SDSU Extension

BEEF

Chapter 34

Health Considerations: Baby Beef Calves

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Introduction

The survivability and health of calves during the first month of life is critical to the productivity of a beef cow-calf enterprise. Despite advancements in disease prevention and nutrition, industry data suggest that approximately 4% of all beef calves born alive will not survive to weaning. One third of those deaths will occur in the period from 24 hours to three weeks of age: ages at which calves are particularly vulnerable to diarrheal disease and other conditions. Moreover, calves that survive bouts of clinical illness will likely perform at a reduced level in the future, whether in the feedyard or the breeding herd. Management decisions regarding the cow herd as well as newborn calves directly impact the level of illness and mortality in beef calves within the herd.

Health Problems Encountered by Baby Calves

Diarrheal Diseases

Surveys suggest nearly a third of US beef producers consider neonatal calf diarrhea to be an economic drain on their operation. One-third of calf death loss occurring between birth and three weeks of age is due to diarrheal and digestive problems. An understanding of diarrhea and digestive pathogens is helpful when designing treatment and prevention protocols.

Normal calf stool has a pudding-like consistency. Stool consistency more fluid than pancake batter indicates a sufficient loss of fluids and electrolytes to warrant treatment. Different types of scours-causing germs employ different mechanisms to cause this loss of fluids and electrolytes. While each scours-causing pathogen is discussed separately below, mixed infections involving more than one of these agents at the same time are more commonly encountered. Without exception, these germs are transmitted in a fecal-oral manner, leaving the body in the manure of infected animals and taken in by susceptible calves in the course of nursing, eating, drinking, or licking contaminated materials.

Key Points

- A third of all calf losses between birth and three weeks of age can be attributed to neonatal calf diarrhea and digestive illness.
- The most important therapy for scouring calves is fluid and electrolyte replacement. Baby calves will benefit from treatment anytime their stool is more watery than normal.
- Managing exposure of baby calves to environments contaminated with scours-causing pathogens is the most important preventive measure in preventing neonatal diarrhea.
- Proper amount and timing of colostrum administration is critical to protecting the calf from a variety of disease threats in the first weeks of life.

Viral Causes of Diarrhea

Rotavirus and coronavirus are common pathogens affecting baby calves. Like most viruses, they are specific for the species and type of body tissue they infect. Both infect the absorptive cells on the tips of the microscopic finger-like projections into the inside surface of the intestine (the villi). As a result, these cells die and flake off. The villi contract and shrink, and are now ineffective at absorbing water and nutrients taken in by the calf. If the calf is supported with proper hydration during this time of infection, the intestinal cells will eventually regenerate and regain normal function. Coronaviruses tend to infect cells farther down on the villus than do rotaviruses, often resulting in more severe or long-lasting diarrhea.

Bacterial Causes of Diarrhea and Digestive Disease

Escherichia coli bacteria are extremely common inhabitants of cattle areas, but not all types of *E. coli* cause illness in calves. Certain enterotoxigenic strains have the unique capacity to attach to the surface of intestinal cells and produce toxins. These toxins stimulate the secretion of large amounts of fluid and electrolytes into the intestine and out of the body. Enterotoxigenic *E. coli* causes illness only in very young calves (0-4 days of age), as older calves have lower gut pH and no longer possess the receptors to which the bacteria can attach.

Clostridium perfringens is implicated in digestive disorders and sometimes in cases of calf diarrhea. There are 5 different "types" of C. perfringens based on the different toxins produced by the bacteria. Clostridium perfringens Type C is implicated in death losses and sometimes bloody diarrhea in very young calves (0-7 days). Clostridium perfringens Type A has been associated with bloating and mild diarrhea in calves of various ages (2-6 weeks), as well as stomach ulcers. These effects are the result of the toxins produced by the bacteria that have been ingested and have colonized the small intestine.

Salmonella infections can occasionally cause severe illness and diarrhea in younger calves. Along with causing severe inflammation and diarrhea in the intestinal tract, *Salmonella* is also implicated in overwhelming systemic bacterial infections (septicemia) that commonly result in high mortality. People are susceptible to Salmonella infections and can contract them from affected calves.

Protozoal Causes of Calf Diarrhea

Protozoal organisms are also commonly-encountered causes of calf diarrhea. These agents are one-celled "animals", more highly-developed than viruses or bacteria.

Cryptosporidium parvum is the cause of cryptosporidiosis, a common diarrheal condition in dairy and beef calves. Oocysts, the infective form of *C. parvum*, are shed in high concentrations from sick calves as well as in lower concentrations from older cattle. These oocysts are immediately infective to calves that ingest them from the environment. Once inside the intestine, the oocysts disrupt the digestive process by inhabiting the tip of the intestinal villus cells. *Cryptosporidiosis* affects calves from 1 to 4 weeks of age. Signs in calves range from a pudding-like stool containing flecks of blood to more watery diarrhea in calves co-infected with other diarrheal pathogens. People are also susceptible to infection with *C. parvum*.

Coccidiosis is another diarrheal disease caused by a protozoon. The agents causing coccidiosis have a more complicated life cycle than that of *C. parvum*. Once ingested, the oocyst form of coccidia undergoes several stages of reproduction and multiplication, using the cells lining the small intestine in doing so. This results in severe disruption and destruction of cells, leading to bloody diarrhea in affected calves. Because of this longer life cycle, signs of coccidiosis rarely occur in calves less than 4 weeks of age.

General Considerations for Treatment of Diarrhea in Baby Calves

The most important treatment for calf diarrhea is fluid and electrolyte replacement. Any calf with a "looser" than normal stool can benefit from supplemental fluids. In general, oral fluids (administered through a bottle or tube feeder) are indicated for slightly to moderately dehydrated calves. Such calves are still able to rise and move; however they may show signs of incoordination or weakness in doing so. The calf's eyeballs may be

slightly to moderately sunken, and the skin, once pinched, will take a longer-than-normal time to snap back to the body.

Many calf rehydration products are on the market. These are powdered formulations that contain electrolytes in the form of sodium, chloride, and potassium. Many also include an alkalinizing agent such as bicarbonate or acetate (preferred), and some include a sugar such as dextrose for an energy source. Products should be mixed exactly according to label directions, as a solution that is too concentrated or dilute may worsen diarrhea. Likewise, other medications should not be added to the replacement fluids. Beef calves should not be withheld from nursing while oral electrolytes are used. The nutrients gained from nursing (or supplemental milk) are important in helping the calf respond to the infection and will not make the diarrhea worse. Calves can be treated as often as is necessary depending on the severity of the diarrhea.

For calves that are more severely dehydrated – those showing more profound weakness when walking or are too weak to rise – intravenous fluid replacement is warranted. A veterinarian should be consulted, and the appropriate type and amount of fluids administered, usually through a catheter in the calf's jugular vein in the neck.

While most of the diarrhea-causing agents listed above are not responsive to antibiotics (exceptions: *E. coli*, *Clostridium*, and *Salmonella* infections), it has been demonstrated that a significant percentage of calves with diarrhea have high levels of coliform bacteria colonizing their small intestine. These calves have a high risk of developing septicemia as a result of bacteria entering the bloodstream. Therefore, treating diarrhea patients with an antibiotic that is effective against coliform bacteria is warranted as a means of preventing septicemia.

Specific treatments beyond fluids and antibiotics exist for some of the causes of calf diarrhea. For example, calves with *Clostridium perfringens* infections may benefit from the administration of Clostridial antitoxin. Calves suffering from coccidiosis will benefit from one of the specific treatments available for that disease.

General Considerations for Prevention of Baby Calf Diarrhea

The most important component of baby calf diarrhea prevention is decreasing the exposure of calves to infectious agents, as described below. In some outbreaks, the use of specific antibody products (against *E. coli*, *Clostridium*, *coronavirus*, etc.) may help the calf's immune system against these infections. Specific antibiotics or anticoccidials may be warranted on a preventive basis if these infections have been diagnosed in a herd.

Any product used for treatment and prevention of calf scours should be chosen and administered with advice from the herd veterinarian.

Septicemia

Septicemia is an overwhelming bacterial infection that has entered the bloodstream and multiple body organs. While many different bacterial species can be involved, the most common is *E. coli*. These bacteria can gain access to the bloodstream through the intestine or through the navel. Classically, septicemia most often occurs in calves between 2 and 6 days of age. Signs are non-specific, and often first appear as a lack of interest in nursing. Depression, rapid heartbeat and breathing, and redness of the mucous membranes and eyes are other signs of septicemia. Fever is not always present. Clinical signs often rapidly progress to an inability to rise, cold extremities, coma and death. Treatment of calves with septicemia is typically unrewarding, but should include appropriate antibiotics and anti-inflammatories along with intravenous fluids.

Respiratory Disease

Bovine respiratory disease complex is much less frequently encountered in baby calves compared to older calves post-weaning, yet cases do occur. In baby beef calves, the most commonly implicated risk factor for this syndrome is the failure of adequate colostrum intake. Many other risk factors have been proposed, including contact with older calves such as feedlot animals across fencelines. Signs include high fevers, rapid labored breathing, and an inability to keep up with the herd. Treatment involves administration of antibiotics and anti-inflammatories.

Navel infections

Umbilical cord infections typically will appear during the first week of life. The major risk factor for navel infections is that of being born into or contact with a contaminated environment. The umbilical cord after birth is a convenient portal for bacteria to enter the calf's bloodstream, but sometimes the infection can stay in the navel without becoming systemic. In these cases, the navel is swollen, warm and painful to the touch. Appropriate antibiotics and anti-inflammatories should be administered under the direction of a veterinarian. Possible results of navel infections can include umbilical abscesses or umbilical hernias.

Frostbite

Calves born in cold weather conditions of the Northern Plains can be subject to frostbite. The extremities such as the ears and end of the tail are most commonly affected, as well as the rear feet (due to the way calves lay with their front feet tucked underneath). The first signs of frostbite manifest themselves as cold stiffness to these body parts. If frostbite is detected at this stage, it may be possible to avert tissue damage by warming the affected parts. Gradual warming with lukewarm water is better than using direct heat. Care should be taken not to vigorously rub the areas, as that can hasten tissue damage.

In the days and weeks following the freezing event, the areas may be painful and mildly swollen before they turn dry and leathery and slough off. In the case of ear tips and the end of the tail, the implications of frostbite damage are simply cosmetic, but in the case of the rear legs, welfare considerations need to be taken into account. Euthanasia is the only proper alternative for a calf that has (or has begun to) slough their rear feet.

Management Considerations Promoting Newborn Calf Health

The Calving Area

Because of the importance of neonatal calf diarrhea as a cause of baby calf illness and death loss, an understanding of how calves become exposed to these disease-causing pathogens is critical. Cows normally shed low concentrations of diarrheal-causing germs such as rotavirus, coronavirus, enterotoxigenic *E. coli*, and *Cryptosporidia* in their manure. All of these agents can survive for weeks to months in typical calving areas. Exposure to enough of these organisms to overwhelm a calf's immune system is the root cause of diarrheal illness in baby calves. Regardless of the age at which calves begin to show signs of diarrhea, their initial exposure to disease-causing germs usually occurs during the first hours of life. Infected calves shed these same organisms, often in large numbers, to younger herd mates. Therefore, steps to minimize the buildup of these pathogens over time – or to ensure that calves are born in areas not subject to this buildup – will be important in the prevention of calf diarrhea.

Calving Pastures and Lots

Ideally, calving pastures should be spacious with good drainage and very little opportunity for mud. However, even the largest calving pasture has areas in which diarrheal organisms can accumulate, such as around feed bunks and water sources. Since disease-causing germs shed by cows have long survival times, calving should not take place where cows have wintered.

A management procedure that has been documented to reduce exposure of new baby calves to diarrhea-causing organisms is that of the Sandhills Calving System. In this management system, cows yet to calve are moved to new, previously unused calving pastures, leaving cow-calf pairs behind. This process is repeated every seven to 10 days, with the final result being age-segregated groups of baby calves that have not been exposed to season-long buildup of pathogens or to older calves shedding high concentrations of these germs.

Calving barns and pens

Cattle producers in the Northern Plains often utilize calving barns or sheds, possibly with individual calving pens, in order to soften the blow of harsh weather. Pathogen buildup can occur within these facilities just as easily as outdoors. In addition, the same shelter that protects cattle can also protect disease-causing germs from the effects of temperature extremes and sunlight. Calving facilities should be cleaned on a regular basis – weekly if possible – during the calving season. Removal of soiled bedding is a critical first step, and may be the

only step feasible in barns with dirt floors. Surfaces such as concrete floors or metal corral panels can be cleaned and disinfected with appropriate products.

Warming and Drying the Newborn Calf

Hypothermia (abnormally low body temperature) is a common cause of death in newborn calves born in cold conditions. Signs of severe hypothermia in calves include low rectal temperature (normal body temperature is 101.5°F, while severe hypothermia is present at 94°F), a cold mouth, and lack of suckle reflex. Hypothermia results from a combination of cold environmental temperatures and the reduced insulating capacity of a calf's wet hair coat. Accordingly, wet conditions with moderate temperatures (30-40°F) may be more likely to induce hypothermia than colder, dry weather conditions.

Efforts to warm a chilled calf should not be delayed, and can incorporate a variety of methods. These include use of a warming crate or "hot box", blankets, and immersion in warm water. Administration of colostrum will also aid body temperature regulation by providing a readily utilizable energy source.

While purchased or homemade "hot boxes" can be extremely effective at warming newborn calves, this equipment can be a very efficient transmitter of diarrhea-causing germs if it is not cleaned between calves and regularly disinfected.

Colostrum

The importance of high-quality colostrum in adequate quantity to a baby calf cannot be overstated. Colostrum not only serves as the sole source of disease-fighting antibodies for the first weeks of life, it is also a high-energy, high-protein meal that provides an important nutritional boost early in life. Evidence exists to suggest that calves that obtained sufficient colostrum not only stay healthier in the neonatal and nursing periods, they benefit by greater health and production throughout the feedlot or heifer development phase as well.

Amount of colostrum

A commonly-stated goal for the amount of immunoglobulin (antibody) needed by a calf through colostrum is 100 grams of immunoglobulin. How this translates into the volume of colostrum needed by the calf therefore depends on the antibody concentration of the colostrum. This concentration is quite variable across breeds of cattle, and even among individuals of the same breed. Dairy cattle may produce colostrum that contains 25 grams of immunoglobulin per liter, while beef breeds typically produce more concentrated colostrum, potentially as high as 100 grams per liter. Typically, the more conservative approach has been to assume cows will produce colostrum in the 25 grams/L range, leading to recommendations to provide four liters of colostrum to baby calves.

In practical terms for beef cattle operations, when calves do not nurse soon (1-2 hours) after birth, it is recommended that the cow be restrained and milked, and the entire first milking fed to the calf. Invariably, this milking will not produce colostrum quantities in the four liter range, but one can usually assume that colostral antibody concentrations will be higher in beef breeds. A colostrometer can be used to estimate the immunoglobulin concentration of colostrum.

Timing of colostrum feeding

A calf's gut can absorb immunoglobulins supplied in colostrum for only a short period after birth. This ability declines on an hourly basis beginning at birth, and is gone after 24 hours of age. When feeding calves colostrum, half the desired dose should be fed within the first two to three hours of life, with the remainder fed four to six hours after that. If a calf is not found until later than that, the entire feeding of colostrum should be given at once.

Colostrum replacers and supplements

Colostrum from the calf's mother is always preferred, but powdered products are available for use in instances when cow colostrum is not available. Colostrum replacers are intended for use to replace a full dose of colostrum for a calf. These products contain 100, 125, or more grams per liter of immunoglobulin, and should be used when a calf has not received any colostrum. Colostrum supplements, on the other hand, contain less than the recommended dose of immunoglobulin (typically 30-50 grams/L) and should be used when the calf has received some, but not sufficient, colostrum from her mother. Some products

marketed as "colostrum supplements" contain only nutritional components and no immunoglobulins at all, so producers should take time to read product labels before purchase.

When utilizing any of these products, the label must be rigidly adhered to regarding mixing instructions, and care should be taken to assure that the powder is completely dissolved in water before feeding.

Colostrum from another cattle operation (e. g., a dairy) is another option for operations lacking a source of colostrum. However, this brings with it a risk of novel disease introduction (e. g. Johne's Disease) into a herd.

Navel Care

When calves are found shortly after birth, it may be advisable to apply disinfectants or antiseptics to the calf's navel. These products combat environmental bacteria that may infect the navel tissue or enter the calf's bloodstream through the open navel shortly after birth. Several products are marketed for this purpose, including iodine and chlorhexidine compounds. Product choice should be discussed with a veterinarian, taking care to choose products that are tissue-friendly and do not cause undue irritation. It is also extremely important to realize that after gross contamination of a calf's navel with manure or mud, the usefulness of these products is questionable.

Banding/castrating

Bull calf castration is easily completed around the time of birth. Castration at this young age typically results in very little stress to the animal and minimal effects on growth. Elastrator bands placed around the base of the scrotum or surgical techniques can be used. While uncommon in baby calves, tetanus is a potential problem in banded and sometimes surgically castrated bull calves. Producers should work with their veterinarians to assess risks for tetanus in castrated bull calves in their local area. Administration of antibiotics, tetanus antitoxin, and tetanus toxoid vaccine may be necessary in some cases.

Administering Nutritional Supplements

A great variety of nutritional pastes and drenches are available for use in newborn beef calves with the stated purpose of giving calves a nutritional boost at the beginning of life. Very little clinical research has been done with any of these products, most of which contain varying levels of fat, protein, vitamins, and minerals. While there is no evidence these products produce measurable effects in treated animals, there is no evidence that they are detrimental, either. In any event, their use should not be considered a replacement for the milk received from the calf's mother, nor for a good nutritional program for cows in late gestation.

Vaccinating the Neonatal Calf

Administering vaccines to newborn calves is a relatively common practice for some disease conditions. However, there are several challenges inherent in trying to stimulate active immunity in very young calves. The influence of antibodies obtained from the mother through colostrum has been identified as a significant barrier to vaccine effectiveness during the period when these antibodies are still present in the calf. The relative immaturity of the calf's immune system is another challenge. In general, it is considered difficult for most vaccines to stimulate a meaningful active immune response in calves less than 1 month of age.

For clostridial diseases, there is little evidence to suggest that neonatal vaccination with 7-way or *Clostridium perfringens* Type C and D toxoids provides measurable immune stimulation (at least as measured by antibody production). Nevertheless, the practice is well-established in many cow-calf operations today. Veterinary advice should be sought when choosing products and developing vaccine schedules.

Summary

Newborn calves are perhaps the most fragile subset of animals present in the cow-calf operation. Their smaller body reserves and immature immune systems make them vulnerable to a long list of health concerns. Cow-calf producers can help reduce this vulnerability by reducing exposures to disease-causing organisms and managing exposure to weather conditions as much as possible.

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