

Calf scours

James G. Thorne, DVM, PhD
College of Veterinary Medicine



Introduction

Calf scours is not a single disease; it is a clinical sign associated with several diseases characterized by diarrhea. Regardless of cause, diarrhea prevents intestines from absorbing fluids. In addition, body fluids pass from the scouring calf's body into the intestines.

Calves are approximately 70 percent water at birth. Scouring calves lose fluids and rapidly dehydrate. Dehydration is also associated with loss of sodium and potassium, which are essential body chemicals (electrolytes). The buildup of acid—acidosis—also follows dehydration.

To implement effective preventive measures, it is essential to identify infectious agents that cause scours.

Causes of calf scours

The known causes of scours are grouped into two categories: non-infectious and infectious.

The non-infectious causes are often called "pre-disposing" or "contributing" factors. There is a dramatic interaction between non-infectious causes and infection. Any effort to prevent infectious causes is usually useless unless control of contributing non-infectious factors is part of the overall program.

Non-infectious causes of calf scours

Non-infectious causes are created by breakdowns in management, including nutritional shortcomings, in-

adequate environment, insufficient attention to newborn calves, or a combination of the above.

The most common non-infectious problems include:

- **Inadequate nutrition** of pregnant dams, particularly during the last third of gestation. Both the quality and quantity of colostrum are adversely affected if pregnant dams receive inadequate energy and protein. Deficiencies in vitamins A and E have been associated with greater incidences of calf scours.

- **Inadequate environment** for newborn calves. Muddy, crowded or contaminated lots are stressful to newborn calves. Calving heifers and cows together, or wintering and calving in the same area, can also cause stress. Storms, heavy snow, or heavy rainfall also permit easy exposure to infectious agents. Wet, chilled newborn calves may lose body heat, may be severely stressed, and may lack the vigor to nurse sufficient colostrum early in life.

- **Insufficient attention** to newborn calves, particularly during difficult births or adverse weather conditions. Calves are born with few antibodies. They get them only by nursing colostrum early in life. Attempts to prevent scours by vaccinating cows is wasted unless calves nurse colostrum, preferably before they are 2 to 4 hours old. Calves lose their ability to absorb colostrum antibodies by the hour. Colostrum given to calves 24 to 36 hours old is practically useless; antibodies are seldom absorbed this late in life.

Infectious causes of calf scours

Infectious causes of calf scours may be grouped as follows:

Bacterial causes	<i>Escherichia coli</i> (<i>E. coli</i>) Salmonella spp. <i>Clostridium perfringens</i> and other bacteria
Viral causes	Coronavirus Rotavirus BVD virus IBR virus
Protozoan parasites	Cryptosporidium Coccidia
Yeasts and molds	

Some pathogens may be more predominant than others in a given area. Diagnostic laboratories in the Midwest report greater incidence of *E. coli*, coronavirus, and rotavirus infections than other agents. It appears cryptosporidium is more common than previously thought.

Single infections are common, but mixed infections—for example, *E. coli* + cryptosporidium or coronavirus + salmonella—are often reported.

Bacterial causes of calf scours

Escherichia coli (*E. coli*)

E. coli appears to be the single most important cause of bacterial scours in calves. There are numerous kinds of *E. coli*.

Recent research indicates the majority of *E. coli* strains able to cause diarrhea first adhere to calves' guts. They do so through very fine, fuzz-like protrusions known as "pili" or fimbriae. These pili are designated the K99 antigen. *E. coli* strains that possess it are called enterotoxigenic *E. coli* (ETEC), which means they can produce toxins in the intestines. Of course, there are exceptions: some ETEC have a different type of pili—the K88 antigen. Other features of scour-causing *E. coli* are known as "capsular antigens," but it appears the K99 (pilus) antigen is the most common characteristic of ETEC.

Most newborn calves receive *E. coli* scours infections from the environment, particularly when sanitation is marginal. *E. coli* scours generally runs its course in two to four days. *E. coli* stimulates the intestines, so they secrete more fluids than they can reabsorb. Therefore, diarrhea and severe dehydration occur. Severe outbreaks of *E. coli* may affect calves as young as 16 to 24 hours. The younger the calves, the greater the chance for death from progressive severe dehydration.

Salmonella

Salmonella produces a potent toxin or an endotoxin (poison) within its own cells. Animals may be more severely depressed following antibiotic treatment because it causes the Salmonella organism to release the endotoxin. Because the endotoxin produces shock when it is absorbed by the intestine, design treatment to prevent shock.

Calves are usually affected at 6 days of age or older. The source of Salmonella infection can be other cattle, birds, cats, rodents, water supplies, or human carriers.

Clinical signs associated with Salmonella infection include diarrhea, blood and fibrin in the feces, depression, and elevated temperature. The disease is more severe in young or debilitated calves. If you find a membrane-like coating in the intestine on necropsy, you have strong evidence Salmonella is involved.

Clostridium perfringens

Clostridium perfringens infections are commonly known as enterotoxemia. Enterotoxemia is often fatal and is caused by toxins released by various types of *C. perfringens*. Types B,C, and D appear to be most important.

The disease has a sudden onset. Affected calves become listless, display uneasiness, and strain or kick at their abdomens. Bloody diarrhea may or may not occur. This is usually associated with a change in weather, change in feed of the cows, or management practices that cause calves to forgo nursing longer than usual. Hungry calves may drink too much milk, which establishes a media conducive to growth and production of toxins by Clostridial organisms. In many cases, calves die without outward signs of illness.

Viral causes of calf scours

Rota and corona virus

Researchers at the University of Nebraska first reported these two viruses as scour-producing agents in 1970. Today, most diagnostic laboratories are using technology pioneered in Nebraska, and the major role of these viruses in calf scours outbreaks has been confirmed.

Both viruses can disrupt cells that line the small intestine, resulting in diarrhea and dehydration. Furthermore, the damage they cause is often compounded by bacterial infections. The risk of fatal diarrhea increases when mixed infections occur.

The rotavirus was originally known as reovirus—reo-like virus—but the correct name, as used today, is rotavirus.

Calves as young as 1 or 2 days old may scour from corona or rotavirus infection; however, most outbreaks seem to occur when calves are nearly a week old and older. The morbidity (number of sick calves)

ranges from 1 to 2 percent to 20 to 30 percent. Mortality rates are quite variable. Many calves will recover if treated early. Conversely, losses of up to 25 percent have been reported, particularly when bacteria compound either corona or rotavirus infections. Death losses are consistently associated with pronounced dehydration.

Bovine virus diarrhea (BVD) virus

The BVD virus can cause diarrhea and death in young calves. Diarrhea begins about one to three days after exposure and may persist for an extended period. Erosions and ulcers on the tongue, lips, and in the mouth are usually apparent. These lesions are similar to those found in yearling and adult animals affected with BVD virus.

Infectious bovine rhinotracheitis (IBR) virus

The IBR ("red nose") virus primarily causes respiratory disease, abortions, vaginitis, and conjunctivitis. There are, however, reports associating the IBR virus with digestive disorders in young calves. Affected calves have erosions and ulcers in the esophagus, and complications include dullness, loss of weight, scours, and death.

Protozoan causes of calf scours

Coccidiosis

Coccidiosis is seldom a problem in newborn calves. However, outbreaks in calves 3 to 4 weeks old and older have been reported. Most outbreaks are associated with stress, poor sanitation, overcrowding, or sudden changes in feed. Some affected calves may exhibit signs of brain damage. Bloody or tar-colored diarrhea is commonly observed.

Cryptosporidium

Cryptosporidium is a protozoan parasite much smaller than coccidia. It adheres to cells that line the small intestine and damages the microvilli. Several reports from researchers and diagnosticians have associated *cryptosporidium* with outbreaks of calf scours. As a rule, *cryptosporidium* is detected in combination with coronavirus, rotavirus, or *E. coli*. Calves infected with *cryptosporidium* are usually 1 to 3 weeks old.

Yeasts and molds

Yeasts and molds are sometimes associated with lesions in the stomach or intestines of scouring calves. These organisms are not considered a primary cause of scours, but rather are secondary invaders. Often, they are found when scouring calves have received excessive antibiotics or sulfas. They are also found after an extended period when very little was done to counteract dehydration.

Nutritional scours

Under pasture conditions, calves adapt nursing patterns that fill their needs. Nutritional scours can be caused by anything that disrupts this normal habit. A storm, strong wind, or the mother's absence disrupts the normal nursing pattern. When calves do nurse, they are excessively hungry and their mothers have more milk than normal. Calves may overload, resulting in nutritional scours—usually white scours caused by undigested milk passing through the intestinal tract.

Treatment is usually easy and sometimes, if the calves are still active and alert, unnecessary. If calves become depressed or quit nursing, you should start treatment. Use oral antibiotics, along with fluids if calves begin to dehydrate.

Preventing calf scours

Because calf scours results from a combination of non-infectious factors and infectious microorganisms, it is essential to use more than shots and pills in any control efforts. You must provide managerial practices and medical treatments that complement each other. Furthermore, calf scours prevention is a year-round effort, not a set of activities conducted during the calving season.

Management aspects

All facets of management are important. Pay particular attention to nutrition, environment, sanitation, and care of newborn calves.

Nutrition

Balance the pregnant dams' rations in energy, protein, minerals, and vitamins. Adjust nutritional provisions during cold or inclement weather, and remember, pregnant replacement heifers have not reached their mature size. Provide them with sufficient feed energy for maintenance and growth. Failure to meet energy needs not only results in weak calves at birth, but also contributes to delays in return to estrus and lowered conception rates. Best results occur when replacement heifers are wintered and calved in advance of, and separate from, the mature cow herd. Give special attention to energy deficiencies and vitamin A and E shortages.

Environment and sanitation

Historically, severe outbreaks of scours are associated with bad weather—storms, slush, and mud. Although weather conditions are unpredictable, we can control the environment in which calves are born and raised early in life. Newborn calves need a dry, clean place if we expect them to survive free of scours. Geographic and climatic conditions dictate the type of management needed to ensure decent shelter.

Sanitation is just as important. Ideally, you should provide a special area used only for calving. Many cattlemen winter their pregnant females in confinement or semi-confinement. Manure and urine accumulate, so it becomes necessary to have a special calving area, separate from the wintering area. After calves are born and have nursed, they should be moved with their dams to a nursing area before being turned to pasture.

Attention to newborns

Calving difficulties may weaken newborns and their dams; calves may not nurse sufficient colostrum and scour later on. Perhaps the single most important requirement for newborn calves is nursing colostrum early in life. Calves must nurse 1 to 2 quarts of colostrum during the first two to four hours immediately after birth. Calves are born without disease protection. Only by absorbing antibodies in the colostrum will they acquire immunity against various infectious causes of scours.

Studies indicate 50 percent of heifers have less than 1 pint of colostrum during the first 12 hours after calving. At times, it is not practical to milk a beef cow or heifer, but the calves still need colostrum. Furthermore, calves born to cows or heifers that had assistance at calving should be given colostrum. Often, such calves are weak or have a swollen tongue or head because of extended calving. Many cattlemen keep frozen colostrum on hand. You can save colostrum from cows. Some cattle producers have one dairy cow in their beef herd to provide colostrum for freezing.

Be sure any colostrum you get for freezing comes from cows vaccinated against infections predominant in your area. Try to get it from the older cows in a dairy herd because older, vaccinated cows are more likely to have greater antibody levels than young, unvaccinated heifers. Save colostrum only from the first milking.

Plastic 1 or 2 quart freezer bags are ideal for storage. When you need colostrum, thaw frozen colostrum slowly; boiling destroys most of the antibodies. Microwave ovens heat unevenly and can destroy the antibodies. Colostrum can be kept frozen one year.

You can give colostrum to calves by nipple bottle or esophageal feeder. The esophageal feeder is a convenient plastic or stainless steel tube with an enlarged end that is placed in the calf's throat or esophagus. A plastic pouch (1 to 2 quart capacity) is attached to the other end. The "ball" end helps prevent the tube from passing into the calf's trachea or windpipe.

Many calves also benefit from a vitamin A injection. Vitamin A deficiency is associated with scours. Calves should be given 500,000 I.U. (usually 1 cc) of vitamin A early in life.

Vaccination programs

A well planned, consistent vaccination program is an effective tool to prevent scours if you manage it properly. Because different herds in the same region may vary in the type of infectious agents present, no universal vaccination program exists. Each program must be tailored to the herd's specific needs. Consultation with the local veterinarian, accurate records, and diagnostic laboratory assistance are integral components in designing an effective vaccination program.

Effective vaccines have been developed during the last decade. The vaccine program is not complete until calves nurse sufficient colostrum early in life. Some of the disappointment associated with the use of scour vaccines may reflect a "missing link." Cows were vaccinated and collected antibodies in the colostrum, but calves did not ingest enough colostrum early enough to be protected.

Table 1 summarizes current information on scour vaccines. Mention of commercial names does not imply endorsement by the Cooperative Extension Service.

Monoclonal antibodies— (Genecol 99)—Molecular Genetics, Inc.

A monoclonal antibody, released in late 1983, is used to reduce death loss due to enterotoxigenic *E. coli*. This genetically engineered product is given orally to calves during the first 12 hours of life. Results from several tests show the product is very effective in protecting calves from death caused by ETEC. It should be noted that while mortality is reduced, the incidence of diarrhea due to *E. coli* may not be changed. The antibody is effective only for *E. coli* scours, not diarrhea caused otherwise.

Treatment

Treatment of scours is similar regardless of cause. You should try to correct the dehydration, acidosis, and electrolyte loss.

You can overcome dehydration with simple fluids given by mouth early in the course of the disease. But if you allow dehydration to continue, you may need to treat with intravenous fluid treatment. You can give antibiotic treatment simultaneously with treatment for dehydration.

Clinical signs of dehydration first occur when fluid loss reaches 5 to 6 percent of body weight. Fluid loss of 8 percent results in depression, sunken eyes, and dry skin. Affected calves will probably be unable to stand. A 12 percent loss of fluids usually causes death. Oral fluids given early to scouring calves are usually successful. Several dry commercial electrolyte powders that can be mixed with water for oral administration are available. Consult your veterinarian for recommendations.

Table 1. Scour vaccines

Type of vaccine	Brand name	Manufacturer's recommendations
<i>E. coli</i> (K99)	Coligen Coli-4	Two 5 ml doses (i.m. or s.c.) to pregnant dams, spaced 21 days apart. The final dose should be given three weeks before calving. Annual booster is recommended.
<i>E. coli</i>	Vicogen Beecham Fort Dodge Norden Pitman Moore	Two 5 ml doses given s.c. to pregnant dams, the first at six weeks before calving and the second at three weeks before calving. Annual booster is recommended.
C/D toxoid	Several	Administer yearly to pregnant dams, according to label directions, no later than three weeks before calving.
Corona & Rotavirus	Calf-Guard	Two doses given i.m. to pregnant dams, the first, two months before calving; the second about one month before calving. Spring programs may use the first injection in the fall during pregnancy examination and annual physical exams. Annual booster is recommended.
Corona + rotavirus + <i>E. coli</i>	Scour-Guard 3	Similar to those for Calf-Guard.
Coronavirus + rotavirus	Scourvac	One 4 ml dose, sprayed into the back of the calves' mouths as soon as possible after birth.
IBR and BVD	Several	Administer, according to label directions, to cows and heifers before breeding.

Before initiating any vaccination program, ask your veterinarian for up-to-date information.

If you can't find any electrolyte powders, you can prepare an oral solution by using 1 tablespoon baking soda, 1 teaspoon salt, and 250 cc (8 ounces) of 50 percent dextrose. (Do not use table sugar.) Add enough warm water to make 1 gallon. Administer up to 1 quart of the mixture every three to four hours, depending upon the degree of dehydration and fluid loss. You can use this solution as the only source of nutrients for 24 to 48 hours. Do not use milk or milk replacers, because milk in the intestinal tract makes an ideal medium in which bacteria such as *E. coli* can grow. As soon as an affected calf is able to follow its mother, return it to her.

Another formula often used includes: 1 package (1 ounce) fruit pectin, 1 teaspoon Lite™ (potassium chloride) salt, 2 teaspoons baking soda, 1 can beef consommé, and enough warm water to make 2 quarts. Give 1 quart warmed solution orally at four-to six-hour intervals. Keep unused solution refrigerated, but discard unused portions after 24 hours.

Giving electrolytes orally may be difficult unless calves will nurse from a bottle. The esophageal feeder is useful in administering oral fluids. It may help to lubricate the esophageal feeder with water before passing it into the mouth and esophagus. Thoroughly disinfect the feeder between uses. Consult your

veterinarian for proper use of an esophageal feeder.

Most dehydrated calves suffer from hypothermia (lower-than-normal body temperature). It is often necessary to provide them with an external source of heat during fluid/electrolyte treatment. You need a warm barn or heat lamps for treatment of hypothermic calves.

When you treat calves for diarrhea, use antibiotics both orally and by injection. Use "systemic" antibiotics—either those that are injected or those that are absorbed from the intestinal tract. These are necessary to prevent pneumonia.

Don't use corticosteroids or drugs that decrease intestinal motility. Oral antibiotics, sulfas, or "scour-pills" may or may not be beneficial. If you use them, do so only at the proper dosage and frequency and for two to three days at the most. If they are ineffective after two to three days, discontinue use. Otherwise, resistant bacteria or molds and yeast may overgrow in the gut.

In some Salmonellosis outbreaks, antibiotics may cause the release of excess endotoxins, so consider using fluid therapy only.

Consult your veterinarian for further recommendations.

■ Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914 in cooperation with the United States Department of Agriculture. John W. Oren, Director, Cooperative Extension Service, University of Missouri and Lincoln University, Columbia, Missouri 65211. ■ An equal opportunity institution.