leukotoxoid
3. Haemophilus Bacterin
4. 5-way Lepto Bacterin
5. 7-way or 8-way Blackleg Bacterin
6. Vibrio Bacterin
7. Trich Vaccine (Heifers)
8. Anaplas Vaccine

**Table 2: Calf Herd Vaccines**

**Postcalving Vaccination of Nursing Calves**
(2 to 3 months of age)
1. 4-way Viral BRD
2. Pasteurella Bacterin & Leukotoxoid
3. Haemophilus Bacterin
4. 5-way Lepto Bacterin
5. 7-way or 8-way Blackleg Bacterin

**Preweaning Vaccination of Nursing Calves**
(3 weeks before weaning)
1. 4-way Viral BRD Vaccine
2. Pasteurella Bacterin & Leukotoxoid
3. Haemophilus Bacterin
4. 5-way Lepto Bacterin
5. 7-way or 8-way Blackleg Bacterin
6. Bang’s Vaccine (Heifers)

Stress at the time of calving reduces resistance to disease. Infectious microorganisms of bovine respiratory disease (BRD viruses and pasteurella and haemophilus bacteria) can break out of dormancy and be shed. However, the active immunity provided by regular vaccinations is expected to suppress shedding of disease agents from the calving cows to the nursing calves of the current year’s calf crop. The active immunity also provides protection for the following year’s calf crop against abortion diseases.

Immunized cows provide passive immunity to calves through the colostrum (first milk). Calves are protected until 2 to 3 months of age against nursing calf diseases. Passive immunity is expected to minimize infection and shedding of disease agents and prevent development of sickness and death. Susceptible baby calves are those that do not receive an adequate amount of good-quality colostrum during the first 24 hours after birth.

A calf should receive an amount equivalent to 2.5 percent of its body weight in the first 6 hours after birth, and again over the next 18 hours. An 80-pound calf needs 2 quarts of colostrum from an immunized cow during the first 24 hours of life to receive protective immunity.

**Vaccinate Nursing Calves**

Nursing calves are vaccinated at 2 to 3 months of age against calf diseases. The immunizations are noninfectious vaccines and are repeated 2 to 4 weeks later. The first vaccination is a priming,
sensitizing dose that provides no protection or a low protection for 1 to 4 months. The second vaccination is a required booster dose, recommended within 2 to 4 weeks, but acceptable within 4 months. It should precede weaning by at least 3 weeks. Duration of the immunity following the second dose is 6 to 12 months.

Immunizations precondition calves by providing immunity to nursing and weanling calves destined to be stockers, feeders and replacements. Heifer calves selected for replacements are immunized against venereal diseases at the time of boosters within 3 to 6 weeks before breeding.

The active immunity developed by the nursing calves is expected to minimize infection and shedding and prevent sickness and death from disease caused by exposures before and after weaning. Immunity might suppress shedding of BRD viruses and pasteurella and haemophilus bacteria at times of stress during hot or cold weather, weaning, selling and hauling. Dormant infections in calves not immunized with two vaccinations prior to weaning commonly break out and cause shedding, sickness and death in calves with weakened immunity at weaning.

If the required booster vaccines are not given before weaning, they must be given at 3 weeks after weaning. Because the first dose is noninfectious, the second dose in weanling calves also is a noninfectious vaccine. An infectious vaccine (modified live) usually is ineffective following a noninfectious vaccine because it prevents the desired infection of the modified live vaccine from being established.

Nursing calves in a cow herd with low risk to bovine virus diarrhea (BVD) and bovine respiratory syncytial virus (BRSV) are not given the priming and booster four-way viral BRD vaccinations. An infectious bovine rhinotracheitis/parainfluenza-3 (IBR/PI3) infectious vaccine (intranasal, temperature sensitive, modified live) is administered as a nasal spray at 2 to 3 months of age. At weaning, an infectious IBR, PI3, BVD, BRSV vaccine is administered intramuscularly. The four-way viral BRD vaccine does not contain intramuscular, temperature sensitive, modified live IBR virus. Immunity induced by the infectious four-way viral BRD vaccine will last a lifetime in properly vaccinated weanling calves. When the desired infections of the BRD viruses are established, repeated modified live infectious vaccinations become unnecessary.

Background Weanling Calves

Weaning is traumatic to a calf and one of the greatest stresses it undergoes. Other stressful procedures should precede or follow weaning by at least 3 weeks. It is best to perform castration and dehorning at birth or before the calf reaches 3 months of age.
Nursing and weanling calves are dewormed for stomach worms in the spring, summer and fall. In the spring and fall, deworming occurs as larvae develop following recent optimum transmission time. In the summer, deworming occurs during larval inhibition that follows optimum transmission in June.

Before selling or shipping, weanling calves are backgrounded for a minimum of 3 weeks. They are kept on grass or fed hay and concentrates, given supplements to provide nutrition, and are kept separated from other groups to prevent suppression of immunity, reduce stress and prevent commingling. Calf groups, whether from inside the herd or outside, are not commingled. During backgrounding, activities are kept to a minimum. No noninfectious vaccinations, castrations, dehorning, selling or hauling are performed.

**Additional Reading**

Additional information can be found in the following Texas Agricultural Extension Service publications: *Cattle Vaccines*, L-5289, and *Common Cattle Parasites*, L-2333.
Basics of Cattle Immunity

When establishing a vaccination program it is important to understand how animals naturally protect themselves from infection and how vaccination and other management practices enhance that protection.

There are three major ways the body defends itself against infectious organisms.

1. The first method is physical barriers, such as skin, normal microorganisms, and self-cleaning procedures such as coughing, sneezing, vomiting and diarrhea. Organisms that penetrate the body are often eliminated by these procedures. Animals must be adequately hydrated and nourished for these barriers to work effectively.

2. The second method of body defense is native or innate immunity. The native immune system controls invading organisms with chemicals and/or by ingesting them. The native immune system lacks memory, so each infection is treated in the same manner. The immune system needs adequate nutrition (including energy, protein and minerals) to function at a maximum level. Stress reduces the efficiency of the native immune system.

3. The third method is the acquired immune system, which responds to vaccines. This system can recognize and destroy specific invaders. With acquired immunity, the body remembers specific invaders and can respond more intensely if stimulated by those invaders later. While physical barriers and the native immune system respond rapidly, the acquired immune system takes days to weeks to become effective. When the acquired immune system is compromised, as in human AIDS patients and cattle with bovine viral diarrhea (BVD), other diseases can rapidly overcome the animal's defenses.

Acquired immunity may involve the production of a specific antibody (humoral immunity); or, it may involve the rapid recognition and destruction of specific foreign cells (cell-mediated immunity). The humoral immune response is relatively easy to measure and it is the most common way immune responses to vaccine and/or disease are detected. Cell-mediated response is much more difficult to quantify. The body reacts to specific diseases with either an antibody or a cell-mediated response. Organisms that attack the outsides of cells usually respond to antibodies. Organisms that invade the cell, such as all viruses and some bacteria (including brucellosis), often are better controlled with a cell-mediated immune response.

Vaccines made from modified live products are usually more efficient at protecting against diseases such as brucellosis or BVD that infect the insides of cells. Modified live vaccines replicate in the animal and usually do not require boosters. However, these vaccines are easily degraded and made ineffective by exposure to chemicals or extremes of light or temperature.

Vaccines made from killed products are usually more efficient at destroying organisms that attack the outsides of cells, such as those that cause blackleg or tetanus. Killed...
products do not replicate, so boosters are usually needed for good protection. Killed products can give undesirable results if shaken excessively or frozen.

All vaccines should be handled according to manufacturers’ recommendations.

A vaccination program is simply a tool in a total health program. Animals must have adequate nutrition for their immune systems to work properly. Animals also should be protected from environmental and social stressors and parasites, which may decrease an animal’s natural response to disease and the effectiveness of vaccines.

Administering too many vaccines, or vaccines that are not compatible, also can lower the immune response. Some vaccines should not be administered to pregnant animals because they may cause reproductive loss. Vaccines may not be effective when given to calves with high levels of maternal antibodies. All of these factors are reasons why you should consult with your veterinarian when designing vaccination programs.

Vaccines are not always effective under field conditions, so producers should have reasonable expectations of vaccine programs. A vaccine program to prevent unborn calves from becoming persistently infected with BVD might be quite different from one to control BVD in a group of stocker calves.

Always consult with your veterinarian, who is familiar with disease patterns in your area and can recommend the most effective vaccination program.

References


Many health problems in beef cattle can be managed successfully if they are detected early. Cattle owners can prevent or minimize losses by taking steps to keep the problems from recurring or spreading to the rest of the herd.

Below are common problems found in beef cattle as well as the probable causes of those conditions and suggested measures to prevent recurrence.

“My cows’ eyes are cloudy and runny.”

When cattle have cloudy, runny eyes, the inflamed and painful eyeballs and eyelids are probably infected with a virus or bacterium or damaged from sunlight or cancer. These conditions include pink eye, IBR virus eye, cancer eye or photo eye.

Specific diagnosis and proper treatment may require close observation, available history, laboratory testing and professional assistance.

**Pink eye (infectious keratoconjunctivitis)**

Although sporadic cases of eye diseases occur in all seasons of the year, this highly contagious bacterial disease is most common during the summer.

**Observations:** The onset of pink eye is sudden, beginning with an excessive flow of tears. The animal holds the eye partially closed, rubs the eye and seeks shaded areas. Soon an ulcer develops in the central area of the cornea and an opaque ring develops around the ulcer. Within 48 hours of onset, the entire cornea becomes cloudy.

Next, the lining of the eyelids becomes red with mucus and pus. As the ulcer deepens and extends completely through the cornea, the eye ruptures and loses fluid, and the eyeball collapses. The infection may affect one or both eyes.

**Management:** The infected cattle must be isolated and treated immediately by a veterinarian to eliminate the infection and prevent spread to other cattle.

**IBR virus eye (infectious bovine rhinotracheitis)**

The IBR virus is transmitted through the air and can spread rapidly through the herd. It causes upper respiratory infections, and it is most prevalent in the fall and winter.
Observations: In the early acute stage, a few cattle may develop cloudy corneas, similar to pink eye. The opacity spreads inward from the outer edge of the cornea, and there is no ulceration.

Management: Isolate the affected animals until the viral infection runs its course, and vaccinate the whole herd and purchased replacements.

Cancer eye (squamous cell carcinoma)
Cancer often appears as smooth plaques on the eyeball and ulcers or horn lesions on the eyelids. It occurs more often in cattle with no eye pigment and those that are constantly exposed to bright sunlight.

Observations: As in cases of pink eye, cancer eye causes an excessive flow of tears. This cancer can be identified by the appearance of the lesions on and near the eye. The cancerous growths develop on the third, upper and lower eyelids and eyeball, and they spread to internal lymph nodes and organs.

Management: Early detection is necessary for heating or freezing therapies or for surgical removal of the tumor alone. In chronic cases with more extensive involvement, the entire eyeball and eyelids must be removed.

Photo eye (photosensitization)
This noninfectious condition is a hypersensitivity to sunlight after ingestion of various plants or administration of certain drugs.

Observations: In addition to cloudiness of the cornea, signs of photo eye include sunburn of nonpigmented eyelids, nose, teats, vulva and areas of the head, body and legs. If the affected cattle are exposed to sunlight for prolonged periods, blindness and severe skin damage will result.

Management: Protect the animal from sunlight until its eyes and skin have healed. Shelter it during the day and allow it to graze on pasture at night.

“My calves have areas of hair loss with skin lesions.”
Calves commonly become infected with ringworm fungus and wart virus. These two infectious, contagious conditions are easily recognized and differentiated by the appearance of localized hair loss with skin lesions.

In cases where there is generalized hair loss with skin lesions, possible causes other than ringworm or warts include photosensitization, dietary deficiencies, infections of worms and infestations of horn flies and lice.

Ringworm fungus (dermatophytosis)
In the early stages, a fungus infection of the skin often goes unnoticed because the affected areas are small and slightly raised with roughened hair. Infected cows often serve as sources of the fungus, which is transferred by direct contact to calves.

Observations: After several weeks of the fungus infiltrating the hair follicles, the hair falls out, leaving distinct circumscribed, grayish lesions. The scaly lesions coalesce to form large patches of hair loss at least 3 inches in diameter. They are often located on the face and neck and are more common in young cattle.

Management: Although the infection tends to clear up spontaneously after several months, separate and treat the affected calves with a prescribed medication to prevent transmission to the others.

Warts (papillomatosis)
Warts are fibrous tumors of the skin and mucous membranes and are caused by many strains of the papilloma virus. The virus is usually transmitted to calves by direct contact from infected cows. It also can be
transmitted by contaminated instruments that puncture the skin and by biting flies such as horn flies and stable flies.

**Observations:** The cauliflower-type growths occur primarily on the head, neck and shoulders, in the mouth and vagina, and on the teats, vulva and penis.

**Management:** To prevent transmission to other calves, isolate those with warts. Over a period of 3 to 12 months, the affected calves build immunity against the virus in the warts and skin. Once the immunity kills the viruses, the warts dry and slough.

**“Every winter, my cows rub their heads, necks and shoulders.”**

Even though lice are known in the winter to cause cattle to itch and rub on objects such as fences, posts, trees and barns, another common cause of itching and rubbing is the aftermath of the allergic dermatitis produced during the previous summer and fall by a horn fly infestation.

**Horn fly allergy (allergic dermatitis)**

During the horn fly season, cattle often develop a skin allergy to the saliva of the biting horn flies. After several weeks, an inflammatory reaction occurs in the skin, and many hair follicles are destroyed.

**Observations:** Before the damaged hair falls out during the winter, the retained hair causes an itch sensation, and the cattle rub their faces, necks and shoulders from December through March. As a result of rubbing these areas, the hair coat becomes sparse, and irritated skin lesions develop.

Once the dead hair is removed by rain and rubbing, a normal hair coat returns. If no crawling lice are on the skin or lice eggs are glued to the hairs, the diagnosis is based on a history that the cows had a horn fly infestation the previous year.

**Management:** To prevent recurrence of this cold-season problem, take steps to reduce the horn fly population during the warm seasons.

**“I have occasionally a cow or a bull crippled on one foot.”**

A cow or bull with a lame foot should be examined closely. Pick up the foot with a rope, and wash and examine between the toes carefully, looking for a foot crack, a corn, swelling, heat or a discharge. You will need professional assistance to differentiate some of the other abnormal conditions of the foot.

Unobservable problems inside the foot include bruises, abscesses, fractures and foot founder, or laminitis. The lameness may also be related to long toes as well as joint inflammation of the leg, including the hip on the rear and shoulder on the front.

**Foot crack (web tear)**

This condition often occurs after cattle walk on rough terrain or when a bull places its weight on the foot when mounting for breeding. These actions commonly spread the toes wide apart and cause the skin to tear. Also, long toes predispose to the likelihood of excessive spreading of toes.

**Observations:** If the problem is not a corn or foot rot, check for signs of foot crack, along with swelling and heat of the foot. The web of skin between the toes is also likely to be cracked deeply into sensitive tissue.

**Management:** The damaged tissue must heal from the inside out. To prevent further tearing, the cow or bull must be confined for a few weeks to limit walking and the toes trimmed and taped together.

**Foot rot (necrotic pododermatitis)**

If the problem is not foot crack, the likely problem is foot rot, a bacterial disease of the foot. During warm, wet weather, the bacteria in manure mixed with mud
commonly gain entry through tiny cracks and abrasions of the skin between the toes and heel bulb, causing swelling and dead tissue.

**Observations:** The signs of foot rot include a hot, swollen and painful foot with pus discharge and a dead odor, fever and loss of appetite and body weight. The infection may spread to the skin of the pastern and fetlock and to bone joints inside the foot.

**Management:** Because the pus discharge contains bacteria and serves as a source of new infections, segregate the cow or bull from the rest of the herd for proper antibiotic treatment. To prevent occurrence of more cases, the unsanitary conditions leading to this condition must be corrected.

**Corn (interdigital hyperplasia)**

The development of scar tissue, or corns, in cattle is thought to be caused by stretched skin folds between the toes in heavy, splay-toed breeds.

**Observations:** A painful and hard, tumor-like, vertical mass develops in the web of skin between the toes.

**Management:** The mass must be removed surgically and the toes bandaged closely together.

“A **one of my cows coughs, protrudes her tongue and breathes with her mouth open.**”

The cow obviously has a lung disease in which inflammation elicits an irritated cough, and reduced air space encourages open-mouthed breathing. Because several infectious and noninfectious causes are possible, professional assistance will be needed to make a specific diagnosis by physical and laboratory examinations.

A common infectious lung disease is pneumonia; a common noninfectious condition is fog fever.

**Infectious lung disease (pneumonia)**

Pneumonia is a highly complex, contagious disease and may be caused by one of several viruses in concert with various bacteria. Pneumonia caused by bacteria is generally serious.

**Observations:** Fever, coughing and labored breathing are caused by inflammation and swelling of the lungs and the accumulation of mucus, blood and pus that interfere with airflow in the air passages. The animal tries to get more air by stretching out its head and neck and protruding its tongue.

**Management:** When you see signs of pneumonia, isolate the sick cow for antibiotic treatment. Laboratory tests are needed to identify the specific viruses or bacteria involved to develop an effective vaccination plan for the herd. The plan should include vaccinating the cows, nursing calves, bulls and replacements with the proper vaccines.

Because stress can contribute to the occurrence of this disease by lowering an animal’s resistance, cattle owners need to minimize adverse conditions of cold or hot weather to prevent pneumonia in the herd.

**Fog fever (pulmonary emphysema and edema)**

Fog fever is caused by a toxic reaction in the lungs after the cow ingests a large quantity of an amino acid in lush, green grass in spring or fall. Diagnosis is based on a history of the cows being moved within the previous 10 days from a dry, brown pasture to a lush, green pasture.

**Observations:** Fever is not present; coughing is minimal; and the onset of symptoms is sudden. Breathing is obviously difficult, with the animal breathing through its mouth, extending its tongue and drooling saliva.
Management: The affected cow should be treated by a veterinarian and handled carefully to prevent death by suffocation brought about by exercise. Move the herd from the lush pasture and gradually return it over 3 weeks by feeding hay and limiting grazing time.

“My calves have runny, snotty noses.”

Runny, snotty nose can be associated with pneumonia if the calves have fever, are coughing and have labored breathing. Otherwise, the calves may simply have an inflammation of the sinuses of the head, which is called sinusitis.

Runny, snotty nose (sinusitis)
Nasal drainage in calves may be the normal discharge of mucus from the sinuses of the head. On extremely hot, cold or windy days, inflamed sinuses can discharge excess drainage, even if there is no infection. Also, irritants and allergens in the environment such as dust, pollen and mold cause inflammation of the sinuses.

Observations: When viruses and bacteria infect the sinuses, they produce a head cold and cause a nasal discharge that is a clear, mucus or pus type. Often the infection is limited to the head and does not involve the lungs.

Management: Do not use antibiotics if there is no or only a low-grade fever; allow the condition to run its course. Respiratory vaccines may lack the specific antigens to prevent recurrence.

“Some of my cows got the staggers, went down and are unable to rise.”

Cows that cannot rise must be checked by a professional, who will conduct physical examinations and evaluate their diet and environment. Although the cause may be one of many poisonous plants, it is more often the result of grazing on Dallisgrass. In chemical poisoning cases, the cause is often the consumption of toxic amounts of lead or arsenic from batteries or lubricating grease of vehicles or machinery. If the cause is dietary, it is likely that the cattle have a common metabolic disorder such as polio, ketosis or grass tetany.

Polio (polioencephalomalacia)
Cows with polio are thin and usually have been on a diet high in sulfate and low in protein and roughage. They probably have been confined and fed a grain diet without roughage.

Observations: As an affected downer cow attempts to stand, the ankles remain flexed or knuckled over.

Management: Immediate treatment by a veterinarian to relieve swelling of the brain is necessary to prevent permanent brain damage. Adequate roughage must be fed with grain concentrates.

Range ketosis (acetonemia, hypoglycemia)
Cows with range ketosis are usually thin, on a low-carbohydrate, low-energy diet and likely are stressed from cold weather or calving and nursing.

Observations: In addition to the incoordination before going down, the cows are observed pressing against walls, posts and trees, bellowing and tongue wallowing and licking.

Management: Immediate treatment by a veterinarian is directed to raise the blood sugar and improve glucose metabolism.

Grass tetany (hypomagnesemia)
The affected cows are thin, grazing lush pasture high in nitrogen and potassium and likely are stressed from cold, cloudy weather or calving and nursing.

Observations: In addition to staggers, signs in cattle include tossing the head, bellowing and galloping before going down with convulsions.
Management: Immediate treatment by a veterinarian is directed to raise the blood magnesium.

“**I have occasionally a thin, downer cow.**”

Dietary deficiencies are the most common cause of weakness and weight loss in cattle. Enteric bacteria and parasites may be contributing factors.

Observations: Tipoffs to problems in the diet include weakness and loss of weight.

Management: Evaluate the nutritional intake, comparing it to the protein and energy requirements of the herd. Make adjustments if necessary.

If the problem is limited to an individual cow instead of affected the entire herd, seek professional assistance to identify the cause, such as infections of body cavity linings (pleurisy, peritonitis) and abscesses and cancers of internal lymph glands and organs.

“**I have low conception rates, repeat breeders and abortions in my cowherd.**”

Dietary deficiencies and stresses of hot weather and malnutrition in cows continue to be major causes of reproductive failures. Abnormal ovaries and uterus and starvation of the embryo or fetus are commonly associated with inadequate intake of protein, energy, minerals or vitamins. These reproductive problems occur in stressed cows on poor quality or short grazing without provisions of hay and nutrient supplements.

Observations: The herd has an unusually high number of abortions, repeat breeders and low conception rates that cause a large percentage of open cows.

Management: If the problem is caused by poor nutrition, evaluate the nutritional intake and take corrective measures. Professional assistance is essential to diagnose infectious diseases, including testing of fetuses, placenta and blood samples.

“**I continue every year to have cows prolapse and retain afterbirth.**”

It is common for a cow that has difficulty in calving to bruise her uterus. A thin, weak cow may have a prolonged calving process that commonly causes a bruised uterus.

Observations: The inflamed, swollen uterus quite often causes straining with prolapse of the vagina, cervix or uterus. If prolapse does not occur, the placenta may be retained because of bruising inflammation.

Management: Treatment by a veterinarian is directed to replace the prolapse and expel the retained placenta.

“**I had several calves suddenly die that before dying were rapidly breathing, weak and feverish.**”

Many infectious causes of rapid breathing, weakness and fever, followed by sudden death of calves are possible. Ask a veterinarian to perform a necropsy on one of the dead calves and make a specific diagnosis by physical and laboratory examinations. Two common diseases that cause sudden death in calves are lepto and blackleg.

**Lepto (leptospirosis)**

Lepto is caused by one of five strains of bacteria. The bacteria are shed with urine from infected animals, such as cattle, raccoons, skunks, opossums, rodents, deer, swine and dogs. The bacteria may be shed for many months.
For calves, the likely exposures are from the urine from carrier cows that were stressed at calving and from diseased and convalescent calves. Cows may have the disease but show no signs of it. Calves are infected with the bacteria when they ingest contaminated urine on teats, hair, grass and hay and in water. Newborn calves are the most susceptible to the acute disease.

**Observations:** The acute form of the disease causes high fever, rapid and difficult breathing, depression, bloody urine, incoordination and death. Lepto calves are often mistakenly diagnosed and treated for pneumonia. Because the bacteria can kill unborn calves as well as nursing calves, it is suggested that cattle owners evaluate the cow herd’s pregnancy rate and look for aborted fetuses.

**Management:** For a closed herd, the most effective approach for control is annual vaccination of all cattle; for an open herd, vaccinate twice yearly. If you time the vaccination in the cow herd during the last trimester of pregnancy, it will provide immunity to the newborn calves through the colostrum.

Use polyvalent killed vaccines containing three or five common serovars. Different vaccines vary in effectiveness, and vaccine failures may occur.

### Blackleg (clostridial disease)

When the cause of sudden death of a calf is blackleg bacterial toxins (poisons), the first point to make is that the calf swallowed blackleg spores from the soil. This means the ground is contaminated with the spores that never die. During rains, these spores are normally concentrated by surface water in various spots in the ground, and drought or rains will cause them to surface from the soil.

When ingested by a calf, the spores go to the muscles and remain dormant. A trigger breaks them out of dormancy, sometimes months or years later. Then the bacteria multiply rapidly and produce toxins in the muscles, killing the muscles (black dead muscles), causing blood poisoning and sudden death.

The most common trigger is fast growth. Another trigger is muscle exertion, such as that caused during working, weaning and hauling. Affected calves may be infected at an early age and die of blackleg at a later age. When blackleg occurs, the transmission was not necessarily recent, but possibly months ago.

**Observations:** Sudden death and rapid, gaseous decomposition are the most common signs of blackleg.

**Management:** The death is so rapid that treatment is normally ineffective. All dead calves should be burned with untreated wood products to keep from contaminating the ground.

Because other calves can have the bacteria in dormancy, guard against triggers such as stress and rapid growth. Vaccinate the remaining calves. If these calves die, they were already infected with the dormancy of blackleg bacteria before vaccination. Vaccination after exposure will not prevent the dormancy from breaking out.

The seven-way blackleg vaccine should be used because other strains in addition to blackleg that also cause sudden death can be present. The seven strains can be diagnosed only in a dead calf by necropsy and laboratory tests. In addition to blackleg, the other six clostridial diseases that cause sudden death are black neck, black liver, malignant edema, and B, C, D enterotoxemia.

A proper vaccination program includes annual vaccination of the entire herd (calves, cows, heifers, bulls), not just calves. Grown cattle die from four of the seven different blackleg-type bacteria. Cows should be vaccinated during last 3 months of pregnancy or twice a year.
“Some of my calves are rapidly breathing, weak, feverish, scouring and dying.”

Because several infectious causes are possible, professional assistance is required to make a specific diagnosis. Fresh feces from live calves must be submitted for laboratory testing, and one of the dead calves must be submitted for necropsy and physical and laboratory examinations. Results of these examinations commonly reveal the presence of tissue damage in the small intestine (enteritis) and large intestine (colitis) and bacteria in the blood (septicemia).

Scours (enteritis-colitis septicemia)

Nursing calves are at high risk to fatal diseases such as scours from the day they are born and continuing during the time of the year when one is calving cows and heifers, moving and mixing these cows and heifers, and bringing in bulls to them. At this time, the baby calves can have low immunity and be highly susceptible to diseases. They can die from scours by dehydration and from septicemia by systemic infections.

Scours are caused by bacteria (E. coli and C. perfringens B, C, D), viruses (rotovirus and coronavirus), and protozoa in the intestines (cryptosporidia and coccidia). Scours and dehydration worsen when affected calves nurse natural or artificial milk and receive oral antibiotics.

The sources of these deadly germs in the pasture include contaminated ground and fecal shedding from the cows, heifers and bulls. When a pasture trap is used year after year for close observation of calving cows and heifers, the ground becomes heavily contaminated with germs from manure. This contamination is long standing during cool, wet weather by a build up of manure from the calving cows and heifers and scouring calves.

Observations: Calves infected with these germs breathe rapidly and are weak, feverish and scouring. Death also may result.

Management: To correct the dehydration, the affected calves must be removed from nursing and given oral electrolytes until the scours have stopped.

Preventive measures include increasing the level of immunity in colostrums and having all calves nurse the first day of birth. Calf scours can be controlled by vaccines containing E. coli, rotavirus, coronavirus and C. perfringens B, C, D. Establish an annual vaccination program to provide immunity for the newborn calf though the cow’s colostrum. The pregnant cows and heifers need to be vaccinated late in pregnancy to be in colostrums and provide the protective immunity against the fatal baby calf diseases.

Other preventive measures include reducing the level of exposures to infectious organisms during calving and breeding seasons. To reduce the calf mortality related to scours and septicemia in a cow herd calving over a period of several months, use more than one pasture trap to provide clean maternity areas.
For beef cattle, biosecurity involves a system of management practices that prevent diseases from infecting a herd. Although biosecurity is often associated with foreign animal diseases, the term also applies to common diseases that affect herds, such as blackleg and bovine viral diarrhea. Vaccines can help prevent disease, but other management practices can be even more important. By developing biosecurity protocols that protect cattle from the common diseases, producers are establishing a safety net against a possible outbreak of a foreign animal disease in the United States.

How Disease Is Spread

Disease spreads directly—from an infected animal to a susceptible animal—or indirectly, from an infected animal to an object or equipment, and then to a susceptible animal. For example, feeding a calf with a bottle that has not been properly sterilized can be a way of indirect transmission.

Disease is transmitted in seven primary ways:

- **Aerosol:** Disease pathogens are carried in the air on moisture droplets from sneezing or coughing.
- **Direct contact:** Disease pathogen contacts an open wound, saliva, blood or mucous membranes, or is passed from nose to nose, by rubbing and biting.
- **Oral:** Susceptible animals consume disease-causing
pathogens in contaminated feed and water or lick or chew contaminated objects.

- Reproductive: Disease pathogens are spread during mating or gestation.
- Vehicles: Contaminated objects, such as needles, trailers, trucks or clothing, transfer the disease-causing pathogen from an infected animal to a susceptible animal.
- Vector-borne: A living insect, animal or human carries the disease from an infected animal to a susceptible animal.
- Fomites: Diseases are transmitted through contaminated soil, water and food.

Immunity

Immunity allows the animal to resist a disease by preventing the pathogen’s development or by counteracting the effects of its toxins. Immune animals have antibodies, which destroy a specific pathogen before it causes an illness. Immunity is natural, active or passive.

Natural immunity is provided by the body’s natural defenses, such as the skin and nasal passages, which help keep disease pathogens out of the body. Some cells in the body also attack disease-causing foreign particles. Fetuses can acquire antibodies in utero through placental transfer.

Passive immunity comes through the transfer of antibodies from one animal to another, such as through colostrum in the mother’s milk shortly after birth. Newborns must receive about 10 percent of their body weight in colostrum within the first 24 hours after birth to ensure some protection against diseases.

Active immunity is provided by protective vaccinations or by the body’s fight against an infection. Both modified-live and killed vaccines cause the body to produce antibodies without actually acquiring the disease. Booster vaccinations may be necessary to maintain immunity.

Vaccinations

Total disease prevention is not possible; therefore, any ranch biosecurity plan requires a sound vaccination program that targets diseases the cattle may be exposed to. Vaccines are only as effective as the animal’s immune response; injecting cattle with vaccine does not guarantee the herd’s immunity. Factors such as nutritional, shipping, social and weather stress can decrease the level of immune response. Minimizing animal stress will improve the disease protection within the herd. Handling and administering vaccines according to the manufacturer’s label is important in maintaining the integrity of vaccine and providing protection against the targeted disease.

When handling and working with vaccines:
- Read the label and/or medication insert before vaccinating animals.
- Observe the expiration date and storage information.
- Keep refrigerators at the proper temperature to maintain vaccine effectiveness, usually between 36 degrees F and 46 degrees F.
- Protect vaccines from sunlight.
- Give the right vaccine to the right species. If the label indicates it is for use in swine, do not use it in cattle. This extra-label use is illegal unless done under the supervision and recommendation of a veterinarian.
- Give the proper dose in the appropriate area on the animal, using the recommended technique.
- Do not insert a used needle back into an open bottle. Always use a sterile needle.
- Use a transfer needle or a sterile needle to reconstitute modified-live vaccines.
- Use boiling water, not chemical sterilants, to disinfect syringes.
- Mix only the quantity of modified-live vaccine that will be used within 1 hour.
- Dispose of the remaining opened vaccine properly after completing the day’s inoculations because the vaccine does not keep well once the bottle seal has been punctured.
- Give booster vaccinations when the label requires it.
- Keep a record of all vaccinations and treatments.
- Follow withdrawal periods.
Consult a veterinarian to ensure proper timing and implementation of a vaccination schedule. Even under ideal conditions, vaccinations are not 100 percent effective. Take extra care in handling and administering vaccines to achieve the highest possible level of immunity.

Evaluate the cost-benefit ratio of any biosecurity management practices. Do the benefits outweigh the costs? For example, if a weaned calf is worth about $550, the loss of that calf can cost the ranch $550 in lost revenue. If a vaccination routine that costs $1.50 per animal, including new needles for each, is implemented on a 40-cow herd, the total cost for this biosecurity practice may be as low as $60. If the result is one more calf, the net benefit is $490.

**Procedures for Handling Incoming Cattle**

Almost every ranch eventually must add new breeding animals to the operation. Some stocker or feedlot operations continuously add new cattle. These new cattle can bring disease to the ranch. Minimize this risk by:

- Defining the level of disease risk for the new cattle. For example, yearling virgin bulls from a purebred breeder with a strict health protocol may be low risk, while cows from an unknown source may be high risk.
- Isolating new animals from the rest of the herd for at least 3 weeks, and possibly at a location off the ranch.
- Watching the isolated animals closely for symptoms of illness, such as elevated temperature and abnormal behavior.
- Consulting a local veterinarian to determine which diseases to test quarantined animals for.
- Vaccinating cattle according to ranch protocols.

**Limiting Unauthorized Access to Pastures and Cattle**

Unauthorized visitors may introduce diseases to the ranch, increase the risk of theft and cause liability issues. To help prevent this:

- Keep doors and gates locked at all times.
- Post ‘No Trespassing’ signs.
- Conduct random security checks and look for signs of unauthorized activity or entry.
- Maintain good perimeter fences.
- Know your neighbors and set up a crime watch program.
- Secure pesticides, fertilizers, feed and nutrients.
- Secure water sources and identify alternative sources.

**General Biosecurity Practices**

Consider these additional general management tips:

- Disinfect reusable equipment, including tattooers, implant guns, ear notchers, dehorners and castration knives, between animals. Sterilize equipment that has been used off the ranch before it is brought back to the ranch.
- Identify cattle and maintain current records.
- Watch cattle for adverse health symptoms or behavior; sudden and unexplained deaths; large numbers of sick animals; unusual ticks or maggots; blisters around an animal’s nose, teats, mouth or hooves; difficulty rising and walking; a drop in milk production; and a large number of dead insects, rodents or wildlife. Contact a veterinarian immediately if these symptoms occur.
- Keep cattle away from exotic wildlife that may harbor disease.
- Develop a carcass disposal plan.
- Remove animals that are “reservoirs” for certain diseases such as Johne’s, trichomoniasis or bovine viral diarrhea. These animals continue to shed the pathogen and infect other animals.
- Avoid fecal and urine contamination of feed and water sources.
- Control pest populations and limit access to feedstuffs.
- Create an emergency contact list of resource people within the community. Post copies near telephones and on bulletin boards. Have employees enter these numbers into their cell phones.
Summary

Protecting cattle from disease is cost-effective. Ranch biosecurity hinges on preventing the introduction of disease into the operation and developing adequate immunity in the herd.
Foot Rot in Beef Cattle

Foot rot is a term commonly used to include a variety of conditions affecting the bovine foot. It is a frequent problem of cattle, especially in poorly drained, muddy pens and pastures. The disease may be found in individual animals or may affect up to 80 percent of cattle in problem herds, resulting in severe economic losses.

Causes and Contributing Factors

The most frequent cause of foot rot in cattle is Fusobacterium necrophorum, formerly called Sphingobium necrophorum, a bacterial organism widespread in the animal's environment, especially in mud and manure. Another bacterial organism accompanied by spirochetes has been incriminated as a cause of foot rot. Also, yeasts and molds have been suggested as contributing organisms.

Before the infectious agent can gain entry, a break in the skin or hoof must occur from such causes as sharp pieces of stone, metal, wood, stubble or frozen manure. Continuous exposure to mud or moist manure causes irritation and erosion. Excessive dryness of the hoof and skin cause cracking or injuries. Hooves that are not wearing properly also may contribute to foot rot if they have areas where filth collects and foot rot starts.

Clinical Signs

Once the infectious organisms become established, they cause inflammation and necrosis of tissue, resulting in slight to severe swelling and extreme pain. The reddened swelling usually is more evident between the hoof and at the bulb of the heel, but sometimes extends up the leg. In older chronic cases, a smelly discharge may occur from the openings between the claws or around the hoof. The deeper structures of the foot may be involved.

The signs of foot rot in cattle include lameness, holding or raising of a foot, reluctance to move, impaired locomotion, loss of appetite and weight and reduction in milk production. Severe illness or death can occur in prolonged cases.

Treatment

The affected foot should be cleaned, trimmed and inspected for the presence of a foreign body. A veterinarian may examine the animal to be sure that other conditions such as virus diseases, founder or injuries are not involved. An antiseptic and bandage may be applied after cleaning and trimming and sulfonamides or broad-spectrum antibiotics administered to combat the infection. Stabling 7 to 10 days to enforce rest aids in recovery.

In commercial cattle that are difficult to handle, sulfonamides, tetracyclines or other recommended drugs may be placed in the feed or drinking water. Animals also may be walked through a 2 to 3 percent solution of copper sulfate, 4 percent formoldehyde solution or other medicated foot baths twice daily for several days. If foot baths are not practical, animals may be walked through a mixture of powdered copper sulfate and slaked lime. Ask your veterinarian for specific recommendations.

In some severe cases where the joint is involved, removal of one claw by a veterinarian may be necessary to salvage the animal. After recovering, cattle usually can function well with one claw.

Prevention

Preventive measures include removing sources of injury and keeping feet dry and clean. Mudholes should be filled and stagnant pools drained or fenced off. Lots should be well drained and manure removed frequently to reduce muddy filth. Areas where cattle walk frequently, such as lanes or gateways, should be graded or filled to provide a well-drained pathway. Around feed bunks or watering troughs, a concrete standing platform will help keep feet dry. Lime or phosphorus fertilizer along the feed bunk also can be used as a drying agent. In valuable cattle and bulls, regular foot care including trimming of feet as needed will help prevent foot diseases and injuries.

Foot baths have been used in prevention of foot rot with some success. Copper sulfate solution, formaldehyde solution and air-slaked lime have been used. Sand or lime in the bottom of a foot bath will help prevent slipage. However, foot baths are impractical for most beef herds. Chlortetracycline in the feed also has been used to reduce the incidence of foot rot.

Foot rot can cause economic losses in a beef herd. Early treatment, control and prevention under the direction of a veterinarian will help to keep losses to a minimum.
Bloat Prevention and Treatment in Cattle

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This publication covers the problems, prevention and treatment caused by bloat in cattle.

Bloat is a form of indigestion marked by excessive accumulation of gas in the rumen. Immediately after cattle consume a meal, the digestive process creates gases in the rumen. Most of the gases are eliminated by eructation (belching).

Any interruption of this normal gas elimination results in gas accumulation or bloat. Bloat can be caused by:

- a condition secondary to acidosis indigestion
- certain proteins in forage
- the amount, rate of intake, and coarseness of the roughage
- rate of digestion of grains as a result of processing (grinding too fine)
- host-parasite reaction following grub treatment
- choking
- enlargement of the lymph nodes between the lungs, which can compress the esophagus or interfere with the function of the vagus nerves
- an inherited tendency for bloat

Trapped gases that are not eructated (belched) may form a foam or froth in the rumen that further prevents elimination of gases. Froth can be formed by many factors resulting from interactions among the animal, rumen microorganisms, and differences in plant biochemistry. Bloat may also be present with no evident froth or foam, described respectively as frothy (pasture) bloat and non-frothy (dry) bloat. The most common is frothy bloat where gas builds up in a foam or froth above the liquid/semi-liquid fraction of the rumen content and the normal belching is inhibited.

Preventing bloat is desirable not only to reduce deaths but also to reduce the negative effect of bloat on cattle performance. Pasture (frothy) bloat can occur in animals grazing wheat pasture or lush legumes (alfalfa, ladino, white clover) or being fed green-chopped legumes. Feedlot (dry) bloat usually refers to bloat in cattle fed high-grain rations that may or may not contain legume forage. It often occurs secondary to acidosis and/or rumenitis. Cattle consuming feedlot diets may have bloat caused by the grain portion being ground too finely. Fine-ground grains are digested rapidly, causing rapid fermentation and gas production.

Visual signs of bloat in cattle include: distension of the left side of the animal as the primary sign (Figure 1), discomfort as indicated by stomping of feet or kicking at the belly, labored breathing, frequent urination and defecation, and sudden collapse.

Preventing Pasture Bloat

Type of forage, weather, time of day, mineral nutrition, animal characteristics (adapted to feeds/forages), and rumen conditions all influence the likelihood of animals bloating. Alfalfa, forage rape, wheat, and many clovers (including white, ladino, sweet, and red) cause bloat more than grasses or other commonly grazed forages. Some animals, more selective in their grazing, may consume a diet higher in bloat-causing plants than other animals.
Cooler than normal temperatures (especially at night) are usually associated with bloat. Reasons may include higher forage intake by animals during cool weather and that plants initially are digested more rapidly when grown at lower temperatures. Cattle also tend to bloat more frequently in the morning, possibly because their biggest meal occurs at this time.

You can reduce bloat by feeding purchased anti-bloating supplements, but this can be expensive. Often, proper grazing management can reduce or eliminate bloat problems as effectively as purchased supplements. Proper grazing management involves providing a consistent and steady diet and controlling access to high bloat-potential plants, especially under moist or succulent conditions.

When you provide a consistent or gradual change in forage quality and plant species, you maintain uniform rumen conditions and reduce the chance of hungry animals overeating. Livestock graze the highest quality forage at the beginning of the grazing period and a lower quality at the end. Using rotational grazing (short grazing periods that leave substantial residue) results in relatively uniform forage quality throughout the grazing period. In addition, the diet change from a grazed paddock to a fresh paddock is minimized.

Management Practices to Reduce the Incidence or Severity of Pasture Bloat

Pasture Establishment and Management

- Plant mixtures of legume and grass with legumes providing no more than 50 percent of the available forage. Observe plant growth rates and legume-grass proportions throughout the growing season.
- Plant non-bloating legumes like birdsfoot trefoil, cicer milkvetch, safflower, and lespedeza or lower-risk legumes like sweet clover and red clover.
- Avoid patches of palatable, high bloat-potential plants. Intersperse these areas with grasses or use herbicides to reduce concentration of high bloat plants.
- Fertilize grass/legume pastures with nitrogen to stimulate grass production.

Livestock Diet Supplements

- Feed anti-foaming chemicals like poloxalene, which prevents pasture bloat for about 12 hours if consumed in adequate amounts. Begin feeding two to five days before turning onto pasture. Poloxalene can be fed as a topdressing on feed, in a grain mixture, in liquid supplements, or in molasses blocks. Because poloxalene is relatively expensive, some producers reduce the dosage or eliminate its use after livestock have been grazing pasture for several weeks.
- Provide supplements or molasses blocks containing bloat-reducing compounds such as an ionophore (example: Rumensin®).
- Provide mineral supplements with adequate sodium (salt) and avoid excessive potassium, calcium, and magnesium.
- Allow livestock free-choice access to portions of pasture windrowed several days prior to grazing or to dry-grass hay, grain, or crop residues while grazing lush, high bloat-potential plants.

Grazing Management

- Never turn hungry livestock into pasture containing a high proportion of bloat-causing plants.
- Fill animals with dry hay or grass pasture before beginning to graze high bloat-potential pastures.
- Avoid turning animals onto fresh, high bloat-potential pasture that is moist with dew, rain, or irrigation water. Both rate of intake and initial rate of digestion are higher from moist plants, causing more rapid initial digestion.
- Make paddock rotations mid-day or later to help minimize moisture and increase plant carbohydrate concentration.
- Avoid dramatic changes in forage quality when rotating from paddock to paddock by leaving adequate residue.
- Observe livestock closely the first several days and remove any “chronic-bloating” animals.
- Avoid grazing legumes before they begin to bloom. This may not be possible if spring grazing or if grazing season-long. Make closer observations for bloat when many plants are at a younger growth stage.
- Manage grazing to encourage livestock to consume low- or non-bloating plants and plant parts rather than just succulent top growth. For example, use daily strip grazing or use high stock density in multiple paddock systems rather than continuous stocking.
- Never allow animals grazing high bloat-potential pasture to get so hungry that they consume too much in one feeding. Always have sufficient feed available.
- Once grazing begins, don’t remove animals from pasture or make frequent, major changes in the type of pasture being grazed unless animals have greatly distended rumens. Mild bloat is common on high bloat-potential pastures. Frequent diet changes prevent rumen microbes and animals from adapting to bloat pastures.
- Be extra observant for cattle bloat when high bloat plants show a rapid flush of growth such as during cloudy, wet periods in the spring and after a plant stress event such as hail or drought.
- Delay grazing high bloat-potential plants for three to five days after freeze damage.
- Graze with animals that have smaller rumen capacities, like yearlings and calves, rather than mature cows.
Managing Feedlot Bloat

Feedlot bloat is most frequently associated with indigestion caused by acidosis. Death losses are minimal in well-managed feedlots.

Most cases are “subacute” rather than “acute.” In acute cases, distress symptoms such as frequent urination and defeation, labored breathing, and restless movements are evident. In some feedlot cattle, bloat is chronic, occurring repeatedly in a few cattle.

Poloxalene does not appear to be effective in preventing feedlot bloat even though foam (and often, slime) is involved. Ionophores (examples: Rumensin®, Bovatec®, Cattlyst®) improve the feed efficiency of high-grain rations and help reduce overeating and the incidence of grain bloat. Thus, the use of ionophores is highly recommended.

Following are some changes that may prove effective in reducing the frequency and severity of feedlot bloat:

1. Coarsely chop the hay and mix with grain.
2. Increase hay to 15 percent of ration dry matter.
3. Feed 50 percent or more rolled corn, whole corn, or rolled grain sorghum (milo).
4. Use a coarser grind on corn and grain sorghum.
5. Substitute low-quality legume or non-legume roughage for alfalfa hay. Adjust the protein, vitamin, and mineral supplement appropriately.
6. Increase the concentration of the ionophore if possible.

Feedlot bloat that occurs on high-concentrate rations usually can be reduced by providing 10 to 15 percent of the ration as coarsely chopped roughage. When separation of the grain or supplement from roughage seems to be involved, change the ration or improve mixing to minimize separation.

Managing Bloat That Follows Grub Treatment

Sometimes bloat may occur 10 to 24 hours following grub treatment with organophosphate grubsicide (pour-on or spray). The grubsicide, if used late in the season, kills migrating grubs in the area of the esophagus, thus causing swelling in that area and preventing the animal from belching or swallowing normally. Animals may try to eat, then spit out feed and saliva. This is followed by bloating and difficult breathing.

If bloat occurs, do not feed the animal for a few hours and walk it slowly until the bloat goes down. If the animal is having trouble breathing, relieve the bloat with a trocar or large bloat needle. **Do not pass a stomach tube in animals that bloat following grub treatment.** The esophagus may be damaged and permanent injury may result. Antihistamines and corticosteroids should be administered under a veterinarian’s direction.

Treatment

Acute bloat must be treated promptly. In the last stages of severe bloat, a few seconds delay may result in the animal’s death.

Plan with your veterinarian for emergency treatment for bloat before the grazing season. Equipment needed includes good handling facilities, a stomach tube or rubber hose about 3/4 to 1 inch in diameter and 8 to 10 feet long, a supply of defoaming agent, and a large trocar. If the trocar fails to relieve the bloat, you will also need a sharp knife suitable for incising the skin and making an opening into the rumen.

In severe cases, a stomach tube can provide relief. If the tube doesn’t provide immediate relief, the defoaming agent will frequently break down the foam and allow large amounts of gas to release through the tube or by belching. The anti-foaming agent can be added through the tube or through a trocar and bloat needle. Never drench a bloated animal. Fluid is apt to be inhaled during drenching, causing immediate death or pneumonia. Antifoaming agents would include emulsified oil (mineral oil), or an oil containing an approved detergent such as diocyl sodium sulfosuccinate.

Large bloat needles may be adequate for relieving feedlot bloat. They are about 6 to 7 inches long and come with a wire stylet to unplug them, if necessary. Insert the needle at a point midway between the last rib and hook-bone on the left side, 3 to 4 inches below the edge of the loin (Figure 2).

If the needle does not relieve the problem, a trocar fitted with a cannula (Figure 3) can be used. The end of the trocar is sharp, much like a knife. Push the trocar through the muscle and rumen wall. Then remove the trocar from the cannula and gas should begin flowing from the cannula that remains.

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Figure 2. Insertion point for needle or trocar fitted with a cannula. Dotted triangle is the left paralumbar fossa where the “hollow” of the flank is found. (Photo Credit: Belinda Walker, courtesy Government of Alberta, Canada)

Figure 3. Trocar (bottom) and cannula. (Photo Credit: Belinda Walker, courtesy Government of Alberta, Canada)
If foam is present and is so viscous that the trocar opening is not large enough to give relief, as a last resort, use a sharp knife to open a slit about 3 inches long and then spread apart with your fingers. Insert at least one finger through the incision until the bloat is fully relieved. Otherwise, the rumen may move, causing the opening in the rumen to shift away from the opening through the belly wall and skin.

Prompt veterinary attention is needed in these cases to deal with potential complicating factors, especially with leakage of rumen contents into the abdomen.

Choking on foreign objects (esophageal obstruction) will prevent gas release and accumulate gas in the rumen. This should be relieved with a trocar or big needle, if possible followed by gentle removal of the obstruction from the esophagus. This is difficult and usually requires help from a veterinarian.

Chronic bloat caused by pressure on the esophagus due to muscle paralysis or other tissue pressure on the esophagus can be corrected by making a ruminal fistula. A veterinarian can surgically create a ruminal fistula in the left flank area to release excess rumen gases. Generally, these openings are about 3/4 inch in diameter. The fistula is designed to remain open for 1 to 2 months. During this time the swollen tissues should decrease in size and normal belching can resume. Normally, natural healing will close the fistula. If not, a veterinarian can surgically repair it.

This publication has been peer reviewed.

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Index: Beef
Feeding and Nutrition
Issued May 2010

Extension is a Division of the Institute of Agriculture and Natural Resources at the University of Nebraska–Lincoln cooperating with the Counties and the United States Department of Agriculture.

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The clostridial diseases are a group of mostly fatal infections caused by bacteria belonging to the group called Clostridia. These organisms have the ability to form protective shell-like forms called spores when exposed to adverse conditions. This allows them to remain potentially infective in soils for long periods of time and to present a real danger to the livestock population. Many of the organisms in this group are also normally present in the intestines of man and animals.

**Blackleg**

Blackleg is a disease caused by *Clostridium chauvoei* that primarily affects cattle under 2 years of age and is usually seen in the calves that are doing better. The organism is taken in by mouth. Symptoms first noted are lameness and depression. A swelling, caused by gas bubbles, often can be felt under the skin as a crackling sensation. A high temperature is present. However, sudden death often occurs with no symptoms observed.

Upon postmortem examination, the infected area is composed of black, dead (necrotic) muscle that is pocked with gas bubbles and is usually found in the heavier, more active muscle masses of the animal. A sweetish odor of rancid butter may be detected from a fresh lesion. Lesions may occasionally be discovered in the diaphragm, heart, or tongue. Diagnosis is based on the symptoms of lameness with a gaseous swelling under the skin in young cattle and is confirmed by postmortem and laboratory tests. The chances for survival are poor unless symptoms are discovered early in the disease. Large doses of penicillin may save the life of the animal if administered early.

Prevention is readily accomplished by the use of Blackleg bacterins, which over the years have proven very effective. Vaccination at less than 4 months of age will not produce a lasting immunity. Calves vaccinated at less than 4 months should be revaccinated at 5 to 6 months.

**Malignant Edema**

Malignant edema is a disease of cattle of any age caused by *Cl. septicum*, which is found in the feces of most domestic animals and in large numbers in the soil where livestock populations are high. The organism gains entrance into the body in deep wounds, and can even be introduced into deep vaginal or uterine wounds in cows after difficult calving.

The primary symptoms are depression, loss of appetite, and a wet doughy swelling around the wound that often gravitates to lower portions of the body. Temperatures of 106°F or more are associated with the infection. Death frequently occurs in 24 to 48 hours.

Postmortem lesions seen are those of necrotic, darkened, foul-smelling areas under the skin, often extending into muscle. Very little, if any, gas is associated with the swellings. Diagnosis is based on the history of illness in unvaccinated cattle, typical symptoms, and postmortem lesions with laboratory confirmation. Treatment with massive doses of penicillin is occasionally successful in cases observed early. The disease can be prevented by the use of *Clostridium septicum* bacterins usually produced in combination with other bacterins.
**Clostridium Novyi**

Infections caused by *Cl. novyi*, infrequently called Black disease, occur sporadically in cow-calf operations. They are more often seen under feedlot conditions. The route of infection and transmission are not known; however, the organism is thought to gain entrance into the body by a wound infection, or is possibly taken in orally. Only sudden deaths are thought to occur, and sick cattle are not generally recognized.

Postmortem lesions are similar to those of *Cl. septicum* with a wet, foul smelling lesion present. Diagnosis is based on the history of sudden death, significant postmortem lesions, and positive laboratory confirmation on fresh tissue. No treatment is recognized due to the sudden death aspect of the disease.

*Cl. novyi* bacterins are available in combination with other clostridial bacterins and are generally thought to offer greater and more solid protection with two injections given 4 to 6 weeks apart.

**Clostridium Sordellii**

*Cl. sordellii* is a sudden death disease of feedlot cattle primarily, infrequently seen in cows. The route of transmission is unknown, but thought to be by mouth. No symptoms are observed, as only dead animals are found.

The postmortem findings are somewhat specific, as they tend to be found in the areas of brisket and throat, consisting of massive black hemorrhage and smelly muscle necrosis with no gas formation. No treatment is of value, as sick animals are not observed. The diagnosis is based on the history of sudden death, with the typical postmortem lesions of the brisket and throat and by laboratory confirmation. *Clostridium sordellii* bacterins are available.

**Tetanus**

Tetanus in cattle is caused by *Cl. tetani*. Although cattle are less susceptible to tetanus than most other animals, it can occur. The organism lives in the intestines of many animals and is found widespread in soil. The organism is introduced into wounds created by punctures or lacerations caused either by accident or following “dirty surgery.”

The organism does not actively invade tissues creating a larger more noticeable wound, but remains in the small area where introduced and produces powerful toxins or poisons that primarily attack nerve tissue, affecting both the spinal cord and brain.

The symptoms observed are those of muscle spasms, sometimes violent, brought about by sudden sounds or touch. The spasms make normal locomotion difficult, and animals are often seen as uncoordinated in early cases. Also, in early stages, the ears are erect, the tail is stiff and elevated, and the third eyelid located in the corner of the eye is seen to protrude partially across the eye.

In general, about 60 percent of affected untreated cattle die. No lesions are found at postmortem, and only occasionally can the original offending wound be found. Diagnosis, therefore, is based on typical clinical signs and perhaps the history of a recent wound.

Treatment consists of tranquilization of the animal and antibiotics, preferably penicillin, to stop the organisms from producing further toxins. Tetanus antitoxin may be used in large doses, but some question its effectiveness in treatment. Supportive treatment to prevent dehydration and starvation may need to be given for 1 to 4 weeks.

Prevention is best accomplished by making sure lots and pasture areas are free from objects that may cause puncture wounds, and by accomplishing surgical procedures as cleanly as possible. In areas of high risk, tetanus antitoxin can be given at the time of surgical procedures.

**Clostridium Hemolyticum**

*Cl. hemolyticum* causes an infection commonly called redwater disease. The disease has somewhat limited geographic locations, occurring mostly in Montana and along the coast of Texas, being found primarily in marshy lowlands. Nevada, Idaho, California, Oregon, and Washington all have problems with *Cl. hemolyticum*.

The organism, taken in orally, is frequently associated with liver fluke infection. Liver tissue damage caused by the flukes allows the bacteria to proliferate, grow, and produce powerful toxins that destroy red blood cells, spilling the released red hemoglobin into the urine, hence the name redwater disease.

Symptoms seen are depression, anemia, bloody diarrhea, red-stained urine, high temperature, collapse, and death in 1 to 3 days. Postmortem lesions are those of an extremely pale animal, red-stained urine in the bladder, thin watery blood, and usually, a large necrotic area in the liver.

Treatment is usually of no avail unless begun early. Large doses of penicillin may help. A bacterin is available for use in areas where the disease appears, but must be given every 6 months. More frequent vaccination may be necessary in heavily infected areas.

**Enterotoxemia**

This disease condition is caused by *Cl. perfringens*. This organism is found throughout the world in the lower intestinal tract of man and animals. The disease entity is seen most frequently in the cow-calf operation is hemorrhagic enterotoxemia, caused by *Cl. perfringens* type C.

As *Cl. perfringens* is a normal inhabitant of almost all mammals, a specific set of circumstances must exist for the disease to present itself to the animal: (a) The type C strain of the bacteria must be present in the intestinal tract; (b) the bacteria must have an abundance of nutrient, especially carbohydrates, for the bacteria to attack, as for instance, would be present in milk; and (c) there must be at least a partial slowdown or stoppage of intestinal tract movement brought about by ingesting a particularly large amount of feed, allowing the toxins to
accumulate and be absorbed in the gut.

These conditions could be met in the case of a young, vigorous week-old calf who, after exercise, develops a real hunger, drinks more than its normal amount of milk from a good milking dam, overloads its digestive tract, and therefore, creates the right conditions for disease to exist.

The disease is usually seen then in calves 1 week of age or less. Although riders may find only dead calves, more often the symptoms observed are those of acute abdominal pain as evidenced by kicking at the stomach and straining. Later the calves go down, frequently go into “paddling” type convulsions and die, usually within 12 hours after symptoms are noted. Infrequently, a bloody diarrhea may develop before death.

At postmortem one finds spectacular lesions of an extremely reddened section of the small intestine, several inches to several feet in length, which can be seen as soon as the abdominal wall is opened. A blood-tinged thick fluid is found when the gut is opened. Hemorrhages may be found on the heart and thymus as well. Diagnosis is based on the typical clinical symptoms and the spectacular lesion at postmortem. A definitive diagnosis can be made in the laboratory with gut content. However, it must be collected and frozen or delivered to the laboratory within 6 hours of death.

There is no treatment of value, as the animals almost always die following the appearance of symptoms. The disease can be prevented by giving the calf an injection of Cl. perfringens type C antitoxin (antiserum) as soon as possible after birth. One preventive injection seems to protect almost all of the calves through the dangerous early period of life.

A more efficient method of protection, if there is a history of a problem with the disease on the premises, is to vaccinate the cows with Clostridium perfringens type C toxoid. Two doses are given during pregnancy and a yearly booster thereafter. The vaccine should be given in late gestation for maximum benefit. This allows the cow to produce her own antitoxin in the colostrum, and therefore protects the calf after nursing. Sporadic outbreaks of type D enterotoxemia do occur, but infrequently, usually occurring in calves after weaning and while on dry feed. Calves dying of type D do not show the spectacular bloody intestinal lesions at postmortem, but have hemorrhages on the heart and thymus. A laboratory confirmation is necessary to absolutely diagnose type D. Types C and D enterotoxemia, of course, do occur in feedlot cattle, but rarely in mature stock cows.

**Botulism**

Botulism caused by Cl. botulinum occurs only rarely in the United States and has only been reported in Texas. The organism is found as a contaminant in feeds usually present in a decomposing animal, such as a rabbit or rat, which, as it grows in the small animal, produces a powerful toxin that leaks out into the surrounding feedstuff. When cattle ingest the contaminated feed, the symptoms are those of progressive paralysis ending in death.

No significant lesions are present at postmortem. No treatment is of value. Since the disease is so sporadic and rare, no preventive bacterins are available for cattle. Diagnosis must be based on presumptive evidence, and definitive diagnosis is almost impossible.

**Clostridium Biological Products**

A number of biological products (bacterins, antitoxins, and toxoids) for immunizing cattle against clostridial diseases have been licensed by USDA for production in the United States. Some of the less widely-used products may not be available in all areas.

Consult your local veterinarian for his recommendations for your particular herd health program.

**Summary**

The clostridial diseases as a group present a unique problem in control and diagnosis. Cow-calf operators should work closely with local veterinarians in evaluating the prevalence of these agents in their area. As was noted in the discussion, prompt postmortem examinations and tissue collection for laboratory testing are essential for an accurate diagnosis.

**Duration of Immunity**

In highly contaminated areas, it may be necessary to revaccinate cattle with these vaccines several times each year. Consult your local veterinarian to see if this is necessary in your area.

Adapted from CATTLE PRODUCER’S LIBRARY CL654

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This publication was prepared in cooperation with the Extension Beef Cattle Resource Committee and its member states and produced in an electronic format by the University of Wisconsin-Extension, Cooperative Extension. Issued in furtherance of Cooperative Extension work, ACTS of May 8 and June 30, 1914.

**BCH-3215 Clostridial Diseases**